

C21_ Curriculum

DIPLOMA IN MECHANICAL ENGINEERING



OFFERED BY

STATE BOARD OF TECHNICAL EDUCATION & TRAINING,

TELANGANA: HYDERABAD

I SEMESTER

	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			Instruction periods per week			Total Periods per semester	Credits	Continuous internal Evaluation(CIE)			Semester end examination (SEE)			
			L	T	P			Mid Sem1	Mid Sem 2	Internal Evaluation	Max marks Min marks	Total Marks	Min marks for passing including CIE	
1	HU-101	Basic English	4	1	0	75	3	20	20	20	40	14	100	35
2	SC-102	Basic Engineering Mathematics	4	1	0	75	3	20	20	20	40	14	100	35
3	SC-103	Basic Physics	4	1	0	75	3	20	20	20	40	14	100	35
4	SC-104	General Engineering Chemistry	4	1	0	75	3	20	20	20	40	14	100	35
5	ME-105	Basic Manufacturing Technology	4	1	0	75	3	20	20	20	40	14	100	35
6	ME-106	Basic Engineering Drawing	1	0	2	45	1.5	20	20	20	40	20	100	50
7	ME-107	Basic Auto Cad Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
8	ME-108	Basic Workshop Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
9	SC-109	Basic Science Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
10	CS-110	Basic Computer Science Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
11	ME-111	Skill Upgradation	0	0	8	120	2.5	0	0	Rubrics			--	-
	Activities: student performance is to be assessed through Rubrics													

HU-101 - Basic English

Course Title	Basic English	Course Code	HU-101
Semester	I	Course Group	Foundation
Teaching Scheme in Minutes (L:T)	4:1:0	Credits	3
Methodology	Communicative Language Teaching + Assignments	Total Contact Hours	75
CIE	60 Marks	SEE	40 Marks

Prerequisites: Basic knowledge of English Language

COURSE CONTENTS

MODULE 1: VOCABULARY

Duration: 12 Periods – (L 8 P 4)

1. How to Use a Dictionary
 - a) How to locate a word
 - b) Different kinds of dictionaries
 - c) Uses of dictionaries and digital dictionaries
2. Building Vocabulary
 - a) Words from other languages – Greek, Latin, French, Sanskrit, Hindi, and Telugu.
 - b) Words from names of people (Eponyms) with focus on terms used in science and technology.
 - c) Word Forms – Focus on words from Science and Technology.
3. Words Often Confused
 - a) Homonyms, Homophones.
 - b) Heteronyms, Heterophones
 - c) Capitonyms

MODULE 2: READING

Duration: 12 Periods – (L 8 P 4)

1. Purpose of Reading
2. Types of Reading
3. Types of Paragraphs and Questions (F I V E)

MODULE 3: SPEAKING

Duration: 12 Periods – (L 8 P 4)

1. Need for English
2. Classroom English

3. Expressing Feelings
4. Expressing Likes & Dislikes
5. Making Requests
6. How to Introduce Oneself
7. Expressing obligations.

MODULE 4: GRAMMAR I

Duration: 12 Periods – (L 8 P 4)

1. Basic Sentence Patterns
2. Tenses
3. Voice

MODULE 5: GRAMMAR II

Duration: 15 Periods – (L 10 P 5)

1. Adjectives
2. Prepositions
3. Asking Questions

MODULE 6: WRITING

Duration: 12 Periods – (L 8 P 4)

1. Paragraph Writing – I
2. Paragraph Writing – II
3. Letter Writing – I
4. Letter Writing – II

COURSE OUTCOMES

No.	At the end of the course, the students will have the ability to:
101.1	Use a dictionary and acquire vocabulary for social interaction.
101.2	Comprehend, identify main ideas, make inferences, visualize, and answer questions. Analyze and evaluate the written material.
101.3	Speak and write grammatically correct sentences, communicate effectively, express their likes, dislikes, feelings, make requests, express obligations and introduce themselves.
101.4	Use verbs in the different tenses according to the situations. Use Voice to express an action clearly
101.5	Describe people and objects, ask questions, use prepositions and write grammatically correct sentences.
101.6	Convey ideas in the form of paragraphs and letters

CO-PO Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	Mapping POs
101.1	-	-	-	-	3		3	5,7
101.2	-	-	-	-	3	2	3	5,6,7
101.3	-	-	-	-	3	3	3	5,6,7
101.4	-	-	-	-	2	2	3	5,6,7
101.5	-	-	-	-	2	2	3	5,6,7
101.6		-	--	--	2		3	5,7

Test	Units	Marks	Pattern
Mid Sem- I	1. Vocabulary 2. Reading	20	Part A: 4 short answer questions Part B: 2 short essay questions with internal choice Part C: 2 essay questions with internal choice
Mid Sem - II	1. Speaking 2. Grammar-1	20	Part A: 4 short answer questions Part B: 2 short essay questions with internal choice Part C: 2 essay questions with internal choice
Slip Test 1	1. Vocabulary 2. Reading	5	2 questions out of 3 questions
Slip Test 2	1. Speaking 2. Grammar-1	5	2 questions out of 3 questions
Assignment	One assignment per one semester	5	Different assignments of higher order questions that develop problem solving skills and critical thinking should be given
Seminars	One seminar per one semester	5	Oral presentations using audio–visual equipment, charts, etc.
	Total	60	

MID SEM - I EXAM					
S. No.	Unit Name	R	U	A	Remarks
1	Unit - I	1, 2	5 (a) 5 (b)	7 (a) 7 (b)	
2	Unit - II	3, 4	6 (a) 6 (b)	8 (a) 8 (b)	
Total Questions		4	4	4	
MID SEM - II EXAM					
S. No.	Unit Name	R	U	A	Remarks
1	Unit - I	1, 2	5 (a) 5 (b)	7 (a) 7 (b)	
2	Unit - II	3, 4	6 (a) 6 (b)	8 (a) 8 (b)	
Total Questions		4	4	4	

SEMESTER END EXAM							
Sl. NO.	Unit No.	Question to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9 (a)	13 (a)	
2	II						
3	III		2		10 (a)	14 (a)	
4	IV						
5	V		3	5, 6	9 (b)	13 (b)	
					11 (a)	15 (a)	
					11 (b)	15 (b)	
6	VI			7, 8	10 (b)	14 (b)	
					12 (a)	16 (a)	
					12 (b)	16 (b)	
Total Questions		8		8	8		

Legend:

Remembering: one mark

Understanding: three marks

Application: five marks

Suggested Student Activities:

- Practice conversation / dialogue / speech and answer the questions.
- Group discussions.
- Seminars.
- Review a movie.
- Review a book.
- Narrating a story.
- Chain stories.
- JAM.
- Speak about incidents /events /memories /dreams /role model.
- Interviews of famous personalities.
- Reading for main ideas and specific details.
- Summarizing.
- Picture description.
- Writing a recipe.
- Describing a process.
- Giving directions using maps.
- Surveys.
- Filling forms.
- e-mail etiquette.
- Preparing reports on field visits, experiments, projects.
- General English for competitive exams – Practice the previous year's question papers of SSC, RRB, TS TRANSCO, TSGENCO, etc.

REFERENCES:

1. Practical English Grammar by A.J Thomson and A.V. Martinet
2. A Course in Phonetics and Spoken English by J. Sethi and P.V Dhamija
3. Word Power Made Easy by Norman Lewis.
4. Keep Talking by Friederike Klippel.
5. More Grammar Games by Mario Rinvulcri and Paul Davis.
6. Essential English Grammar by Raymond Murphy.
7. Spoken English-A Self Learning Guide to Conversation Practice by V Sasi Kumar.

E-learning resources:

1. www.duolingo.com
2. www.bbc.co.uk
3. www.babbel.com
4. www.merriam-webster.com
5. www.ello.org
6. www.lang-8.com

7. youtube.com
8. Hello English (app)
9. mooc.org
10. <https://onlinecourses.nptel.ac.in>
11. <https://www.indeed.com/career-advice/>
12. Dictionary.com
13. Online Dictionaries
14. <https://englishsentences.com>
15. <https://englishcub.com/vocabulary/dictionary-thesaurus.htm>
16. TEDx talks.
17. Toastmasters International on YouTube.

BOARD DIPLOMA EXAMINATION (C-21)
MID SEMESTER EXAMINATION – I
HU-101-BASIC ENGLISH

Time: 1 Hour

Total Marks: 20

PART - A

1 X 4 = 4

Instructions: Answer all the questions. Each question carries one mark.

1. Choose the correct guide words for the following words.

1. Pool:

a. Play, Portico	b. Poem, Poet
c. Prosper, Pull	d. Porpoise, Pout

2. Monkey:

a. Money, Monk	b. Mole, Mount
c. Moon, Most	d. More, move

2. _____ is the Unit of Electric Current in SI Units named after Andre Marie Ampere.

3. Read the following passage and answer the question.

There once was a Bald Man who sat down after work on a hot summer's day. A Fly came up and kept buzzing about his bald pate, stinging him from time to time. The Man aimed a blow at his little enemy, but his palm came on his head instead; and again the Fly tormented him. But this time the Man was wiser, and said: "You will only injure yourself if you take notice of despicable enemies."

- i) How can you say that the man has become wiser?

4. Read the following passage and answer the question.

An Eagle was soaring through the air when suddenly it heard the whizz of an Arrow, and felt itself wounded to death. Slowly it fluttered down to the earth, with its life- blood pouring out of it. Looking down upon the Arrow with which it had been pierced, it found that the shaft of the Arrow had been feathered with one of its own plumes. "Alas!" it cried, as it died. "We often give our enemies the means for our own destruction."

- i) What did the eagle discover before its death?

PART - B

3 X 2 = 6

Instructions: Answer the following questions. Each question carries three marks

5. a) Read the following and use correct words in the blanks.

I went to _____ (meat/ meet) the _____ (Principle / Principal) but he was on _____ (live/ leave) for a _____ (weak / week). I had to _____ (weight / wait) in the room before I was _____ (allowed / aloud) to go out.

(OR)

b) Use the following set of words in sentences of your own to express the difference in the meaning.

i) break - brake

ii) stationery - stationary

iii) waste - waist

6. a) Read the passage and answer the questions.

When I woke up it was broad daylight and the weather had cleared. The storm abated. The Ship was lifted off at night from the sand where she lay by the tie and was driven up almost as far as the rock where I have been bruised by the dashing. As the ship was upright and within a mile, I wish to board it to save necessary things for my use.

(i) How was the weather in the morning?

(ii) What had happened to the ship at night?

(iii) Why did he wish to board the ship?

(OR)

b) Read the passage and answer the questions.

O. Henry's original name was William Sidney Porter, he was born on 11th September, in 1862, Greensboro, North Carolina, U.S. He died on 5th June, 1910, New York. He was an American short story writer whose tales romanticized the commonplace - in particular the life of ordinary people in New York City. His stories expressed the effect of coincidence on character through humour, grim or ironic, and often had surprise endings, a device that became identified with his name and cost him critical favour when its vogue had passed.

(i) Who was William Sidney Porter?

(ii) What did his stories deal with?

(iii) What was the name he took up to write stories?

PART-C

5 X 2 = 10

Instructions: Answer the following questions. Each question carries five marks

7. a) Write the basic uses of a dictionary.

(OR)

b) How will you look up the word, "Travel", in the dictionary.

8. a) Read the passage and answer the questions.

An owl is a bird. There are two basic types of owls: typical owls and bam owls. Owls live in almost every country of the world. Owls are mostly nocturnal, meaning they are awake at night. Owls are predators – they hunt the food that they eat. Owls hunt for mince and other small mammals, insects and even fish. Owls are well adapted for hunting. Their soft, fluffy feathers make their flight nearly silent. They have very good hearing which helps them to hunt well in the darkness. The sharp hooked beaks and claws of the owl makes it very easy to tear apart their prey quickly, although owls also eat some prey whole.

Owl's eyes are unusual. Like most predators, both the eyes of the owl face front. The owl cannot move its eyes. Owls are far – sighted, which means they can see very well far away.... But they can't see close very well at all. Fortunately, their distant vision is what they use for hunting and they see far away even in low light. Owls have facial disks around their eyes, tufts of feathers in a circle around each eye. These facial disks are thought to help the Owl's hearing. Owls can turn their heads 180 degrees is all the owl needs to see what's going on all around it. Perhaps because of the Owl's mysterious appearance, especially its round eyes and flexible neck, there are a lot of myths and superstitions about Owls. Many cultures believe that Owls are unusually wise. Because owls are nocturnal, some cultures associate owls with bad omens. The screech of the barn owl is considered by many to sound early human, like a person screaming. However, owls probably do not interact with fates of human at all. In fact, some owl species may become extinct because of humans.

- (i) How can you say that an owl is a predator? List a few special features present in predators.
- (ii) What helps owls in hunting?
- (iii) Why are myths and superstitions associated with an owl?
- (iv) Pick out the words from the passage which means:
 - a) A sign of something that will happen in the future.
 - b) In a strange frightening mysterious way.
- (v) What will you do if you see an owl with owlets in your college premises?

(OR)

b) Read the passage and answer the questions.

Marie Curie was born in Poland in 1867. She was the youngest of five children. Her father was a professor. Marie won a gold medal when she graduated from high school. She and her sister did private tutoring to earn money. At Sorbonne University she studied Mathematics and Physics. She earned a master's degree in Physics and with the help of a scholarship earned a master's in Mathematics. Later she received a doctorate in Physics. She met Pierre Curie and married him in 1895. Together they discovered two new radioactive elements. They named them Polonium and Radium. They received the Nobel Prize in the year 1903 for the discovery of Radioactivity along with Henry Becquerel. In 1911 she received another Nobel Prize for the discovery of Polonium and Radium. In 1923 the French government gave her a pension of forty thousand Francs a year in recognition of her lifetime work in France. Many people have benefited from the discoveries made by Pierre and Marie Curie.

- (i) When and where was Marie Curie born?
- (ii) Why were they awarded the Nobel Prize?
- (iii) Write the antonyms for the following words:
 - a) Benefit
 - b) Youngest
- (iv) Why did the French government give her a pension?
- (v) How can you say many people have benefitted from discoveries made by Pierre and Marie Curie?

BOARD DIPLOMA EXAMINATION (C-21)
MID SEMESTER EXAMINATION – I
HU-101- BASIC ENGLISH

Time: 1 Hour

Total Marks: 20

PART - A

1 X 4 = 4

Instructions: Answer all the questions. Each question carries one mark.

1. Write a sentence to express the trait you like in your friend.
2. Rewrite the sentence using a word of obligation.
 - a) The teacher advised the students to work hard in order to get good marks.
3. Read the following sentence and write the sentence pattern.
 - a) I teach students.
 - b) Farmers are hard working.
4. Fill in the blank with the appropriate form of the verb.
 - a) He _____ (live) in that house since 2015.

PART - B

3 X 2 = 6

Instructions: Answer the following questions. Each question carries three marks.

5.
 - a) Write one expression used by the teacher.
 - (i) When the Class is noisy.
 - (ii) When a student is distracted.
 - (iii) When a student is permitted to leave early.
- OR**
- b) Write the feelings you express in the following situations.
 - (i) The train you have been waiting for hours has been cancelled.
 - (ii) Your mother says she is proud of you.
 - (iii) You forgot that a holiday was declared and went to college.
 6.
 - a) Change the voice of the following sentences.
 - (i) He eats only vegetarian food.
 - (ii) Ethical hacking has been learnt by Gaurav.
 - (iii) Submit your application.

OR

- b) Fill in the blanks with simple past and past continuous forms of the verbs given in the brackets.

When the children ____i____ (Play) in the park, they ____ii____ (hear) the whimper of a small puppy. The friends ____iii____ (search) under the bushes and

____iv____ (find) a white puppy. When they ____v____ (try) to pacify it a big dog suddenly ____vi____ (appear).

PART-C

5 X 2 = 10

Instructions: Answer the following questions. Each question carries five marks.

7.

- a) Write three difficulties faced by students while learning English. Give suggestion to overcome these difficulties.

OR

- b) Write your introduction in a formal situation (You are Anish studying in class XII)

8.

- a) Write a sentence using each of the given sentence patterns.

- a) S V b) S V O c) S V S C d) S V O OC
e) S VIODO

OR

- b) Write your routine using ten verbs.

BOARD DIPLOMA EXAMINATION (C-21)
END SEMESTER EXAMINATION
HU-101- BASIC ENGLISH

Time: 2 Hours

Total Marks: 40

PART – A

8 X 1 = 8

Instructions: 1. Answer all the questions.

2. Each question carries one mark.

1. Read the sentence and capitalize the words which represent the name of a country, month:
 - a. He bought a jersey in jersey.
 - b. They may come in may.
2. Rewrite the following sentence in the form of a request: to a friend, to your teacher.
Lend me your pen.
3. Frame “Yes” or “No” question for the following statement.
I have understood the problem.
4. Write the feeling you undergo in the following situation.
You see a small child working in a hotel at mid night while returning from a party.
5. Fill in the blanks with suitable prepositions.
Sreeni was angry _____ her mother _____ not permitting her to go to a late-night party.
6. Write a sentence about your teacher using two adjectives.
7. Write the salutation written to your friend while writing a letter.
8. Read the given paragraph and write the topic sentence.

The white Rhino is the largest mammal weighing around 300 Kgs. It has become endangered as humans hunt it for its horns. It has a wide mouth used for grazing and is the most social of all rhino species. White rhinoceroses are found in grassland and savannah habitat. [Herbivore grazers](#) that eat grass, preferring the shortest grains, the white rhinoceros is one of the largest pure grazers. It drinks twice a day if water is available, but if conditions are dry it can live four or five days without water. It spends about half of the day eating, one third resting, and the rest of the day doing various other things.

PART- B

4 X 3 = 12

Instructions: 1. Answer the following questions.

2. Each question carries three marks.

9.
 - a) Read the following passage and answer the questions.

During the summer holidays, I lost my phone. And for the week that I was phoneless, it felt like a disaster. I love my phone. It gives me quick access to information and allows me to constantly be looped in with my friends, to know exactly what is going on in their lives. So, when I didn't have my phone for a week, I felt a slightly sense of FOMO, or if you are not up to speed with the lingo, fear of missing out. By the end of the week, I would have got used to not having a phone and I would have enjoyed the break from social media. But there was still a lingering sense of sadness at the back of my mind that there would be conversations I had missed, messages that there would be conversations I had missed, messages that had been sent, funny videos shared and night time chats that I would probably never get to see.

- i. What felt like a disaster to the writer?
- ii. Why does the writer love his phone?
- iii. How did the writer feel without the phone?

OR

- b) Read the following passage and frame two "Wh" questions and one "Yes No" questions:

Dr Seuss was born on March second 1904. He was an American cartoonist and writer. His real name was Theodor Seuss Geisel. He was born in Springfield, Massachusetts. Dr Seuss liked draw and write even as child. The first book that Dr Seuss wrote was titled "And to think that I saw it on Mulberry Street". He wrote it while on a ocean voyage, returning from a trip to Europe. The rhythm of the ship's engine gave him the feeling for the poetry rhythm in the story. Dr Seuss was not a real doctor. He added the "Dr" to his name to honour his dad, who wanted Theodor to become a doctor. Even though he never became a real doctor, he did write books that helped millions of kids to read. Dr Seuss had also used other names, pen names to write books. These names include Theophrastus Seuss, Theo Le Sieg which is his real name spelled backwards, and Rosetta stone. Dr Seuss wrote more than sixty children's books including some which have been made into movies such as "The Lorax", "The Cat in the Hat", "Horton Hears a Who", and "How the Grinch Stole Christmas". He wrote lots of books for children, even though he and his wife never had children of their own. He died at age 87 in San Diego California, USA.

10.

- a) Write as directed.

a) Write a sentence expressing what you like about the rainy season.

b) Rewrite the sentence using a word of obligation:

The Doctor told the patient to reduce the intake of salt, if he wants the healthy life.

c) Write two hobbies you would express while giving your introduction.

OR

- b) Write a paragraph in 100 words about a festival you like.
- 11.
- a) Fill in the blanks with the proper order of adjectives given in brackets
- a) He ate _____ (green/ English / round / some) apples.
- b) She has _____ (lot of / old / interesting) books.
- c) My grandmother had always been _____ (slightly bend / fat / short).

OR

- b) Fill in the blank with adjectives or prepositions.
- Tiger is a _____ animal that lives _____ forests. It is _____ animal as it feeds _____ other animals. Tigers are very _____. The body _____ tigers is red or orange with black stripes.
- 12.
- a) Write a letter to your friend asking him to write about his college.

OR

- b) Write a paragraph on the importance of physical exercise.

PART-C

4 X 5 = 20

*Instructions: 1. Answer the following questions.
2. Each question carries five marks.*

- 13.
- a) Write about five different kinds of dictionaries.

OR

- b) Read the following passage and write three “Wh” questions and two “yes No” questions.

One of the results of Technology and population growth is increase of pollution throughout the world. According to United Nation’s report the future of all life on earth will be endangered. If man does not control contamination of the environment, It is time, we learn the full extent of the dangers that face mankind.

For instance, here in Egypt, look at River Nile. It is strange to see how everything is thrown into it as if it were litter basket. Instead of keeping it clean and pure, we pollute it. We our-selves, not our enemies, dirty it with our own hands. Some farmers wash themselves, their clothes, their animals, their pots and pans in its water. They even throw away their dead animals, and birds into it. Some people living in cities and towns throw their old tyres and broken bottles and rusty tins into it. Factories throw their waste chemicals and garbage. In this way the Nile water gets poisoned, kills fish, poisons land, weakens crops and destroys health.

So, it would be foolish to shut our eyes to the dangers of the pollution that man causes to the very thing on which his life depends. Please keep Nile clean.

- 14.
- a) Write five problems faced by students while learning English. Write your suggestions to overcome these problems.

OR

- b) Write a paragraph about Covid-19 pandemic in 150 words.
15. a) Describe your favourite place using ten adjectives.

OR

- b) Fill in the blanks with suitable prepositions.
He lives _____ (in / on) a beautiful cottage _____ (beside / besides) the river. There is a pathway _____ (between / among) the two flower beds leading _____ (to / from) the cottage. He has been living there _____ (since / for) his childhood.
16. a) Write a letter to your friend advising him to work hard to get good marks.

(OR)

- b) Write a letter to the editor of The Times of India about the problems faced by the students during the recent monsoon.

SC-102-BASIC ENGINEERING MATHEMATICS

Course Title	Basic Engineering Mathematics	Course Code	SC-102
SEMESTER	I	Course Group	Foundation
Teaching Scheme in periods (L : T : P)	4:1: 0	Credits	3 Credits
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites:

This course requires the basic knowledge of Algebra, Trigonometry in Mathematics at Secondary school level

Course Outcomes: COs

At the end of the course, the student will have the ability to:

CO 1	Solve simple problems using concepts of Logarithms& Partial Fractions
CO 2	Determine the inverse of a square matrix using matrix algebra
CO 3	Calculate trigonometric ratios of allied and compound angles and Solve simple problems using concepts of multiple and sub multiple angles
CO 4	Understand the concepts of properties of triangles and determine various forms of complex numbers
CO 5	Transform sum or difference of trigonometric ratios into product and vice versa and also solve some problems in inverse trigonometric functions
CO 6	. Solve simultaneous Linear Equations using the concepts of Matrices and Determinants and solve some problems in solutions of triangles

Course Content:

Algebra

Unit-I

Duration: 08Periods (L: 06– T: 02)

1. Logarithms:

Definition of logarithm and its properties, natural and common logarithms; the meaning of e and exponential function, logarithm as a function and its graphical representation – Solve some simple problems.

2. Partial Fractions:

Definition of Rational, proper and improper fractions of polynomials. Resolving rational fractions into their partial fractions covering the types mentioned below:

$$\begin{array}{ll} \text{i)} & \frac{f(x)}{(x+a)(x+b)(x+c)} \\ \text{ii)} & \frac{f(x)}{(x+a)^2(x+b)(x+c)} \\ \text{iii)} & \frac{f(x)}{(x^2+a)(x+b)} \\ \text{iv)} & \frac{f(x)}{(x+a)(x^2+b)^2} \end{array}$$

UNIT-II

Duration: 16 Periods (L: 12 – T:

04)

- 1. Matrices and Determinants:** Definition of matrix, types of matrices-examples, algebra of matrices-equality of two matrices, sum, difference, scalar multiplication and product of matrices. Transpose of a Matrix- Symmetric, Skew symmetric matrices- Minor, cofactor of an element-Determinant of a square matrix up to 3rd order -Laplace's expansion, properties of determinants. Singular and non-singular matrices- Adjoint and multiplicative inverse of a square matrix –related problems.

Trigonometry:

Unit-III

Duration: 14 Periods (L: 12 – T:

02)

- 1. Compound angles:** Formulae of Sin (A±B), Cos (A±B), Tan (A±B), Cot(A±B), and related identities with problems - Derive the values of $\sin 15^\circ$, $\cos 15^\circ$, $\sin 75^\circ$, $\cos 75^\circ$, $\tan 15^\circ$, $\tan 75^\circ$ etc.-Derive identities like $\sin(A+B) \sin(A-B) = \sin^2 A - \sin^2 B$ etc.,
- 2. Multiple and sub multiple angles:** Trigonometric ratios of multiple angles 2A, 3A and submultiples angle A/2 with problems - Derive useful allied formulas like

$$\sin^2 A = \left(\frac{1 - \cos 2A}{2} \right) \text{ etc., - Solve simple problems using the above formulae}$$

Unit – IV

Duration: 10 Periods (L: 08– T:

2.0)

- 1. Properties of triangles:** Statements of Sine rule, Cosine rule, Tangent rule and Projection rule and solve some simple problems using above rules

2. **Hyperbolic functions:** Definitions of hyperbolic functions – $\sinh(x)$, $\cosh(x)$, $\tanh(x)$ etc., - identities of hyperbolic functions, inverse hyperbolic functions and expression of inverse hyperbolic functions in terms of logarithms.
3. **Complex Numbers:** Definition of a complex number, Modulus and conjugate of a complex number, Arithmetic operations on complex numbers, Modulus- Amplitude (polar) form, Exponential (Euler) form of a complex number.

Algebra & Trigonometry

Unit – V

Duration: 13Periods (L: 11 – T: 2.0)

1. **Transformations:** Transformation of products into sums or differences and vice versa - Simple problems - Solve problems by applying these formulae to sum or difference or product
2. **Inverse trigonometric functions:** Define inverses of six trigonometric functions along with their domains and ranges - Derive relations between inverse trigonometric functions so that given $A = \sin^{-1}x$, express angle A in terms of other inverse trigonometric functions - with examples - State various properties of inverse trigonometric functions and identities like $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$ etc - solve simple problems. like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$ where $x \geq 0$, $y \geq 0$, $xy < 1$

Unit – VI

Duration: 14 Periods (L:11– T:03)

1. **Solution of Simultaneous equations using Matrices & Determinants.:** System of linear equations in 3 Variables-Solutions by Cramer's rule, Matrix inversion method – Examples- Elementary row operations on Matrices -Gauss-Jordan method to solve a system of equations in 3 unknown variables
2. **Solutions of triangles:** Solve a triangle when (i) Three sides (SSS) (ii) Two sides and an Included angle (SAS) (iii) One side and two angles are given (SAA) - Simple problems.

References

1. Text Book of Matrices – by Shanti Narayan
2. Plane Trigonometry - by S. L. Loney
3. NCERT Mathematics Text Books Of Class XI, XII.
4. Intermediate Mathematics Text Books (Telugu Academy)

Suggested E-Learning references

1. www.freebookcentre.net/mathematics/introductory-mathematics-books.html
2. E-books: www.mathebook.net

Suggested Learning Outcomes:

At the end of the course, the student will have the ability to:

Algebra

UNIT – I

1.0 Use Logarithms in engineering calculations

- 1.1 Solve some simple Logarithm problems. Using logarithm properties
- 1.2 Distinguish natural logarithms and common logarithms.
- 1.3 Explain the meaning of e and exponential function.
- 1.4 Understand logarithm as a function and its graphical representation.

Resolve Rational Fraction into sum of Partial Fractions in engineering problems

- 1.5 Define the following fractions of polynomials:
 - i) Rational
 - ii) Proper and
 - iii) Improper
- 1.6 Resolving rational fractions of the type mentioned below into partial fractions

$$\begin{array}{ll} \text{i)} & \frac{f(x)}{(x+a)(x+b)(x+c)} \\ \text{ii)} & \frac{f(x)}{(x+a)^2(x+b)(x+c)} \\ \text{iii)} & \frac{f(x)}{(x^2+a)(x+b)} \\ \text{iv)} & \frac{f(x)}{(x+a)(x^2+b)^2} \end{array}$$

UNIT – II

2.0 Use Matrices for solving engineering problems:

- 2.1 Know the matrix and types of a matrix.
- 2.2 Compute sum, difference, scalar multiplication and product of matrices.
- 2.3 Know the properties of these operations such as associative, distributive, commutative properties with examples and counter examples.
- 2.4 Define the transpose of a matrix and write its properties.
- 2.5 Define symmetric and skew-symmetric matrices.

- 2.6 Resolve a square matrix into a sum of symmetric and skew- symmetric matrices with examples in all cases.
- 2.7 Define minor, co-factor of an element of a 3x3 square matrix with examples.
- 2.8 Expand the determinant of a 3 x 3 matrix using Laplace expansion formula.
- 2.9 Distinguish singular and non-singular matrices.
- 2.10 Apply the properties of determinants to solve problems.
- 2.11 Compute Adjoint and multiplicative inverse of a square matrix.

Trigonometry:

UNIT – III

3.0 Solve simple problems on Compound Angles

- 3.1 Understand the compound angles and able to write the formulae of $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$ and $\cot(A \pm B)$
- 3.2 Able to derive the values of $\sin 15^\circ$, $\cos 15^\circ$, $\tan 15^\circ$ and $\sin 75^\circ$, $\cos 75^\circ$, $\tan 75^\circ$ etc.
- 3.3 Derive identities like $\sin(A+B)$, $\sin(A-B) = \sin^2 A - \sin^2 B$ etc.,
- 3.4 Solve simple problems on compound angles.

Solve problems using the formulae for Multiple and Sub- Multiple Angles

- 3.5 Derive the formulae of multiple angles $2A$, $3A$ etc and sub multiple angles $A/2$ in terms of angle A of trigonometric functions.
- 3.6 Derive useful allied formulas like $\sin^2 A = \left(\frac{1 - \cos 2A}{2} \right)$ etc.,
- 3.7 Solve simple problems using the above formulae

UNIT – IV

4.0 Appreciate Properties of triangles:

- 4.1 Understand the sine, cosine, tangent and projection rules. Solve some simple problems

Represent the Hyperbolic Functions in terms of logarithm functions

- 4.2 Understand $\sinh x$, $\cosh x$ and $\tanh x$ and list the hyperbolic identities.
- 4.3 Represent inverse hyperbolic functions in terms of logarithms.

Represent Complex numbers in various forms:

- 4.4 Understand the complex number, its modulus, and conjugate and list their properties.

- 4.5 Represent the complex number in various forms like modulus-amplitude (polar) form, Exponential (Euler) form – illustrate with examples.

UNIT – V

5.0 Apply Transformations for solving the problems in Trigonometry:

- 5.1 Derive the formulae on transforming sum or difference of two trigonometric ratios in to a product and vice versa- examples on these formulae.
- 5.2 Solve problems by applying these formulae to sum or difference or product of three or more terms.

Use Inverse Trigonometric Functions for solving engineering problems:

- 5.3 Know the concept of the inverse of a trigonometric function by selecting an appropriate domain and range.
- 5.4 Derive relations between inverse trigonometric functions so that given $A = \sin^{-1}x$, express angle A in terms of other inverse trigonometric functions - with examples.
- 5.5 State various properties of inverse trigonometric functions and identities like $\sin^{-1}x + \cos^{-1}x = \frac{\pi}{2}$ etc.
- 5.6 Solve some problems like $\tan^{-1}x + \tan^{-1}y = \tan^{-1}\left(\frac{x+y}{1-xy}\right)$ where $x \geq 0, y \geq 0$
And $xy \leq 1$

UNIT – VI

6.0 Apply Matrices and Determinants in solving system of Linear Equations:

- 6.1 Solve system of linear equations with 2 and 3 unknown variables using Cramer's rule.
- 6.2 Solve system of linear equations with 2 and 3 unknown variables by matrix inversion method
- 6.3 State elementary row operations.
- 6.4 Solve a system of linear equations in 3 unknown variables by Gauss- Jordan method

Apply Properties of Triangles to solve a triangle.

- 6.5 Solve a triangle when
- Three sides (SSS)
 - Two sides and an included angle (SAS),
 - One side and two angles are given (SAA).

Suggested Student Activities

1. Student visits Library to refer Standard Books on Mathematics and collect related material.
2. Quiz
3. Group discussion
4. Surprise tests
5. Seminars
6. Home Assignments.
7. Mathematics- for preparing competitive exams and solve some arithmetical ability exam Questions

CO / PO - MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapped POs
CO1	3	1					3	1,2,7
CO2	3	2					3	1,2,7
CO3	3	2					3	1,2,7
CO4	3	2					3	1,2,7
CO5	3	2					3	1,2,7
CO6	3	2					3	1,2,7

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
		11(b)		15(b)			
6	VI		7,8	10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEMESTER EXAMINATIONS - I
SC-102 - BASIC ENGINEERING MATHEMATICS

TIME: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions:

1. Answer **ALL** questions

04 X 01 = 04

2 Each question carries **ONE** mark

1. Find the value of $\log_8 2$
2. Define Proper fraction and give an example.
3. If $A = \begin{bmatrix} 1 & 2 \\ -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & -1 \\ 3 & 2 \end{bmatrix}$ Then Compute $3A + 5B$.
4. Find the value of $\begin{vmatrix} 1 & 2 \\ 3 & 4 \end{vmatrix}$.

PART-B

Instructions:

1. Answer All questions

02 X 03 = 06

2. Each question carries **THREE** marks

- 5.
- a) Resolve: $\frac{x}{(x-1)(x-2)}$ into partial fractions

OR

- b) Find the value of $\log_2 16 + 3\log_8 32$

6.

- a) If $\begin{pmatrix} 2 & 1 & 2 \\ 1 & 4 & 1 \\ 1 & 3 & 2 \end{pmatrix}$, then Compute $A^2 + 2A - 3I$, where **I** is a unit matrix of order 3

OR

- b) Find x if $\begin{vmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & -6 & x \end{vmatrix} = 48$

PART C

Instructions:

1. Answer All questions

02 X 05 = 10

2. Each question carries **FIVE** marks

7.

a) Resolve $\frac{9}{(x-1)(x+2)^2}$ into Partial fractions:

OR

b) Prove that $\log\left(\frac{75}{60}\right) - 2\log\left(\frac{5}{9}\right) + \log\left(\frac{32}{243}\right) = \log 2$

8.

a) If $A = \frac{1}{3} \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$, then show that $A^{-1} = A^T$

OR

b) Show that $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$.

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BOARD DIPLOMA EXAMINATIONS (C21)
MID SEMESTER EXAMINATION
SC-102- BASIC ENGINEERING MATHEMATICS

TIME: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions 04 X 01 = 04

2 Each question carries **ONE** mark

1. Write the formulae for Sin (A - B) and Cos (A - B)
2. If Tan A = 2, Find the value of Cos2A.
3. Write the formula for Cosine rule.
4. Find the Modulus of $\frac{2}{3+2i}$

PART-B

Instructions: 1. Answer All questions 02 X 03 = 06

2. Each question carries **THREE** marks

5.

a) Show that $\frac{\cos 27^\circ + \sin 27^\circ}{\cos 27^\circ - \sin 27^\circ} = \tan 57^\circ$

OR

b) Prove that $\cos 20^\circ \cos 30^\circ \cos 40^\circ \cos 80^\circ = \frac{\sqrt{3}}{16}$.

6.

a) Write any 3 formulae from Hyperbolic functions.

OR

b) Find the modulus of $\frac{1}{2+4i}$

PART C

Instructions: 1. Answer All questions

02 X 05 = 10

2. Each question carries **FIVE** marks

7.

a) Prove that
$$\frac{(\tan A + \sec A - 1)\cos A}{\sin A + \cos A - 1} = \frac{1 + \sin A}{\cos A}$$

OR

b) Prove that
$$\cos^2 A + \cos^2 (60^\circ + A) + \cos^2 (60^\circ - A) = \frac{3}{2}$$

8.

a) Find the additive and multiplicative Inverse of $4 + 3i$

OR

b) Express the complex number $\frac{1+i}{1-i}$ in Exponential form

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BOARD DIPLOMA EXAMINATION (C-21)
SEMESTER END EXAMINATION
SC-102- BASIC ENGINEERING MATHEMATICS

Time: 2 hours

[Total Marks: 40]

PART-A

Instructions: 1. Answer **ALL** questions 08 X 01 = 08

2 Each question carries **ONE** mark

1. Define proper fraction.
2. Write the formula for $\cos(A + B)$ and $\tan(A + B)$
3. Define solution of a triangle.
4. Find the value of $\log_4 16$.
5. Convert $\sin 6\theta + \sin 8\theta$ in to product
6. If $\sin^{-1} \frac{3}{5} = A$ then find $\cot A$.
7. List the elements of a triangle ABC.
8. What is the formula for the solution of triangle ABC when three sides are given

PART-B

Instructions: 1. Answer All questions 04 X 03 = 12

2. Each question carries **THREE** marks

9 (a) Resolve : $\frac{9}{(x-1)(x+2)^2}$ into Partial fractions:

9 (b) Prove that $\frac{\sin 8\theta + \sin 6\theta}{\cos 8\theta + \cos 6\theta} = \tan 7\theta$

10 (a) Express $\frac{9}{4+3i}$ in the form of $a + bi$.

Or

10(b) Solve the triangle ABC with $a=2$, $A=30^\circ$, $C=30^\circ$.

11(a) Prove that $\sin 50^\circ - \sin 70^\circ + \sin 10^\circ = 0$.

Or

11(b) Prove that $\tan^{-1} \frac{2}{7} + \tan^{-1} \frac{1}{5} = \tan^{-1} \frac{17}{33}$.

12(a) Solve $\begin{bmatrix} 3 & 2 \\ 2 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 7 \end{bmatrix}$.

Or

12 (b) Find the angle C in any triangle ABC if $b = \sqrt{2}, c = \sqrt{3}, B = 45^\circ$.

PART C

Instructions:

1. Answer All questions

04 X 05 = 20

2. Each question carries **FIVE** marks

13(a) Find the Adjoint of the matrix $\begin{bmatrix} 1 & 3 & 4 \\ -1 & 2 & 1 \\ 0 & 3 & 3 \end{bmatrix}$

Or

13 (b) Prove that $\sin \theta + \sin(120^\circ + \theta) - \sin(120^\circ - \theta) = 0$

14 (a) Prove that $\cos 6^\circ \cdot \cos 42^\circ \cdot \cos 66^\circ \cdot \cos 78^\circ = \frac{1}{6}$

(b) Solve: $x + y + z = 6, x + 2y + 3z = 14, x + 4y + 9z = 3$ by using inverse Matrix method.

15(a) In any triangle ABC prove that $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$

15(b) if $\tan^{-1} x + \tan^{-1} y + \tan^{-1} z = \frac{\pi}{2}$ then prove that $xy + yz + zx = 1$

16(a) Solve: $x + 2y - z = -3, 3x + y + z = 4, x - y + 2z = 6$ by Cramer's Rule.

Or

16 (b) Solve the triangle ABC with $a = 1, b = 2, c = \sqrt{2}$.

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SC-103 BASIC PHYSICS

Course Title	Basic Physics	Course Code	SC-103
Semester	Semester-I	Course Group	Foundation
Teaching Scheme in Pds(L:T:P)	4:1:0	Credits	3
Type of course	Lecture+Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites: High School Science and Mathematics

Course Objectives: After studying this course, the student will be able to understand and appreciate the role of Physics in different areas of engineering and technology.

Course outcomes: On successful completion of the course, the student will have the ability to attain below Course Outcomes (CO):

CO1	Identify physical quantities, select their units for use in engineering solutions, and make measurements with accuracy by minimizing different types of errors.
CO2	Apply laws of Vectors as tools to solve engineering problems
CO3	Explain friction on horizontal and inclined surfaces, analyze projectile and circular motions and apply the formulation to projectiles and central forces and solve engineering problems
CO4	Explain Hooke's law, properties of fluids viz surface tension, viscosity and significance of Reynolds's number and apply Bernoulli's principle to solve engineering problems
CO5	Apply conservation laws to various energy sources
CO6	Apply Heat and thermodynamic processes and formulate to understand engineering problems

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	-	2
CO2	3	1	-	-	-	-	2
CO3	3	1	-	-	-	-	2
CO4	3	1	-	1	-	-	2
CO5	3		-	-	1	-	2
CO6	3	1	-	-	-	-	2
	3	1		1	1		2

SC-103 - BASIC PHYSICS

Course Contents

1. UNIT - 1 UNITS, DIMENSIONS AND MEASUREMENTS

Duration: 12 periods

Physical quantity – Fundamental and derived quantities, unit – definitions – system of units – Advantages of S.I. units

Dimensions and dimensional formula – definitions, units and dimensional formulae for physical quantities, Dimensionless quantities, Principle of homogeneity, Applications of dimensional analysis – Checking the correctness of physical equations – conversion of unit from one system to another system – problems on density, force and energy

Error in measurement – accuracy and precision of instruments, rules for representing significant figures-Numerical problems

2. UNIT – 2 VECTORS

Duration: 13 periods

Scalar and Vector quantities – definition and examples, representation of a vector, Classification of vectors - Proper vector, Equal vectors, Unit vector, Negative vector, null vector and Position vector, Resolution of a vector.

Lami's theorem, Parallelogram law of vectors – statement- expression for magnitude and direction of resultant vector –derivation- illustrations(working of sling and flying bird), Representation of a vector in unit vectors $\mathbf{i}$, $\mathbf{j}$ and $\mathbf{k}$. – numerical problems.

Scalar product of vectors- application to work done by force and power – properties of scalar product. – Numerical problems.

Vector product of vectors– Right hand thumb rule and right hand screw rule - application to torque - properties of vector product - Application to area of parallelogram and triangle -numerical problems.

3. UNIT -3 MECHANICS

Duration: 13 periods

Concept of Friction - Normal reaction, Angle of friction, Motion of a body over a rough horizontal surface - expressions for Acceleration, Displacement, Time taken to

come to rest - derivations, inclined plane - Motion of a body over a smooth inclined plane and rough inclined plane–forces acting on the body -angle of repose, Application of friction – brake system in bicycle– numerical problems

Projectile motion – definition – examples, Horizontal projection - Oblique projection, Expression for path of a projectile in oblique projection –derivation, Maximum height, Time of ascent, Time of descent, Time of flight, Horizontal range and maximum horizontal range in oblique projection– derivations, numerical problems

Circular motion – definition of angular displacement, angular velocity, angular acceleration, frequency and time period, Relation between linear and angular velocity – derivation – related numerical problems, Central force – examples, Expressions for centripetal and centrifugal forces (no derivation), Applications of centripetal and centrifugal forces - Banking of roads and its expression, bending of cyclist and principle of centrifuge - related numerical problems.

4. UNIT – 4 PROPERTIES OF MATTER

Duration: 12 periods

Elasticity – Elastic body –definition - examples, Stress and Strain – definitions and expressions, types of stress and strain, elastic limit - Hooke’s law – statement – modulus of elasticity, significance of stress and strain curve -Young’s modulus – Derivation, numerical problems

Cohesive and Adhesive forces - Surface tension - Capillarity –angle of contact – definition- examples for capillarity- Formula for Surface tension based on capillarity (no derivation), effect of temperature and impurity on surface tension, applications and illustrations of surface tension, numerical problems.

Viscosity - Newton’s formula for viscous force – derivation - Coefficient of viscosity - Poiseuille’s equation (formula only), Effect of temperature on viscosity of liquids and gases, applications of viscosity, numerical problems.

Concept of fluid motion –streamline and turbulent flow, Reynold’s number, equation of continuity, Bernoulli’s theorem (only formula) and applications - related problems.

5. UNIT – 5 CONSERVATION LAWS AND ENERGY SOURCES

Duration: 12 periods

Work, Power and Energy – explanation, Potential Energy and Kinetic energy– examples – expressions for Potential energy and Kinetic energy– derivations, Work-Energy theorem – derivation, Law of conservation of energy – examples, Law of conservation of energy in the case of freely falling body – proof – Illustration of

conservation of energy in the case of simple pendulum, Nonrenewable and renewable energy sources – definition and applications (solar cooker, wind mill and biogas plant), Green House effect, Energy conservation (saving) methods - domestic and industrial, related problems

6. UNIT – 6 HEAT

Duration: 13 periods

Heat – thermal expansion of solids – Coefficients of expansions, different scales of temperature- Centigrade and Fahrenheit and their relationship, Bimetallic strip – applications in daily life - electric heater thermostat- circuit breaker-iron box, Boyle's law – statement, concept of absolute zero - Absolute scale of temperature, Charles' laws, Ideal gas equation – derivation - value of universal gas constant 'R', Gas equation in terms of density, Isothermal and Adiabatic processes - Differences between isothermal and adiabatic processes, Internal energy and External work done, Expression for work done – derivation, first law of thermodynamics –application of first law to isothermal and adiabatic processes, second law of thermodynamics, specific heats of a gas, related numerical problems.

LEARNING OUTCOMES:

Upon completion of the course the student shall be able to

UNITS, DIMENSIONS AND MEASUREMENTS

- 1.1 Define Physical quantity, fundamental quantity and derived physical quantity.
- 1.2 Classify system of units (FPS, CGS, MKS and SI) and outline advantages of S.I. units.
- 1.3 Write S.I. units of physical quantities.
- 1.4 Define Dimensions and dimensional formulae of physical quantities.
- 1.5 List dimensional formulae of physical quantities.
- 1.6 List dimensionless quantities.
- 1.7 Explain Principle of homogeneity of dimensions.
- 1.8 List the applications of dimensional formulae.
- 1.9 List the limitations of dimensional analysis.
- 1.10 Apply dimensional formulae to check the correctness of physical equations and to convert a unit from one system to another system (density, force and energy).
- 1.11 Define accuracy and precision of instruments, random and systematic errors.
- 1.12 List the rules for representing significant figures.
- 1.13 Solve simple numerical problems.

VECTORS

- 2.1 Define Scalar and Vector quantities with examples.

- 2.2 Represent a vector graphically and label vector characteristics.
- 2.3 Classify Vectors - Proper vector, Equal vector, Unit vector, Negative vector, Null vector and Position vector.
- 2.4 Resolve a Vector into two orthogonal components.
- 2.5 Explain Lami's theorem.
- 2.6 Explain Parallelogram law of vectors and develop expressions for magnitude and direction of resultant vector.
- 2.7 Illustrate parallelogram law of vectors (working of sling and flying bird).
- 2.8 Represent a vector in terms of unit vectors ($\hat{i}, \hat{j}, \hat{k}$).
- 2.9 Explain Scalar product of vectors.
- 2.10 Apply scalar product to work done by force and power.
- 2.11 List the properties of scalar product.
- 2.12 Explain vector product of vectors.
- 2.13 Explain right hand thumb rule and right hand screw rule.
- 2.14 Apply vector product to explain torque.
- 2.15 List the properties of vector product.
- 2.16 Extend vector product to area of parallelogram and area of triangle.
- 2.17 Solve related numerical problems.

MECHANICS

- 3.1 Explain concept of friction.
- 3.2 Explain Normal reaction and Angle of friction.
- 3.3 Derive expression for acceleration of a body on a rough horizontal surface.
- 3.4 Derive expressions for displacement and time taken to come to rest by a body over a rough horizontal surface.
- 3.5 Explain and label the forces acting on a body moving over smooth and rough inclined planes.
- 3.6 Define angle of repose.
- 3.7 Apply friction in brake system of moving vehicles such as bicycle.
- 3.8 Explain and classify Projectile motion with examples.
- 3.9 Derive expression for path of a projectile in oblique projection.
- 3.10 Develop formulae for Maximum height, Time of ascent, Time of descent, Time of flight, Horizontal range and maximum horizontal range of a projectile in oblique projection.
- 3.11 Explain circular motion and define angular displacement, angular velocity, angular acceleration, frequency and time period.
- 3.12 Develop a relation between linear velocity and angular velocity.
- 3.13 Explain Central force with examples and outline expressions for Centripetal and Centrifugal forces.
- 3.14 Apply centripetal and centrifugal forces to banking of roads, bending of cyclist and centrifuge.

3.15 Solve related numerical problems.

PROPERTIES OF MATTER

- 4.1 Define Elasticity and elastic bodies with examples.
- 4.2 Define Stress and Strain with their expressions.
- 4.3 Explain types of stress and strain.
- 4.4 Define Elastic limit.
- 4.5 Explain Hooke's law.
- 4.6 Outline the significance of stress and strain curve.
- 4.7 Develop a formula for Young's modulus of a wire having circular cross-sectional area.
- 4.8 Compare Cohesive and Adhesive forces.
- 4.9 Explain Surface tension and illustrate Surface tension with examples.
- 4.10 Define capillarity and angle of contact.
- 4.11 Outline the formula for Surface tension based on capillarity ($T = \frac{1}{2} h d \rho g$).
- 4.12 Effect of temperature and impurity on surface tension of a liquid.
- 4.13 Explain Viscosity.
- 4.14 Develop Newton's formula for viscous force and explain coefficient of viscosity.
- 4.15 Outline Poiseuille's equation for coefficient of viscosity.
- 4.16 Explain the effect of temperature on viscosity of liquids and gases.
- 4.17 Identify the importance of viscosity in blood flow through arteries, liquid soap, paint, lubricants and braking oil.
- 4.18 Explain Streamline flow and Turbulent flow.
- 4.19 Define Reynold's number and explain its significance.
- 4.20 Outline the Equation of Continuity and explain the terms with diagram.
- 4.21 Explain Bernoulli's theorem.
- 4.22 Apply Bernoulli's theorem to dynamic lift (aero foil lift, swing of a ball, blowing of roofs, atomizer, Bunsen burner).
- 4.23 Solve related numerical problems.

CONSERVATION LAWS AND ENERGY SOURCES

- 5.1 Explain concept of Work, Power and Energy.
- 5.2 Explain Potential energy and Kinetic energy with examples.
- 5.3 Develop expressions for Potential energy and Kinetic energy.
- 5.4 State Work-Energy theorem and prove the relation.
- 5.5 State law of conservation of energy with examples.
- 5.6 Prove law of conservation of energy in the case of a freely falling body.
- 5.7 Illustrate law of conservation of energy in the case of simple pendulum.
- 5.8 Explain Non-renewable and Renewable energy sources and list the examples.
- 5.9 Explain Solar cooker, Wind mill and Biogas plant with neat diagrams.
- 5.10 Explain Green House effect.
- 5.11 List domestic and industrial energy conservation methods.

5.12 Solve related numerical problems.

HEAT

- 6.1 Explain thermal expansion of solids and three coefficients of expansion of solids.
- 6.2 Outline Centigrade and Fahrenheit scales of temperature and relate them.
- 6.3 Explain principle of Bimetallic strip.
- 6.4 Apply principle of bimetallic strip to electric water heater thermostat, circuit breaker and iron box.
- 6.5 Explain Boyle's law in gases and its limitations.
- 6.6 Explain concept of Absolute Zero using the relations $P_t = P_0[1 + \frac{t}{273}]$ and $V_t = V_0[1 + \frac{t}{273}]$.
- 6.7 Explain Absolute scale of temperature.
- 6.8 Explain Charles' laws in gases in terms of absolute temperature.
- 6.9 Develop Ideal gas equation and calculate the value of Universal gas constant.
- 6.10 Translate gas equation in terms of density.
- 6.11 Explain Isothermal and Adiabatic processes and distinguish between them.
- 6.12 Explain the terms internal energy and external work done.
- 6.13 Derive the expression for work done by the gas [$W = P(V_2 - V_1)$].
- 6.14 Explain first law of thermodynamics and list applications of it.
- 6.15 Apply first law of thermodynamics to isothermal and adiabatic processes.
- 6.16 Explain second law of thermodynamics and list applications of it.
- 6.17 Define specific heats and molar specific heats of a gas.
- 6.18 Solve related numerical problems.

References:

1. Principles of Physics by N. Subrahmanyam and Brijlal, S. Chand & Co, New Delhi, edition, 1982
2. Engineering. Physics by R.K. Gaur, S.L. Gupta, Dhanpatrai Publications, New Delhi.
3. ISC Physics, Book I&II, P. Vivekanandan, DK Banerjee, S Chand, New Delhi.
4. Intermediate Physics, Vol. I&II, Telugu Academy, TS, Hyderabad.
5. Fundamentals of Physics by Halliday and Resnick.

E-learning resources:

1. Hyper Physics website: <http://hyperphysics.phy-astr.gsu.edu/>

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
6	VI				7,8	11(a)	
		11(b)				15(b)	
		10(b)	14(b)				
			12(a)		16(a)		
			12(b)		16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

BOARD DIPLOMA EXAMINATION (C-21)
MID SEM-I
FIRST SEMESTER EXAMINATION
SC-103 - BASIC PHYSICS

Time: 1 Hour

Total Marks: 20

PART-A

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

4X1 =4

1. Define fundamental physical quantity.
2. Write dimensional formula for work.
3. Define vector quantity.
4. Define unit vector.

PART-B

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

2X3 =6

5. (a). Outline three applications of dimensional analysis.
(OR)
(b). Outline any three rules for representing significant figures.
6. (a). Explain Lami's theorem.
(OR)
(b). Explain right hand screw rule of vector product.

PART-C

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

2X5 =10

7. (a). By applying the dimensional analysis convert CGS unit of energy into SI units of energy.
(OR)
(b). Check the correctness of the following equations by applying Principle of homogeneity?
1) $s = ut + \frac{1}{2} at^2$ 2) $v^2 - u^2 = 2as$
8. (a). Derive expression for magnitude and direction of resultant vector by applying parallelogram law of vectors.
(OR)
(b). Two vectors are $\vec{A} = 3\vec{i} - 3\vec{j} + \vec{k}$ and $\vec{B} = 4\vec{i} + 9\vec{j} + 2\vec{k}$. Solve $\vec{A} \times \vec{B}$

BOARD DIPLOMA EXAMINATION (C-21)
MID SEM –II
FIRST SEMESTER EXAMINATION
SC-103 - BASIC PHYSICS

Time: 1 Hour

Total Marks: 20

PART-A

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

4X1 =4

1. Define angle of friction.
2. Define central force.
3. Define stress.
4. Define Reynold's number.

PART-B

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

2X3 =6

5. (a). Explain the forces acting on the body moving up on a rough inclined plane.
(OR)
(b). Derive the relation between linear velocity and angular velocity.
6. (a). Explain the effect of temperature on viscosity of liquids and gases.
(OR)
(b). Explain Bernoulli's theorem.

PART-C

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

2X5 =10

7. (a). Develop expressions for maximum height and horizontal range of a projectile in oblique motion.
(OR)
(b). Develop the expression for angle of banking of roads.
8. (a). Develop formula for young's modulus of a wire having circular cross-sectional area.
(OR)
(b). Apply Bernoulli's theorem to dynamic aero foil lift.

BOARD DIPLOMA EXAMINATION, (C-21)
FIRST SEMESTER EXAMINATION
SC-103 - BASIC PHYSICS

Time: 2 Hours]

[Total Marks: 40

PART – A

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

08X01=08

1. Define unit.
2. Define capillarity.
3. What is SI unit of power?
4. Define Hooke's law.
5. Name any one example of conservation of energy.
6. Define energy.
7. Define specific heat of a gas.
8. Define internal energy.

PART – B

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

04X03=12

9(a). Explain Lami's theorem.

(OR)

9(b). Explain renewable and non-renewable energy sources with example.

10(a). Explain projectile motion with example.

(OR)

10(b). Explain Boyle's law and its limitations.

11(a). Show that $PE = mgh$

(OR)

11(b). Explain law of conservation of energy in the case of simple pendulum.

12(a). Explain first law of thermodynamics and list applications of it.

(OR)

12(b). Explain Boyle's law and its limitations.

PART – C

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

04X05 = 20

13(a). Develop expressions for magnitude and direction of resultant of two vectors using parallelogram law of vectors.

(OR)

13(b). Develop expression for kinetic energy of a body of mass 'm' moving with a velocity 'v'.

14(a). Develop a relation between linear velocity and angular velocity.

(OR)

14(b). apply first law of thermodynamics to isothermal and adiabatic processes.

15(a). Apply law of conservation of energy in the case of freely falling body.

(OR)

15(b). Explain Work-Energy theorem and develop the relation.

16(a). develop ideal gas equation

(OR)

16(b). Explain principle of bimetallic strip and apply it to electric water heater thermostat

SC-104 - GENERAL ENGINEERING CHEMISTRY

Course Title	General Engineering Chemistry	Course Code	SC-104
Semester	I	Course Group	Foundation
Teaching Scheme in Periods (L:T:P)	4:1:0	Credits	3
Methodology	Lecture +Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Prerequisite: Basic knowledge of chemistry in secondary education.

Course Objectives: After studying this course, the student will be able to understand and appreciate the role of Chemistry and environmental studies in different spheres of industries.

Course Outcome: On successful completion of the course, the students will have ability to attain below Course Outcomes (CO):

CO1	Understand and explain the concept of atomic structure, chemical bonding, oxidation, reduction and oxidation number and apply the knowledge to solve engineering problems.
CO2	Understand and explain concept of mole, molarity, normality and colloids and apply the knowledge in various engineering areas.
CO3	Understand and explain the different theories of acids and bases, concept of pH, buffer action and apply the knowledge to solve engineering problems.
CO4	Understand the concept of Ecosystem, Biodiversity, Green Chemistry and Management of e-waste and take measures to support sustainable development.
CO5	Understand the concept of hardness and degree of hardness of water and apply the relevant water treatment methods to solve domestic and industrial problems.
CO6	Understand the concept of electrolysis, applications of electrolysis, Faraday's Laws of Electrolysis and apply the knowledge in extraction and purification of metals used for domestic and industrial purpose.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	-	-	2
CO2	3	1	-	-	1	-	2
CO3	3	1	-	-	-	-	2
CO4	3	-	-	-	3	-	3
CO5	3	1	-	-	1	-	2
CO6	3	1	-	-	-	-	2

COURSE CONTENTS

UNIT-I: Fundamentals of Chemistry

13 Periods

Atomic Structure: Introduction – Atomic number – Mass number- Isotopes and Isobars - Bohr's Atomic Theory - Orbitals - Shapes of s, p and d orbitals – Aufbau principle - Hund's rule - Pauli's exclusion principle - Electronic configuration of elements

Chemical Bonding: Introduction – Electronic theory of valency - Types of chemical bonds - Ionic, Covalent, Co-ordinate covalent, Metallic and Hydrogen bonds with examples - Properties of Ionic and Covalent compounds - Types of Hydrogen bonds – Effect of hydrogen bonding on physical properties.

Oxidation-Reduction: Electronic concept of Oxidation, Reduction, Oxidation Number - Calculations.

UNIT-II: Solutions and Colloids

12 Periods

Introduction - Solution – Solubility - Classification of solutions based on physical state- Atomic weight - Molecular weight ,Equivalent weight - Mole concept – Molarity – Normality - Numerical problems on mole, molarity and normality – Colloids - Types of colloids- Lyophilic and Lyophobic colloids - Protective Colloids - Gold number - Properties of Colloids - Industrial applications of colloids.

UNIT-III: Acids and Bases

13 Periods

Introduction - Theories of acids and bases and limitations - Arrhenius theory - Bronsted - Lowry theory - Lewis acid base theory - Ionic product of water - pH and related numerical problems - Buffer solutions- buffer action - Applications of buffer solution - Ostwald's theory of indicators.

UNIT-IV: Environmental Science

12Periods

Introduction - Environment -Scope and importance of environmental studies- Important terms -Concept of ecosystem - Producers, consumers and decomposers - Food chain - Food web - Carbon and nitrogen cycles - Biodiversity, definition and threats to Biodiversity- Forest resources- Deforestation – Green Chemistry – e-waste – Management of e-waste.

UNIT-V: Water Technology

13 Periods

Introduction -Soft and hard water - Causes of hardness – Types of hardness - Disadvantages of hard water using in industries - Degree of hardness - Softening methods - Permutit process - Ion exchange process - Drinking water - Municipal treatment of water for drinking purpose – Osmosis - Reverse Osmosis - Advantages of Reverse osmosis – Desalination by Electro dialysis – Defluoridation – Nalgonda Technique.

UNIT-VI: Electrochemistry:

12 Periods

Conductors, insulators, electrolytes – Types of electrolytes - Arrhenius theory of electrolytic dissociation - Electrolysis – Electrolysis of fused NaCl and aqueous NaCl – Applications of electrolysis - Faraday's laws of electrolysis- Numerical problems.

Reference Books:

1. Engineering chemistry – Jain & Jain – Dhanpat Rai Publishing Company.
2. A Text book of Engineering Chemistry – S.S.Dara – S.Chand Publications.
3. Environmental Studies – A.K.De.
4. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press
5. Intermediate Chemistry I and II – Telugu Academy TS
6. Engineering chemistry – Prasanta Rath, B. Ramadevi, Ch. Venkataramana Reddy& Subhendu Chakroborty – CENGAGE

E - learning links:

1. <https://iupac.org/>
2. <https://www.khanacademy.org/>
3. www.nptel.ac.in
4. www.chemguide.co.uk
5. www.visionlearning.com

Specific Learning Outcomes

Upon completion of the course, the student will have ability to

UNIT- I: FUNDAMENTALS OF CHEMISTRY

- 1.1 Explain the concept of atomic number, mass number, isotopes and isobars
- 1.2 State the postulates of Bohr's atomic theory and its limitations
- 1.3 Define Orbital.
- 1.4 Draw and explain the shapes of s, p and d orbitals.

- 1.5 Distinguish between Orbit and Orbital
- 1.6 Make use of 1. Aufbau principle, 2. Hund's rule and 3. Pauli's exclusion principle in writing electronic configuration of elements.
- 1.7 Write the electronic configuration of elements up to atomic number 30
- 1.8 Define chemical bond.
- 1.9 Write the Postulates of Electronic theory of valency.
- 1.10 List the types of chemical bonds viz., Ionic, Covalent, Co-ordinate covalent, Metallic and Hydrogen bond.
- 1.11 Define ionic bond and explain the Ionic bond formation in NaCl, MgO, CaCl₂, Na₂O, K₂O.
- 1.12 List and explain the properties of ionic compounds.
- 1.13 Explain covalent bond formation in Hydrogen, Oxygen, Nitrogen, Ammonia, Methane, Ethylene, and Acetylene molecules using Lewis Dot Method.
- 1.14 List and explain the properties of covalent compounds.
- 1.15 Compare the properties of ionic compounds and covalent compounds.
- 1.16 Define metallic bond and explain with free electron theory/ electron sea model.
- 1.17 Define hydrogen bond
- 1.18 Explain inter molecular hydrogen bonding in HF, H₂O, NH₃
- 1.19 Explain inter and intra molecular hydrogen bonding in Salicylaldehyde and Nitrophenol.
- 1.20 Explain the effect of hydrogen bonding on the boiling point.
- 1.21 Explain the effect of hydrogen bonding on solubility of alcohols
- 1.22 Understand the electronic concept of oxidation, reduction and redox reaction.
- 1.23 Define oxidation number
- 1.24 List the rules for calculation of oxidation number.
- 1.25 Apply the rules to calculate the oxidation number.

UNIT-II: SOLUTIONS AND COLLOIDS

- 2.1 Define the terms 1.Solution, 2.Solute and 3.Solvent.
- 2.2 Define solubility.
- 2.3 Explain the factors effecting solubility.
- 2.4 Define aqueous solution and alcoholic solution.
- 2.5 Compare unsaturated, saturated and super saturated solutions.

- 2.6 Classify the solutions based on the physical state of solute and solvent.
- 2.7 Define atomic weight, molecular weight and equivalent weight.
- 2.8 Calculate the molecular weight and the equivalent weights of acids, bases and salts.
- 2.9 Define mole.
- 2.10 Explain mole concept and solve the numerical problems.
- 2.11 Define and explain molarity and normality.
- 2.12 Derive the relationship between molarity to normality.
- 2.13 Solve numerical problems on molarity and normality of a solution and mixture of solutions.
- 2.14 Define and explain colloids, dispersed phase and dispersion medium with examples.
- 2.15 List the types of colloids with examples.
- 2.16 Distinguish between Lyophilic Colloid and Lyophobic Colloid.
- 2.17 Understand the Protective Colloids and Gold number. (Elementary level)
- 2.18 Explain the properties of colloids: Tyndall effect, Brownian movement and Coagulation.
- 2.19 State and explain the industrial applications of colloids.

UNIT-III: ACIDS AND BASES

- 3.1 Explain Arrhenius theory of acids and bases.
- 3.2 State the limitations of Arrhenius theory of acids and bases
- 3.3 Explain Bronsted - Lowry theory of acids and bases.
- 3.4 State the limitations of Bronsted - Lowry theory of acids and bases.
- 3.5 Explain Lewis theory of acids and bases.
- 3.6 List out the types of Lewis acids and bases.
- 3.7 State the limitations of Lewis theory of acids and bases.
- 3.8 Explain the ionic product of water and solve the problems.
- 3.9 Define pH and explain Sorenson's pH scale.
- 3.10 Solve the numerical problems on pH (Strong acids and bases).
- 3.11 Define buffer solutions and give examples of acidic and basic buffers.
- 3.12 State the applications of buffer solutions.
- 3.13 Explain the buffer action of acidic (acetate buffer) and basic (ammonium buffer) buffers.
- 3.14 Explain the Ostwald's theory of indicators with phenolphthalein and methyl orange indicators as an example.

UNIT-IV: ENVIRONMENTAL SCIENCE

4.1 Define the term environment

4.2 Explain the importance of the following

1) Lithosphere, 2) Hydrosphere, 3) Atmosphere, 4) Biosphere,

4.3 Define and understand the following terms

i) Pollutant, ii) Contaminant iii) Pollution, iv) Receptor, v) Sink,
vi) Particulates, vii) Threshold limit value (TLV), viii) Dissolved oxygen
(DO), ix) BOD and x) COD

4.4 Define Ecosystem. Understand the biotic and the abiotic components of ecosystem.

4.5 Define and explain the following biotic components with examples

1) Producers, 2) Consumers and 3) Decomposers

4.6 Explain the food chain of land, aquatic and forest.

4.7 Explain the Food web.

4.8 Understand the Carbon and Nitrogen cycles.

4.9 Define and explain biodiversity

4.10 Explain the threats to biodiversity.

4.11 Explain conservation of biodiversity.

4.12 Describe the forest and list the uses of forests.

4.13 Define the deforestation and explain the causes, effects and control of deforestation.

4.14 Understand the concept of Green Chemistry – Its principles and benefits.

4.15 Define e-waste

4.16 Explain the effect of e-waste on environment.

4.17 State the effects of chemicals released from e-waste on human beings.

4.18 Explain the management of e-waste.

4.19 Understand and explain the advantage of recycling of e-waste.

UNIT V: WATER TECHNOLOGY

5.1 State the various sources of water.

5.2 Define the terms soft water and hard water with examples

5.3 Define hardness of water.

5.4 Explain temporary and permanent hardness of water.

5.5 List the usual chemical compounds causing hardness (with Formulae)

5.6 Explain the disadvantages of using hard water in industries.

- 5.7 Define Degree of hardness, units of hardness in ppm , mg/L and numerical problems related to hardness.
- 5.8 Explain the methods of softening of hard water:
- a) Removal of temporary hardness by i) Boiling ii) Clark's Method
 - b) Removal of total hardness by i) Permutit process ii) Ion-Exchange process.
- 5.9 List the essential qualities of drinking water.
- 5.10 Explain Municipal treatment of water for drinking purpose.
- 5.11 Define Osmosis and Reverse Osmosis (RO).
- 5.12 List the applications and advantages of RO.
- 5.13 Explain the process of desalination of sea water by Electro dialysis.
- 5.14 Explain the process of defluoridation by using Nalgonda Technique.

UNIT VI: ELECTROCHEMISTRY

- 6.1 Define the terms 1. Conductor, 2. Insulator, 3. Electrolyte and 4. Non-electrolyte
- 6.2 Types of electrolytes - strong and weak electrolytes with examples.
- 6.3 Distinguish between metallic conductors and Electrolytic conductors.
- 6.4 Explain the Arrhenius theory of electrolytic dissociation
- 6.5 Define electrolysis.
- 6.6 Explain the electrolysis of fused NaCl and aqueous NaCl (Nelson Cell).
- 6.7 Explain the applications of Electrolysis - Electrolytic refining of metal (Copper)
- Electroplating.
- 6.8 Explain Faraday's laws of electrolysis
- 6.9 Define chemical equivalent, electrochemical equivalent.
- 6.10 Know the relationship between chemical equivalent and electrochemical equivalent
- 6.11 Solve the numerical problems based on Faraday's laws of electrolysis

Blue Print

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks
		R		U	A	
1	I	4	1	9(a)	13(a)	
2	II					
3	III		2	10(a)	14(a)	
4	IV					
5	V	4	3	5, 6	9(b)	
					11(a)	
					11(b)	
6	VI		7,8	10(b)	14(b)	
					12(a)	
					12(b)	
Total Questions		8		8	8	

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

BOARD DIPLOMA EXAMINATIONS (C21)
I SEMESTER, MIDSEM – I
SC-104 - GENERAL ENGINEERING CHEMISTRY

Time: 1 Hour

Max. Marks: 20

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark.
marks

4 X 1 = 4

1. State Hund's rule.
2. Write the electronic configuration of Cr.
3. Define mole.
4. What are colloids?

PART – B

Instructions: Answer **the following** questions. Each question carries **three** marks

2 x 3 = 6 Marks

5. a. Draw the shapes of s and d orbitals.
(OR)
b. Explain the covalent bond formation in Nitrogen molecule by Lewis dot method.
6. a. Classify solutions based on their physical state.
(OR)
b. Compare any three properties of lyophilic and lyophobic colloids.

PART – C

Instructions: Answer **the following** questions. Each question carries **five** marks

2 x 5 = 10 Marks

7. a. Explain the effect of hydrogen bonding on boiling point with examples.
(OR)
b. What is oxidation number? Find the oxidation number of 'S' in H_2SO_4 and 'Mn' in KMnO_4 .
8. a. Define molarity. Find the weight of H_2SO_4 required to prepare 400 ml of 0.5M solution.
(OR)
b. Define normality. Calculate the normality of 500 ml solution containing 0.53 grams of Na_2CO_3 .

BOARD DIPLOMA EXAMINATIONS (C21)
I SEMESTER, MIDSEM – II
SC-104 - GENERAL ENGINEERING CHEMISTRY

Time: 1 Hour

Max. Marks: 20

PART – A

Instructions: i. Answer **all** questions. Each question carries **one** mark.

4 X 1 = 4 marks

1. What is conjugate acid base pair?
2. Define ionic product of water.
3. Define an ecosystem.
4. What is threshold limit value?

PART – B

Instructions: Answer **the following** questions. Each question carries **three** marks

2 x 3 = 6 Marks

5. a. What are the limitations of Arrhenius theory of acids and bases?
(OR)
b. Explain the neutralization according to Lewis theory of acids and bases with an example.
6. a. Explain the terms producers, consumers and decomposers with example.
(OR)
b. Explain the aquatic food chain.

PART – C

Instructions: Answer **the following** questions. Each question carries **five** marks

2 x 5 = 10 Marks

7. a. Define pH. Find the pH of 0.5M NaOH solution.
(OR)
b. What are buffer solutions? State the applications of buffer solutions.
8. a. What is Biodiversity and how to conserve the Biodiversity.
(OR)
b. What is deforestation? What are its consequences?

BOARD DIPLOMA EXAMINATIONS (C21)
I SEMESTER END EXAMINATION
SC-104 - GENERAL ENGINEERING CHEMISTRY

Time: 2 Hours

Max. Marks: 40

PART-A

Instructions: Answer **all** questions. Each question carries **one** mark.

8 X 1 = 8 marks

1. Define atomic mass number.
2. What is biodiversity?
3. Define degree of hardness of water.
4. What are buffer solutions?
5. Define soft water and hard water.
6. Name the salts responsible for temporary hardness of water.
7. Define the terms conductor and insulator.
8. What is an electrolyte?

PART – B

Instructions: Answer **the following** questions. Each question carries **three** marks

4 x 3 = 12 Marks

9. a. State and explain Hund's rule.
or
b. Write any six essential qualities of drinking water.
10. a. Explain the terms producers, consumers and decomposers with example.
or
b. What are strong and weak electrolytes? Give examples.
11. a. Define reverse osmosis and state its advantages.
or
b. Compare temporary and permanent hardness of water.
12. a. Distinguish between metallic and electrolytic conductors.
Or
b. State Faraday's Laws of electrolysis.

PART – C

Instructions: Answer **the following** questions. Each question carries **five** marks 4 x 5 =20
Marks

13. a. Find the molarity and normality of the two litres of solution containing 10.6 grams of Na_2CO_3 .
or
b. Calculate the temporary and permanent hardness of water containing the following salts per litre
i. $\text{Ca}(\text{HCO}_3)_2 = 32.4 \text{ mg}$, ii. $\text{Mg}(\text{HCO}_3)_2 = 29.2 \text{ mg}$, iii. $\text{CaSO}_4 = 13.6 \text{ mg}$, iv. $\text{MgCl}_2 = 19 \text{ mg}$
14. a. Explain Lewis theory of acids and bases.
or
b. Explain the process of electrolysis of fused NaCl .
15. a. Explain the permutit process of softening of hard water with a neat diagram.
or
b. What are the disadvantages of using hard water in industries?
16. a. Explain the process of electrolytic refining of copper.
Or
b. Calculate the weight of Al deposited on the cathode if 0.5 amperes of electric current is passed through AlCl_3 solution for 1 hour.
- .

ME-105 BASIC MANUFACTURING TECHNOLOGY

Course title:	Basic Manufacturing Technology	Course code:	ME-105
Semester:	I	Course group:	Core
Teaching scheme in periods:	4:1:0	Credits:	3
Methodology:	Lecture + Tutorial	Total Contact periods:	75
CIE:	60 Marks	SEE:	40 Marks

Prerequisites

Enthusiasm to learn the course and requires the basic knowledge of Applied Science and Mathematics at Secondary school level.

CORSE OUTCOMES

On successful completion of the course, the students will be able to:

COURSE OUTCOMES	
CO1	Attain the knowledge of tools and equipment used in Carpentry and Sheet Metal works
CO2	Know the fitting tools and operations
CO3	Know the forging tools, forging operations and machine forging
CO4	Attain the knowledge of Mechanical Working of Metals and differentiate hot working and cold working processes
CO5	Gain knowledge of foundry tools, moulding sands and patterns, for casting process
CO6	Attain the knowledge of Lathe & Lathe Work

BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Periods	Questions to be set for SEE				
			R		U	A	
1	Carpentry , Forging and Sheet metal tools	12	Q4	Q1		Q9(a)	Q13(a)
2	Fitting and Drilling	13					
3	Mechanical Working of Metals	13		Q2		Q10(a)	Q14(a)
4	Foundry	12					
5	Lathe & Lathe Work	13		Q3	Q9(b), Q11(a), Q11(b)		Q13(b), Q15(a), Q15(b)
6	Welding	12			Q10(b), Q12(a), Q12(b)		Q14(b), Q16(a), Q16(b)
Total		75	08		08	08	

CO-PO Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
CO1	3	3	3	2	-	-	1	1, 2,3,4,7
CO2	3	3	3	2	-	-	2	1, 2,3,4,7
CO3	3	3	3	2	-	-	2	1, 2,3,4,7
CO4	3	3	3	2	-	-	1	1,2 4, 7
CO5	3	3	3	2	-	-	2	1,2, 4,7
CO6	3	3	3	2	-	-	3	1,2,3,4,7

COURSE CONTENT

UNIT - I	CARPENTRY, FORGING AND SHEET METAL TOOLS	PERIODS:12

Carpentry Tools:

Marking & Measuring Tools - Scales, Rules, Straight Edge, Try Square, Marking gauge, Mortise gauge, Cutting gauge; Striking Tools - Hammers - Claw hammer and mallet specifications and uses.

Cutting Tools - Saws - Ripsaw, Cross cut saw (Hand saw), Tenon saw. Chisels - Firmer chisel, Bevelled edge firmer chisel, Parting chisel, Mortise chisel, Inside and Outside gauges. Planes - Jack plane (Wooden jack plane), Metal jack plane.

Sheet Metal Tools:

Cutting and Measuring Tools –Snips, Straight snip, Bent or curved snip, Double shears, Bench Shear, Riveting hammer, Setting hammer, Raising hammer, Mallet.

Stakes - Double seaming stake, Break horn stake, Bevel edged square stake, Funnel Stack, Half moon stack, Hatches stake, Needle stake, Blow Horn stake, Hollow mandrel stake,

Hand Forging Tools: Anvil, swage block, hand hammers - types; sledge hammer, specifications and uses, tongs - types, specifications & uses, chisel - hot & cold chisels specifications & uses. Swages - types and sizes, fullers, flatters, set hammer, punch and drift - sizes and uses.

Smithy Operations: Upsetting, drawing down, setting down, punching, drifting, bending, welding, cutting, swaging, fullering and flatterring. Advantages and disadvantages of Forging

UNIT - II	FITTING & DRILLING	PERIODS:13

Holding Devices:

Vices - Bench vice, leg-vice, hand vice, pin vice, tool makers vice, pipe vice.

Cutting tools:

Hand hacksaws, Files, Chisels, Scrapers, Drill Bits, Reamers, Taps, Dies, specifications and uses.

Marking Tools: Surface plate, V-block, angle plate, try square, scribe, punch, prick punch, centre punch, number punch, and letter punch.

Fitting Operations: Marking, Sawing, Chipping, Filing, Methods of Filing, Scrapping, Grinding, Drilling, Reaming, Tapping and Dieing.

Drilling: Introduction, classification of drills, twist drills, straight flute drills, common forms of parallel shank drills, taper shank twist drills, drill size and specifications, Working principle of drilling, Type of drilling machines: sensitive drilling machine, upright drilling machine (single spindle), radial drilling machine. Operations- Drilling, reaming, boring, counter boring, counter sinking, tapping, spot facing and trepanning.

UNIT-III MECHANICAL WORKING OF METALS

PERIODS: 13

Introduction: Hot working and cold working,

Hot Working Processes: Rolling - types of rolling, two high mill, three high mills, four high mills, piercing or seamless tubing, reeling, drawing or cupping, spinning, Extrusion - direct or forward extrusion, indirect or backward extrusion, tube extrusion, Impact extrusion. Effects of hot working of metals, advantages & limitations of hot working of metals.

Cold Working Processes: Rolling, drawing - wire drawing, tube drawing, Stretch forming, Cold extrusion, Squeezing Operation-Cold Heading, Cold reeling, Cold swaging, Stamping, Cold hobbing, Shot peening, Thread rolling, Shearing Operations- Blanking, Piercing, Notching, Bending-Roll bending, Angle bending, Cold spinning, Effects of cold working of metals, advantages & limitations of cold working.

UNIT – IV

LATHE & LATHE WORKS

PERIODS: 12

Working Principle of Lathe, Types of Lathes - Engine lathe – construction details– specifications., geometry and nomenclature of single point cutting tool, tool signature, functions of tool angles. Cutting speed, feed, depth of cut, cutting tool materials, General and special operations – (Turning, facing, taper turning thread cutting, knurling, forming, drilling, boring, reaming, key way cutting). Methods of taper turning – explanation Lathe accessories viz., work holding devices and tool holding devices.

UNIT - V

FOUNDRY

PERIODS: 13

Introduction to foundry - Advantages and limitations of casting over other manufacturing processes

Foundry Equipment: Hand moulding tools: shovel, riddle, rammers, trowels, slicks, lifter, strike - off bar, sprue pin bellow, swab, gate cutter, mallet, vent rod, draw spike, rapping plate or lifting plate, pouring weight, gagger, clamps, spirit level, moulding boxes,

Pattern – Making: Materials for pattern such as wood, cast Iron, aluminium, brass, plastics their uses and relative advantages, classification of patterns such as solid (one piece), two piece and three pieces, split patterns, gate patterns, shell patterns, etc, sequence in pattern making, pattern allowances and colour codes

Types of Moulding Sand : Green sand, dry sand, loam sand, facing sand, backing sand, parting sand, core sand, system sand- their ingredients and uses.

Sand Properties: Properties of moulding sand - porosity, flow ability, collapsibility, adhesiveness, cohesiveness and refractoriness.

Mouldings: Moulding Procedure, Moulding Processes, Green sand, Dry sand moulding, Skin dry sand moulding, Loam moulding, Cement bonded moulding, Shell moulding, Ceramic moulding, Moulding a split pattern, Moulding with three parts flask.

Cores: Need of cores and different types of cores,

UNIT – VI**WELDING****PERIODS:12**

Introduction & classification of welding processes. Applications, Advantages and limitations of welding, Principles of arc welding, Arc welding equipment, Choice of electrodes for different metals,

Principle of gas (oxy – acetylene) welding. Equipment of gas welding. Welding procedures (arc & gas),forge welding, forge welding pressure welding, flash welding, resistance welding, spot welding -projection welding -seam welding, -butt welding, -percussion welding,.

Soldering and Brazing techniques, Types and applications of solders & fluxes, Various flame cutting processes. Advantages and limitations of flame cutting, Defects in welding. Testing and inspection

SUGGESTED LEARNING OUTCOMES:

Upon completion of the course the student shall be able to;

I. CARPENTRY, FORGING AND SHEET METAL TOOLS

- 1.1. List various marking tools used in carpentry
- 1.2. List various measuring tools used in carpentry
- 1.3. Know the uses of measuring tools in carpentry
- 1.4. State various cutting tools of carpentry
- 1.5. Describe the construction and working of Plane
- 1.6. Describe anvil, swage block, hammers and their specifications
- 1.7. Learn about tongs, chisels, and swages
- 1.8. Explain about fullers, flatters, set hammers, punches and drift
- 1.9. Learn about smithy operations i.e. upsetting, drawing down, setting down, punching, drifting, cutting, fullering, flattening and bending
- 1.10. Know advantages and disadvantages of forging
- 1.11. List various tools used in sheet metal work and know the purpose
- 1.12. Explain construction and working of cutting tools snips, shears used in sheet metal
- 1.13. Illustrate the purpose of measuring tools used in sheet metal
- 1.14. Explain about various stakes used in sheet metal
- 1.15. List various sheet metal joints and their uses

II. FITTING & DRILLING:

- 2.1. List various work holding devices used in fitting
- 2.2. Illustrate construction and working of Bench vice only
- 2.3. List and know construction of Hack saw
- 2.4. Know types of files and chisels
- 2.5. Describe the construction details and usage of files
- 2.6. List various chisels and know the purpose.
- 2.7. Know types of drills, reamers, taps and dies and their purposes
- 2.8. List various marking tools in fitting and know their purposes.

- 2.9. List various measuring tools in fitting and know their purposes
- 2.10. Attain knowledge of various fitting operations.
- 2.11. State the working principle of drilling.
- 2.12. List out different types of drilling machines.
- 2.13. Understand the construction and working of sensitive drilling machine
- 2.14. Understand the construction and working of radial drilling machine.
- 2.15. List various types of drills and know the purpose
- 2.16. Understand the construction and working of Twist drill only
- 2.17. Identify forms of drill shank such as straight and taper shank and its purpose
- 2.18. Identify various drill bit materials
- 2.19. Write the specifications of drilling machines.
- 2.20. List and explain the different operations on drilling machine.

III. MECHANICAL WORKING OF METALS

- 3.1. Differentiate hot working and cold working
- 3.2. List hot working processes
- 3.3. Describe rolling, types of rolling
- 3.4. Know about Piercing, reeling, drawing or cupping, spinning operations
- 3.5. Know how to perform direct extrusion, indirect extrusion, tube extrusion, impact extrusion
- 3.6. Explain Effect of hot working of metals, advantages and limitations of hot working.
- 3.7. List cold working processes
- 3.8. Know about cold rolling; drawing – wire drawing, tube drawing, stretch forming
- 3.9. Describe cold extrusion; squeezing operations-cold heading, cold reeling, cold swaging, stamping, cold Hobbing, Shot peening, thread rolling
- 3.10. Explain shearing operations- blanking, piercing, notching; bending operations-roll forming, angle bending and cold spinning
- 3.11. Write advantages and limitations of cold working processes

IV LATHE AND LATHE WORK

- 4.1 State the working principle of lathe.
- 4.2 Classify lathes.
- 4.3 Draw the line diagram of engine lathe and describe the functions of each part in lathe.
- 4.4 Indicate the specifications of a lathe.
- 4.5 Study the effect Cutting speed, feed, depth of cut on metal removal rate and surface finish
- 4.6 Identify various single point Cutting tool materials and effect of alloying elements.
- 4.7 List the various operations performed on lathe including special operations.
- 4.8 Explain methods of taper turning with line diagrams.
- 4.9 Calculate the included angle for taper turning.

- 4.10 Explain the Nomenclature of single point tool with the help of legible sketch
- 4.11 Explain the Significance of various angles.
- 4.12 Understand the various steps involved in threading.
- 4.13 Understand the principle of half nut mechanism.
- 4.14 List and know the purpose of different work holding devices.

V. FOUNDRY

- 5.1 Explain importance of foundry, advantages and disadvantages of casting
- 5.2 Know foundry tools and their purposes
- 5.3 Describe usage of foundry tools used in mould preparation
- 5.4 Explain pattern making procedure
- 5.5 Describe pattern materials, their advantages and disadvantages
- 5.6 Explain types of patterns
- 5.7 Illustrate about pattern allowances and colour codes
- 5.8 Explain about moulding sands, green sand, dry sand, skin dry sand
- 5.9 Write about ingredients used in moulding sand and their uses
- 5.10 Explain desirable properties of moulding sand
- 5.11 Understand the purpose and construction of Gate, Runner and riser.
- 5.12 Define Core and types of cores and their specific purposes only
- 5.13 Explain preparation of mould
- 5.14 Know about loam moulding, cement bonded moulding, shell moulding, ceramic moulding
- 5.15 Explain moulding process with split pattern.

VI. WELDING

- 6.1 State the necessity of welding.
- 6.2 State the applications, advantages and limitations of welding.
- 6.3 Explain the principle of arc welding.
- 6.4 List and explain the tools, equipment and accessories of arc welding.
- 6.5 List and explain DC welding methods(SP & RP)
- 6.6 Classify Electrodes
- 6.7 Explain different welding procedures in arc welding
- 6.8 Explain the principle of gas welding.
- 6.9 List and explain the tools and equipment of gas welding
- 6.10 Understand types of flames in gas welding and its uses
- 6.11 Explain different welding procedures in gas welding.
- 6.12 Explain the pressure welding
- 6.13 Explain the principle of resistance welding
- 6.14 Know types of resistance welding like spot, continuous etc.
- 6.15 Explain the principles of soldering & brazing.
- 6.16 Differentiate soldering from brazing.
- 6.17 List the gas cutting equipment.
- 6.18 State the principle of flame cutting.
- 6.19 State the relative advantages of flame cutting over other types of cutting.

REFERENCE BOOKS

1. Production Technology by Jain & Gupta (KhannaPublishers)
2. Elementary Workshop Technology (Vol. I & II) by HazraChowdary
3. Manufacturing Technology (Vol. I) by P N Rao (McGraw Hill)
4. Workshop Technology (Vol. I & II) by Raghuvamshi
5. Production Technology by P.C.Sharma

Suggested E-Learning references

1. <http://www.asme.org>
2. www.ocw.mit.edu/courses/mechanical-engineering
3. www.nptel.ac.in

MID SEM-I EXAM PATTERN BLUE PRINT

(Shown are Question numbers)

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1,2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM PATTERN BLUE PRINT

(Shown are Question numbers)

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3,4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

SEMESTER END EXAMINATION (SEE) BLUE PRINT PATTERN

(Shown are Question numbers)

S No	Unit No.	Questions to be set for SEE				
		R		U		A
1	I	4	1	9(a)		13(a)
2	II					
3	III		2	10(a)		14(a)
4	IV					
5	V		3	5, 6	9(b)	13(b)
					11(a)	15(a)
		11(b)			15(b)	
6	VI	7,8		10(b)	14(b)	
				12(a)	16(a)	
				12(b)	16(b)	
Total Questions		8		8		8

BOARD DIPLOMA EXAMINATION, (C-21)
DME- I SEMESTER- EXAMINATION
MID SEM-I
BASIC MANUFACTURING TECHNOLOGY

Time: 1Hour

Total Marks: 20

PART-A

04X01=04

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.
1. State the use of try square
 2. Why snips are used?
 3. Define Drilling.
 4. What is the use of file?

PART-B

02X03=06

- Instructions :**
1. Answer any **TWO** questions.
 2. Each question carries **THREE** marks.
5. (a) Write about Tenon Saw with a neat sketch?
(or)
 5. (b) List various joints in sheet metal and their uses.
-
6. (a) Draw a neat sketch of hand hack saw and label the parts.
(or)
 6. (b) Draw a neat sketch of Sensitive Drilling Machine?

PART-C

02X05=10

- Instructions :**
1. Answer any **TWO** questions.
 2. Each question carries **FIVE** marks.
7. (a) Draw and explain about metal jack plane.
(or)
 7. (b) Explain about any two stakes with sketches
-
8. (a) What is filing? And explain about any two files.
(or)
 8. (b) Draw a neat sketch of Radial drilling machine

BOARD DIPLOMA EXAMINATION, (C-21)
MID SEM-II
DME – II SEMESTER- EXAMINATION
BASIC MANUFACTURING TECHNOLOGY

Time: 1Hour

Total Marks: 20

PART-A

04X01=04

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.

1. Define hot working.
2. What is cold working?
3. What is the purpose of Chuck?
4. What is Tail stock?

PART-B

02X03=06

- Instructions :**
1. Answer any **TWO** questions.
 2. Each question carries **THREE** marks.

5. (a) List different methods of taper turning
(or)
5. (b) Name different types of work holding devices.
6. (a) How hot rolling is done?
(or)
6. (b) What is blanking operation?

PART-C

02X05=10

- Instructions :**
1. Answer any **TWO** questions.
 2. Each question carries **FIVE** marks.

7. (a) List and explain various lathe operations.
(or)
7. (b) Draw a neat sketch of Engine Lathe and name the parts..
8. (a) Explain hot extrusion with a neat sketch.
(or)
8. (b) How wire drawing is done in cold working?

BOARD DIPLOMA EXAMINATION, (C-21)
MODEL PAPER-2021
DME-SEMESTER END EXAMINATION
BASIC MANUFACTURING TECHNOLOGY

Time :2 Hours

Total Marks: 40

PART-A

08X01=08

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.
1. Define “Forging”
 2. State the purpose of reamer.
 3. Name one work holding device used in lathes?
 4. What is the purpose of tail stock.
 5. Define “Porosity” of moulding sand?
 6. Why cores are used in casting?
 7. Define Welding
 8. What is a electrode

PART-B

04X03=12

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **THREE** marks.
9. (a) Draw a neat sketch of a file and label the parts.
(or)
 9. (b) List various parts of a lathe
 10. (a) Write advantages and disadvantages of hot rolling
(or)
 10. (b) List various arc welding equipments
 11. (a) List various work holding devices used on lathe.
(or)
 11. (b) List various taper turning methods
 12. (a) List different types of electrodes.
(or)
 12. (b) What is meant by DCSP & DCRP.

PART-C

04X5=20

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **FIVE** marks.

13. (a) Draw and explain about wooden jack plane
(or)
13. (b) Explain Engine lathe with a sketch
14. (a) Explain one type of rolling operation
(or)
14. (b) List and explain various gas welding equipment.
15. (a) Explain four jaw chuck with a sketch..
(or)
15. (b) Explain taper turning by swivel compound rest method
16. (a) Explain seam welding
(or)
16. (b) Explain flash welding

ME-106 BASIC ENGINEERING DRAWING

(This Course is Common to all programs of Diploma in Engineering offered by the State Board of Technical Education, Hyderabad, Telangana State)

Course Title :	Basic Engineering Drawing	Course Code	ME-106
Semester	I	Course Group	Core
Teaching Scheme in Pds (L :P)	1:0:2	Credits	1.5
Methodology	Lecture + Practice	Total Contact Pds:	45
CIE	60 Marks	SEE	40 Marks

Prerequisites: No prerequisites are required to learn this course.

Course Objectives

The Course is aimed at developing basic drawing skills so as to enable them to use these skills in the preparation of engineering drawings, their reading and interpretation.

Course Outcomes

Upon completion of the subject the student shall be able to

CO1	Recognize the importance of Engineering Drawing and usage of the drawing instruments.
CO2	Practice free hand lettering & numbering in different styles.
CO3	Recognize the importance of Dimensioning and Acquiring the knowledge of different methods of dimensioning systems.
CO4	Appreciate the usage of engineering curves such as tangent lines, tangent arcs, parabola, hyperbola, ellipse, involute, cycloid and helix in various engineering applications and draw the above said curves
CO5	Realize the concept of projection and attain visualization projection of points, Lines and Planes. The student will also be able to draw the views related to projection of Points, Lines and Planes.
CO6	Analyze the concept of orthographic projections and student will be able to draw orthographic views of an object from its pictorial drawing.

Blueprint for Marks in SEE

Unit No	Name of the Unit	Periods	Questions to be set for SEE		
			R	U	A
			PART-A (2M Questions)		PART-B (6M Questions)
1, 2 & 3	Importance of Engineering Drawing and Instruments, Free hand lettering and Numbering and Dimensioning Practice	09	Q1		Q9(a)
4a.	Geometric constructions up to construction of polygons	06	Q2		Q9(b)
4b.	Geometric constructions contd., Conical curves and Special curves	06	Q3		Q10(a)
5	Projection of points, Lines, and Planes	09	Q4		Q10(b)
6	Orthographic projections	15	Q5, Q6, Q7, Q8		Q11(a), Q11(b), Q12(a), Q12(b)
Total Periods / Total Questions		45	8		4
[R: Remembering; U: Understanding – 2 Marks; A: Application – 6 Marks] <u>Note: Question Paper consists PART – A and PART-B</u> PART – A consists of 8 questions) and student has to answer ALL questions, each question carries 2 marks. (8x2 = 16) PART – B consists of 4 questions and student has to attempt ALL questions, each question carries 6 marks (4x6=24)					

CIE Question Paper Pattern and Syllabus

Unit No	Name of the Unit	Periods	Questions to be set for CIE		
			R	U	A
			PART-A (2M Questions)		PART-B (6M Questions)
Mid Sem – I Exam					
1, 2 & 3	Importance of Engineering Drawing and Instruments, Free hand lettering and Numbering and Dimensioning Practice	09	Q1, Q2	Q5(a), Q5(b)	
4a.	Geometric constructions up to construction of polygons	06	Q3, Q4	Q6(a), Q6(b)	
Total			4	2	
Mid Sem – II Exam					
4b.	Geometric constructions contd., Conical curves and Special curves	06	Q1, Q2	Q5(a), Q5(b)	
5	Projection of points, Lines, and Planes	09	Q3, Q4	Q6(a), Q6(b)	
Total			4	2	
[R: Remembering; U: Understanding – 2 Marks; A: Application – 6 Marks]					
<u>Note: Question Paper consists PART – A and PART-B</u> PART – A consists of 4 questions and student has to answer ALL questions, each question carries 2 marks. (4x2 = 8) PART – B consists of 2 questions and student has to attempt ALL questions, each question carries 6 marks (2x6=12)					

Course Contents

NOTE:

1. B.I.S Specification should invariably be followed in all the topics.
2. A-3 Size Drawing Sheets are to be used for all Drawing Practice Exercises.

1.0 The importance of Engineering Drawing and Engineering Instruments

Explanation of the scope and objectives of the subject of Engineering Drawing Its importance as a graphic communication -Need for preparing drawing as per standards – SP-46 –1988 – Mention B.I.S - Role of drawing in -engineering education – Link between Engineering drawing and other subjects of study.

Engineering drawing Instruments

Classifications: Basic Tools, tools for drawing straight lines, tools for curved lines, tools for measuring distances and special tools like mini drafter & drafting machine – Mentioning of names under each classification and their brief description -Scales: Recommended scales reduced & enlarged -Lines: Types of lines, selection of line thickness - Selection of Pencils -Sheet Sizes: A0, A1, A2, A3, A4, A5, Layout of drawing sheets in respect of A0, A1, A3 sizes, Sizes of the Title block and its contents, Care and maintenance of Drawing Sheet, Drawing plate:

Lay out of sheet – as per SP-46-1988 to a suitable scale.

2.0 Free hand lettering & numbering

Importance of lettering – Types of lettering -Guide Lines for Lettering

Practicing of letters & numbers of given sizes (7mm, 10mm and 14mm)

Advantages of single stroke or simple style of lettering - Use of lettering stencils

3.0 Dimensioning practice

Purpose of engineering Drawing, Need of B.I.S code in dimensioning -Shape description of an Engineering object -Definition of Dimensioning size description - Location of features, surface finish, fully dimensioned Drawing -Notations or tools of dimensioning, dimension line extension line, leader line, arrows, symbols, number and notes, rules to be observed in the use of above tools -Placing dimensions: Aligned system and unidirectional system (SP-46-1988)-Arrangement of dimensions Chain, parallel, combined progressive, and dimensioning by co-ordinate methods-The rules for dimensioning standard, features: Circles (holes) arcs, angles, tapers, chamfers, and dimension of narrow spaces.

4.0 Geometric Construction

Division of a line: to divide a straight line into given number of equal parts internally examples in engineering application. Construction of tangent lines: to draw tangent lines touching circles internally and externally.

Construction of tangent arcs

- a) To draw tangent arc of given radius to touch two lines inclined at given angle (acute, right and obtuse angles).
- b) Tangent arc of given radius touching a circle or an arc and a given line.
- c) Tangent arcs of radius R, touching two given circles internally and externally.

Construction of polygon: construction of any regular polygon of given side length using general method.

Conical Curves: Explanation of Ellipse, Parabola, Hyperbola, as sections of a double cone and a loci of a moving point, Eccentricity of above curves – Their Engg. application viz. Projectiles, reflectors, P-V Diagram of a hyperbolic process.

Conical Curves: Construction of any conic section of given eccentricity by general method.

Construction of ellipse by concentric circles method.

Construction of parabola by rectangle method.

Construction of rectangular hyperbola.

Special Curves: Involute, Cycloid and Helix, explanations as locus of a moving point, their engineering application, viz, Gear tooth profile, screw threads, springs etc. - their construction

5.0 Projection of points, lines and planes

Projecting a point on two planes of projection -Projecting a point on three planes of projection -Projection of straight line.

- a) Parallel to both the planes.
- b) Perpendicular to one of the planes.
- c) Inclined to one plane and parallel to other planes.

Projection of regular planes.

- a) Plane perpendicular to HP and parallel to VP and vice versa.
- b) Plane perpendicular to HP and inclined to VP and vice versa.

6.0 Orthographic Projections

Meaning of orthographic projection -Using a viewing box and a model – Number of views obtained on the six faces of the box - Legible sketches of 3 views for describing object -Concept of front view, top view, and side view for sketching these views of engineering objects - Explanation of first angle projection. – Positioning of three views in First angle projection - Projection of points as a means of locating the corners of the surfaces of an object – Use of miter line in drawing a third view when other two views are given -Method of representing hidden lines -Selection of minimum number of views to describe full object.

Reference Books

1. Engineering Drawing by N.D. Bhatt (Charotar Publishing House Pvt. Ltd.)
2. Engineering Drawing by Kapil dev – (Asian Publisher)

3. Engineering Drawing by Basant Agarwal & C. M. Agarwal - (McGraw-hill)
4. A Textbook on Engineering Drawing by P. Kannaiah, K. L. Narayana, K. Venkata Reddy

Online Resources

1. [1.https://nptel.ac.in/courses](https://nptel.ac.in/courses)
2. [2. www.slideshare.net/shameem.mist/engineering-drawing](http://www.slideshare.net/shameem.mist/engineering-drawing)
3. [3.https://www.powershow.com/viewfl/76303a-](https://www.powershow.com/viewfl/76303a-OWI5M/Engineering_Drawing_powerpoint_ppt_presentation)
4. OWI5M/Engineering_Drawing_powerpoint_ppt_presentation
5. [4.https://www.powershow.com/view0/91a2bf-](https://www.powershow.com/view0/91a2bf-N2Q2N/Basic_engineering_drawing_solved_question_powerpoint_ppt_presentation)
6. N2Q2N/Basic_engineering_drawing_solved_question_powerpoint_ppt_presentation

Suggested Learning Outcomes

Upon completion of the subject, the student shall be able to

1.0 Understand the basic concepts of engineering drawing

- 1.1 State the importance of drawing as an engineering communication medium
- 1.2 State the necessity of B.I.S. Code of practice for Engineering Drawing.
- 1.3 Explain the linkages between Engineering drawing and other subjects of study in diploma course.

Use of Engineering Drawing Instruments

- 1.4 select the correct instruments and draw lines of different orientation.
- 1.5 Select the correct instruments and draw small and large Circles.
- 1.6 Select the correct instruments for measuring distances on the drawing.
- 1.7 Use correct grade of pencil for different types of lines, thickness and given function.
- 1.8 Select and use appropriate scales for a given application.
- 1.9 Identify different drawing sheet sizes as per I.S. and Standard Lay- outs.
- 1.10 Prepare Title block as per B.I.S. Specifications.

2.0 Write Free Hand Lettering and Numbers

- 2.1 Write titles using sloping lettering and numerals of 7mm, 10mm and 14mm height
- 2.2 Write titles using vertical lettering and numerals of 7mm, 10mm and 14mm height
- 2.3 Select suitable sizes of lettering for different layouts and applications
- 2.4 Practice the use of lettering stencils.

3.0 Understand Dimensioning Practice

- 3.1 Define “Dimensioning.
- 3.2 State the need of dimensioning of drawing according to accepted standard.
- 3.3 Identify notations of Dimensioning used in dimensioned drawing.

- 3.4 Identify the system of placement of dimensions in the given dimensioned drawing.
- 3.5 Dimension a given drawing using standard notations and desired system of dimensioning.
- 3.6 Dimensioning standard features applying necessary rules.
- 3.7 Arrange dimensions in a desired method given in a drawing.
- 3.8 Identify the departures if any made in the given dimensioned drawing with reference to SP-46-1988, and dimension the same correctly.

4.0 Apply Principles of Geometric Constructions

- 4.1 Divide a given line into desired number of equal parts internally.
- 4.2 Draw tangent lines and arcs.
- 4.3 Use General method to construct any polygon.
- 4.4 Explain the importance of conics.
- 4.5 Construct conics (ellipse, parabola and hyperbola) by general method.
- 4.6 Construct ellipse by concentric circles method.
- 4.7 Construct parabola by rectangle method.
- 4.8 Construct rectangular hyperbola from the given data.
- 4.9 Construct involute from the given data.
- 4.10 Construct cycloid and helix from the given data.
- 4.11 State the applications of the above constructions in engineering practice.

5.0 Apply Principles of Projection of points, lines and planes (06 Hours)

- 5.1 Visualize the objects
- 5.2 Explain the I-angle and III-angle projections
- 5.3 Practice the I-angle projections
- 5.4 Draw the projection of a point with respect to reference planes (HP&VP)
- 5.5 Draw the projections of straight lines with respect to two reference Planes (up to lines parallel to one plane and inclined to other plane)
- 5.6 Draw the projections of planes (up to planes perpendicular to one plane and inclined to other plane)

6.0 Apply principles of orthographic projection

- 6.1 Explain the principles of orthographic projection with simple sketches.
- 6.2 Draw the orthographic view of an object from its pictorial drawing.
- 6.3 Draw the minimum number of views needed to represent complete engineering component.

Course Outcomes (CO)

Upon successful completion of the course, the students will be able to

Course Outcome		Cognizant Level	Linked Program Objectives (PO)
CO1	Acquiring the knowledge about the importance of Engineering drawing and Drawing instruments usage.	R	1, 4, 7
CO2	Practicing free hand Lettering & Numbering in different styles.	R/U	1, 3, 4, 7
CO3	Acquiring the knowledge about different methods of dimensioning systems.	R/U	1,3, 4, 7
CO4	Appreciate the usage of engineering curves for tracing the paths and surface profile of the machine components such as gear profile from involute and cycloid., cooling towers from hyperbola, automobile headlights from ellipse and dish antenna from parabola etc.	R/U/A	1, 2, 3, 4, 7
CO5	Realize the concept of projection and attain visualization projection of points, Lines and Planes. The student will also be able to draw the views related to projection of Points, Lines and Planes.	R/U/A	1, 2, 3, 4,6, 7
CO6	Realize the concept of orthographic projections and student will be able to draw orthographic views of an object from its pictorial drawing.	R/U/A	1, 2, 3, 4, 7

CO-PO MATRIX:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	3	-	-	3
CO2	3	-	1	2	-	-	3
CO3	3	-	1	2	-	-	2
CO4	3	1	2	2	-	-	2
CO5	3	3	2	2	-	1	1
CO6	3	1	3	3	-	-	2

BOARD DIPLOMA EXAMINATION, (C-21)
DME – I SEMESTER
ME-106, MID SEMESTER - I EXAMINATION
BASIC ENGINEERING DRAWING

Time: 1 Hour]

[Total Marks: 20

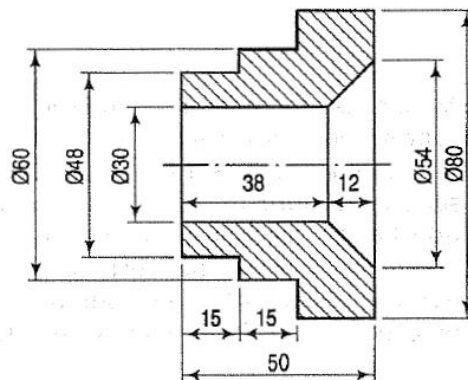
PART-A

04x02=08

Instructions :

1. Answer **ALL** questions.
2. Each question carries **TWO** marks.

1. Write freehand the following, using single stroke vertical capital letters of height 12 mm.
‘NECESSITY IS THE MOTHER OF INVENTION’
2. Redraw the following figure in Uni-Directional system of dimensioning.



3. To divide a straight line of 70mm into 6 equal parts.
4. Bisect a given line AB of length 75mm.

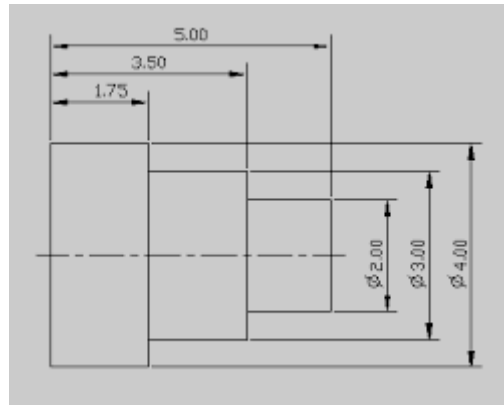
PART-B

02x06=12

Instructions :

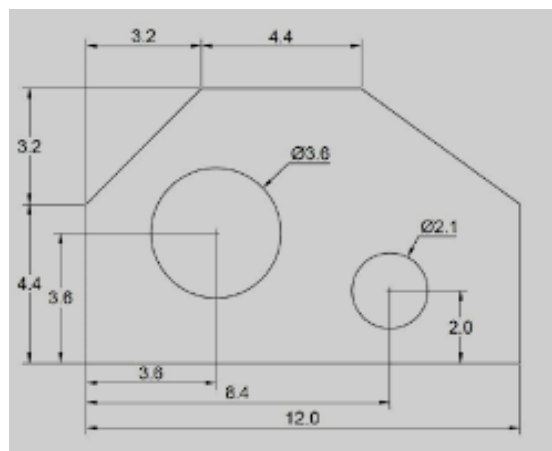
1. Answer ALL questions.
2. Each question carries **SIX** marks.

5. (a) Redraw the following figure with chain dimensioning.



(Or)

5. (b) Redraw the following figure in aligned system of dimensioning.



6. (a) Construct a regular pentagon of base side 30 mm in general method.

(Or)

6. (b) Draw an arc of radius 30 mm touching the given straight line AB of length 70 mm and passing through a point 'P' which is 55 mm above the line AB.

BOARD DIPLOMA EXAMINATION, (C-21)
DME – I SEMESTER
ME-106 MID SEMESTER - II EXAMINATION
BASIC ENGINEERING DRAWING

Time: 1 Hour]

[Total Marks: 20

PART-A

04x02=08

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **TWO** marks.
1. Draw an arc of radius 30 mm touching the two given straight lines AB and AC making an angle 45^0 with each other.
 2. Draw an internal common tangent for the two given circles of equal radius of 30 mm if the centre distance is 75 mm.
 3. Draw the projections of a point A lying on both the planes.
 4. A line AB of length 70 mm is parallel to V.P. and inclined an angle of 30^0 to H.P. Draw its projections when its end A is on the H.P. and 20 mm in front of V.P.

PART-B

02x06=12

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **SIX** marks.
5. (a) Construct an ellipse if the distance between focus and the directrix is 50 mm by eccentricity method. Also draw the normal and tangent at any point on the curve.

(Or)
 5. (b) Construct the locus of a point 'P' which is on the circumference of circle of radius 25 mm when it is rolling on a straight line for one complete revolution without slipping. Also name the curve.
 6. (a) Draw the projections of a line AB of length 75 mm parallel to HP and inclined at an angle of 30^0 to VP. The end A is 30 mm from both the reference planes.

(Or)
 6. (b) A square of base side 40 mm is perpendicular to both the reference planes. Draw its projections.

MODEL PAPER SEE
ME-106 BOARD DIPLOMA EXAMINATION, (C-21)
DME – I SEMESTER EXAMINATION
BASIC ENGINEERING DRAWING

Time: 2hours]

[Total Marks: 40

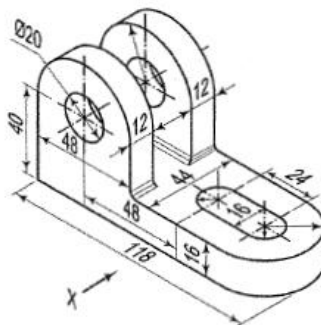
Important Note: Wherever any question has choice, marks will be allotted only to first attempted question. No marks will be allotted for extra questions answered.

PART-A

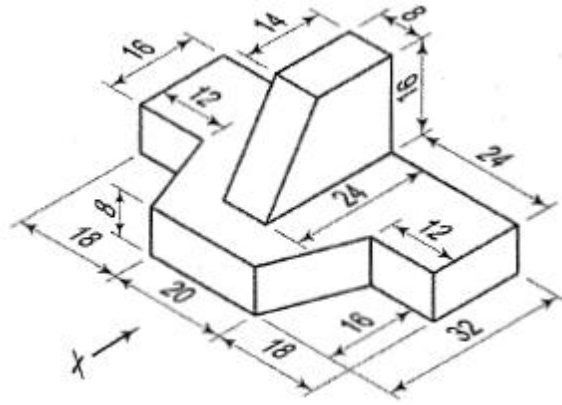
08x02=16

Instructions :

1. Answer **ALL** questions.
2. Each question carries **TWO** marks.
3. All the dimensions are in mm.
1. Write the following, using single stroke vertical capital letters of size 10 mm:
'DEVELOP AN ATTITUDE OF GRATITUDE'
2. Bisect the given angle of 55° .
3. Inscribe a pentagon in a given circle of radius 35 mm.
4. Draw the projections of a point 'P' lying on HP and 30 mm behind VP.
5. Draw the top view of a circular plane of diameter 50mm when its plane is perpendicular to HP.
6. Draw the projections of a cube of base side 30 mm when it is resting on one of its base on HP with one of its vertical face is parallel to VP.
7. Draw the front view of the block shown in figure



8. Draw the front view of the block shown in figure



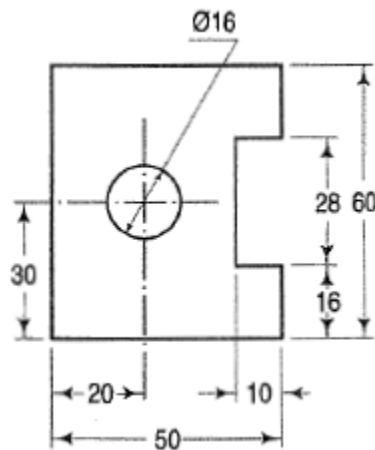
PART-B

04x06=24

Instructions :

1. Answer ALL questions.
2. Each question carries **SIX** marks.
3. All the dimensions are in mm.

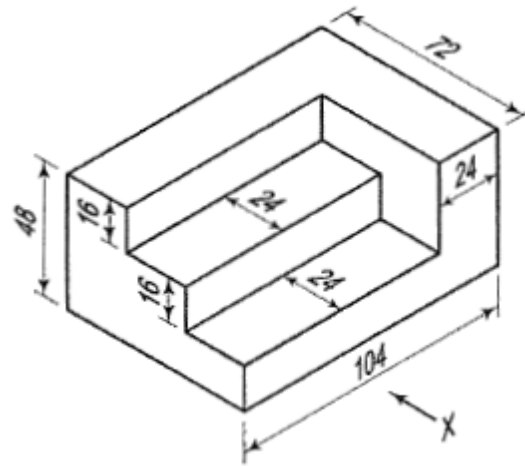
9. (a) Redraw the following figure with aligned system of dimensioning.



(Or)

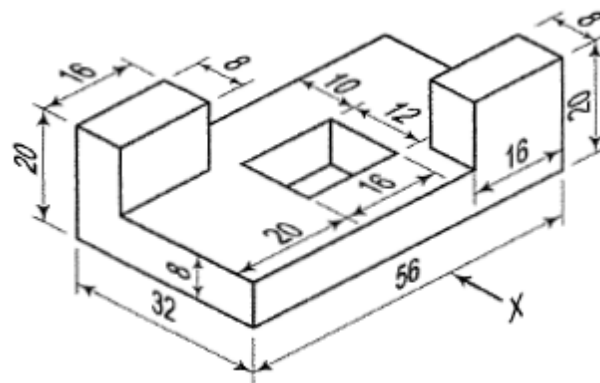
9. (b) Inscribe a hexagon in a given circle of radius 30mm by keeping one of its side horizontal.
10. (a) Draw a parabola with the distance of the focus from the directrix at 50 mm using eccentricity method and draw a normal and tangent through a point 40 mm from the directrix.
- (Or)
10. (b) A line AB 75 mm long is parallel to H.P. and inclined at 30° to V.P. The end A is 25 mm above H.P and 30 mm in front of V.P. Draw its projections.

11. (a) Draw the front view of the component shown in figure

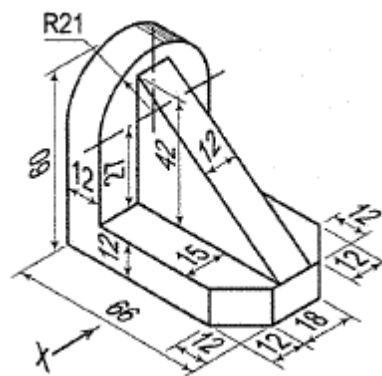


(Or)

11. (b) Draw the top view from the component as shown in figure.

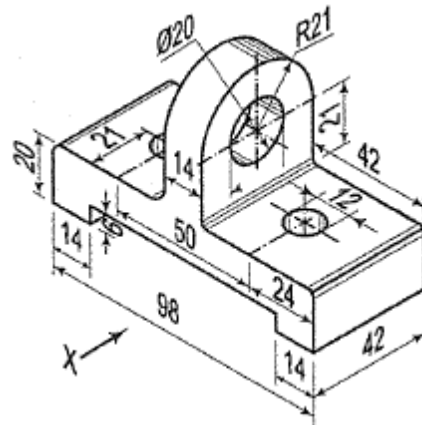


12. (a) Draw the frontview of component shown in figure



(Or)

12 (b) Draw the top view and front view of the component as shown in figure



ME-107 - BASIC AUTOCAD LAB

Course Title :	Basic AutoCAD Lab	Course Code	ME-107
Semester	I	Course Group	Core
Teaching Scheme in periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practice	Total Contact periods	45 Periods
CIE	60 Marks	SEE	40 Marks

Pre requisites:

This course requires the Basic Computer Skills and Practice concepts of engineering drawing

Course Outcomes

CO1	Importance and advantages of CAD. Set drawing area and draw geometric shapes and modify as per requirement
CO2	Creating new objects by using draw commands
CO3	Modifying the existing drawing using modify commands
CO4	Add dimensions and text with required font and size.
CO5	Generate isometric model and draw circle on three iso planes
CO6	Create 2D drawings with front, side view with all above features

Course Content

UNIT -1

Duration: 15 periods (T:5 + P:10)

1.1 The Computer Aided Drafting and its software

Definition of Computer Aided Drafting, the Advantages and importance of CAD software LIKE Auto CAD, Intelli Cad, ProG CAD etc., the features of Graphic Work station, CAD Environment: Screen, Various tool bars and menus.

1.2 Selection of commands

Commands using toolbars, menus, command bar. Repeating a command, Nesting a command and modifying a command. Use of prompt history window and scripts, mouse shortcuts. Creating the drawing. Opening existing and, saving of drawing, setting up a drawing. Setting and changing the grid and snapping alignment, and the Entity snaps.

1.3 Use of viewing tools of CAD & Use of coordinate systems of the drawing

Use of mouse, Scroll bar to move around within drawing, changing of magnification of drawing. Displaying of multiple views, the use of controlling visual elements like Line weight and line types.

Two dimensional coordinates such as Absolute, Cartesian, Relative Cartesian and Polar coordinates and direct method of drawing line.

1.4 Creating simple and complex entities

Drawing of lines, circles, arcs, ellipses, elliptical arcs, rays and infinite lines, rectangles, polygons,

1.5 Use the simple Modifying tools to modify the properties of entities

Entity selection and de selection methods, the Deletion of entities. Copying of entities within a drawing, between drawings, parallel copies,

UNIT -2

Duration: 15 periods (T:5 + 10P)

2.1 Use the Modifying tools to modify the properties of entities

Mirroring entities and arraying entities. The Rearranging of entities by Moving, Rotating and Reordering. The Resizing of entities by Stretching, Scaling, Extending, Trimming, and editing the length. The Braking and joining of entities. Chamfering and Filletting of entities

2.2 Creating complex entities

Drawing of shapes like rectangle, Polygon, polylines, Splines, donuts, and adding of hatch pattern

2.3 Use the drawing information retrieving tools Measure, Divide, Calculate and Display

Creating and editing of point entities. Dividing the entities in to segments. Calculation of areas of defined by points, closed entities, and combined entities, calculate the distance and angle between the entities. Displaying the information about the entities and drawing status.

2.4 Use the Text tool to create and formatting the various types of text Fonts and its styles

The creating, naming and modifying the text fonts, the Creation of line text, paragraph text, setting of line text style and its alignment. The Setting of Paragraph text style and its alignment, and modifying the text. Rectangular and polar array

2.5 Use Dimensioning concepts to create, Edit ,Control dimension styles & variables and Adding geometric tolerances

The creating of linear, Angular, Diametral, Radial, Ordinate dimensions. The creating leaders and annotations, making dimensions oblique, Editing the dimension text, controlling of dimension arrows and format. The Controlling of line settings and dimension text, the Controlling of dimension units, and dimension tolerance.

2.6 Isometric Views

Setting of isometric grid – change of iso planes, drawing straight line and circle
Create Isometric views of simple objects

.UNIT -3

Duration: 15 periods (T:3 + P:10)

Practise of 2D Drawings consisting of different line types, line weights, hatch, dimensioning and Text

Using appropriate commands creation of 2D drawings of standard components

Specific Learning Outcomes

UNIT-1

Duration: 15 periods (T:3 + P:10)

Upon completion of the course the student shall be able to Understand about the

1. Computer Aided Drafting and its software

- 1.1 Define Computer Aided Drafting
- 1.2 List the Advantages of CAD and also various CAD software's
- 1.3 Explain the importance of CAD software
- 1.4 Explain the features of Graphic Work station
- 1.5 Explain CAD Screen, Various tool bars and menus
- 1.6 Explain the benefits of Templates
- 1.7 Identify various CAD software's and their features

Use appropriate selection commands

- 1.8 Practice commands using toolbars, menus, command bar
- 1.9 Practice repeating a command, Nesting a command and modifying a command
- 1.10 Use prompt history window and scripts
- 1.11 Know the use of mouse for zooming and pan
- 1.12 Practice the Creating the drawing, saving the drawing with .drawing extension and Opening Existing drawing
- 1.13 Practice the setting up a drawing with drawing limits and drawing units.
- 1.14 Practice the setting and changing the ortho, grid and snapping alignment
- 1.15 Practice the Entity snaps

Use viewing tools of CAD & Use coordinate systems of the drawing

- 1.16 Practice the use of Scroll bar, pan command and rotating view to move around within drawing
- 1.17 Practice the changing of magnification of drawing

- 1.18 Practice how the coordinate system work and it is displayed
- 1.19 Practice the Two dimensional coordinates such as Absolute Cartesian, Relative Cartesian, Polar coordinates and direct method to draw a line.
- 1.20 Explain importance and use of Osnap/ Esnap points.
- 1.21 Practice to draw with other drawing commands like circle, polygon and other.

Create the simple and complex entities

- 1.22 Draw the lines, circles, arcs, ellipses, elliptical arcs, rays and infinite lines.

UNIT -2

Duration: 15 periods (T:3 + P:10)

2. Use the modifying tools to modify the properties of entities

- 2.1 Practice the various methods of entity selection like window, cross window, fence, last and previous methods and deselect ion method
- 2.2 Draw shapes like Rectangles, Polygons, Polylines, Splines, donuts
- 2.3 Practice the adding of hatch with required pattern and adjusting line angle and line space.
- 2.4 Practice the Deletion, breaking and trimming of entities
- 2.5 Practice the Copying of entities within a drawing, between drawings
- 2.6 Practice the Chamfering and Filleting of entities
- 2.7 Practice the making of parallel copies, Mirroring entities and Arraying entities
- 2.8 Practice the Rearranging of entities by Moving, Rotating and Reordering
- 2.9 Practice the Resizing of entities by Stretching, Scaling, and Extending.
- 2.10 Practice the Editing of polylines: Opening, Closing, Curving, Decurving, Joining, Changing width and editing vertices
- 2.11 Practice the Exploding of entities

Use the drawing information retrieving tools Measure, Divide, Calculate, Display, and Track

- 2.12 Divide the entities in to required number of segments
- 2.13 Calculate the areas defined by points, of closed entities, and combined entities
- 2.14 Calculate the distance between the entities
- 2.15 Calculate the angle between the entities
- 2.16 Display the information about the entities and drawing status
- 2.17 Track time spent working on a drawing

Use the Text tool to create and formatting the various types of text fonts and its styles

- 2.18 Practice the creating, naming and modifying the text fonts
- 2.19 Practice the Creation of line text, paragraph text
- 2.20 Practice the Setting of line text style and its alignment
- 2.21 Practice the Setting of Paragraph text style and its alignment

- 2.22 Practice the Changing of line text and Paragraph text
- 2.23 Practice the use of alternate text editor

Use Dimensioning concepts to create dimensions, Edit dimensions, Control dimension styles & variables and Adding geometric tolerances

- 2.24 Practice the creating of linear, Angular, Diametral, Radial, Ordinate dimensions
- 2.25 Practice the creating leaders and annotations
- 2.26 Practice the making dimensions oblique,
- 2.27 Edit the dimension text
- 2.28 Practice the Controlling of dimension properties like arrow types, size, dim line adjustment, dim offset, text size: primary and secondary units and format
- 2.29 Practice the Controlling of dimension units, and dimension tolerance

UNIT-3

Duration: 15 periods (T:3 + P:10)

3. Create 2D Drawings

- 3.1 Create 2D drawings of standard mechanical components with dimensions and text

Recommended Books

1. AutoCAD by George Omura
2. 4MCAD User Guide- IntelliCAD Technology Consortium

Key competence to be achieved by students / Suggested Learning Outcomes

S.No	Experiment Title	Key components
1	Introduction to CAD	• Open / close AutoCAD program • Understands AutoCAD Graphic User Interface(GUI) and various toolbars
2	Selecting commands & Working withdrawing	• Use prompt history window and scripts • Practice the setting up a drawing • Practice the Entity
3	a) Viewing drawing	• Use Scroll bar, pan command, and rotating view to move around within drawing • Control visual elements like Fill, Text, Blips and • Line weight
	b) Working with coordinates	• Use Two dimensional coordinates and Three dimensional coordinates • Use right-hand rule • Use filters in two and three dimensions • Define user coordinate system
4	Creating simple and complex	• Draw the simple shapes like lines, circles, arcs

	entities	- and complex shapes like polygons, planes etc., - Practice adding of hatch pattern
5	Getting Drawing information	- Measure the intervals and distance between Entities. - Divide the entities in to segments - Calculate the areas defined by points, of closed entities, and Combined entities
6	Use the Text tool to create various types of text fonts and its styles	- Calculate the areas defined by points, of closed entities, and Combined entities - Use filters in two and three dimensions - Draw the simple shapes like lines, circles, arcs and complex shapes like polygons, planes etc., - Practice the adding of hatch pattern
7	Dimensioning drawing	- Practice the Controlling of dimension properties like arrow types, size, dim line adjustment, dim offset, text size , primary and secondary units and format - Practice the Controlling of dimension units, and dimension tolerance
8	Isometric Views	Use Iso snap command to create Isometric views
9	2D Drawings	Use proper 2D commands to create 2D drawings

Course Outcomes		CL	Linked PO	Teaching Hours
CO1	Importance and advantages of CAD. Set drawing area and draw geometric shapes and modify as per requirement	U/A	1,2,3,4,7	3
CO2	Creating new objects by using draw commands	U/A	1,2,3,4	12
CO3	Modifying the existing drawing using modify commands	U/A	1,2,3,7	6
CO4	Add dimensions and text with required font and size.	A	1,2,3,4	6
CO5	Generate isometric model and draw circle on three iso planes	U/A	1,2,3,4,7	3
CO6	Create 2D drawings with front, side view with all above features	A	1,2,3,4,7	15

MID SEM-I EXAM

S.No	Unit Name	R	A	Remarks
1	Unit-I	1, 2,3,4	5,6	
Total Questions		4	2	

MID SEM –II EXAM

S.No	Unit Name	R	A	Remarks
1	Unit-II	1, 2,3,4	5,6	
Total Questions		4	2	

SEMESTER END EXAM

S N	Unit name	Questions to be set for SEE		Remarks
		R, U	A	
1	Unit-1	1,2		
2	Unit-2	3,4		
3	Unit-3		5, 6	

CO-PO MAPPING MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	1	3	-	-	3
CO2	3	1	1	2	-	-	3
CO3	3	1	1	2	-	-	2
CO4	3	-	-	2	-	-	2
CO5	3	1	1	2	1	-	1
CO6	3	2	3	3	-	1	2

ME-107 - Basic AutoCAD Lab
MODEL PAPER FOR MID -1 (CIE)

TIME: 1hr

Marks: 20M

PART-A

NOTE: Answer all questions
8marks

4 X 2 =

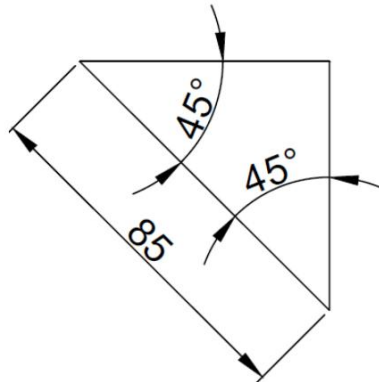
1. Draw a square of 50x50mm by using any CAD software.
2. Draw an equilateral triangle of 50mm side by using any CAD software.
3. Draw an ellipse with major axis 80mm and minor axis 30mm by using any CAD software.
4. Draw a line of 50mm and draw five parallel lines at 10mm distance by using offset command

PART-B

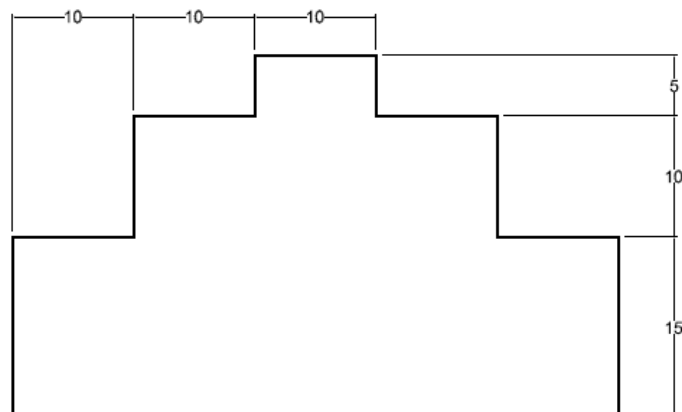
NOTE: Answer any one questions
12marks

1 X 12 =

5. Draw the following using any CAD software without dimensioning.



6. Draw the following using any CAD software without dimensioning.



ME-107 - Basic AutoCAD Lab
MODEL PAPER FOR MID -2 (CIE)

TIME: 1hr

Marks: 20M

PART-A

NOTE: Answer all questions
8marks

4 X 2 =

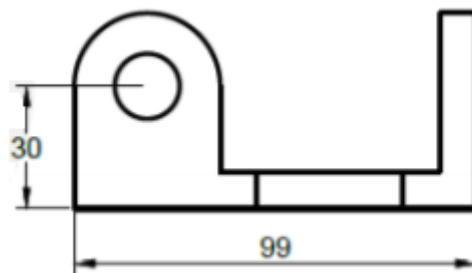
1. Write text “CAD Lab” with Calibri font style and font size 10 by using any CAD software.
2. Draw a line of 10mm and divide it into four equal parts by modifying the point style to x shape.
3. Add continuous dimensions to divided line drawn in Q no. 2.
4. Draw a pentagon of side 60mm and calculate its area by using any CAD software.

PART-B

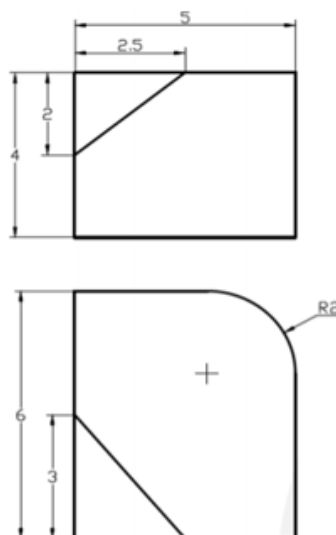
NOTE: Answer any one questions
12marks

1 X 2 =

5. Draw the following using any CAD software and add dimensioning.



6. Draw the following using any CAD software and add dimensioning.



ME-107 - Basic AutoCAD Lab
MODEL PAPER FOR SEE

TIME: 2hr

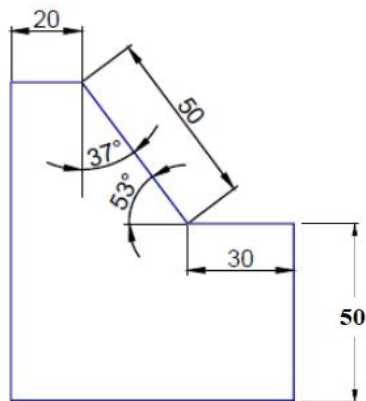
Marks: 40M

PART-A

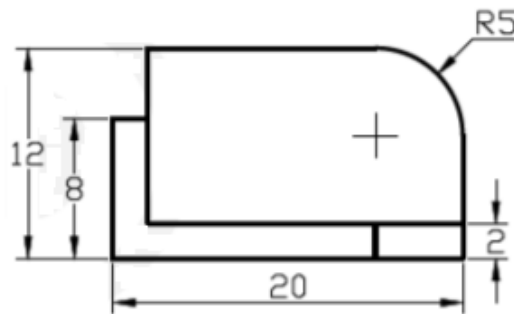
NOTE: Answer all questions
16marks

4 X 4 =

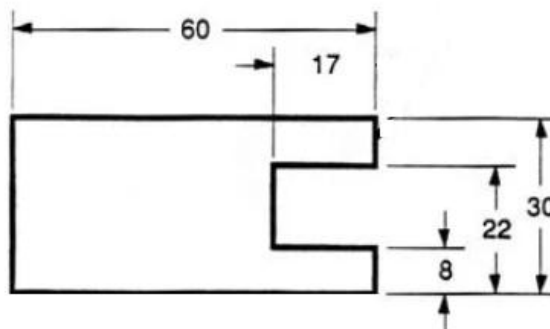
1. Draw the following fig by using any CAD software, change the line type and add dimensions. Also list the commands used in sequence.



2. Draw the following arrow mark by using any CAD software, and add complete dimensions. Also list the commands used in sequence.



3. Redraw the following figure and add dimensions as shown in figure.



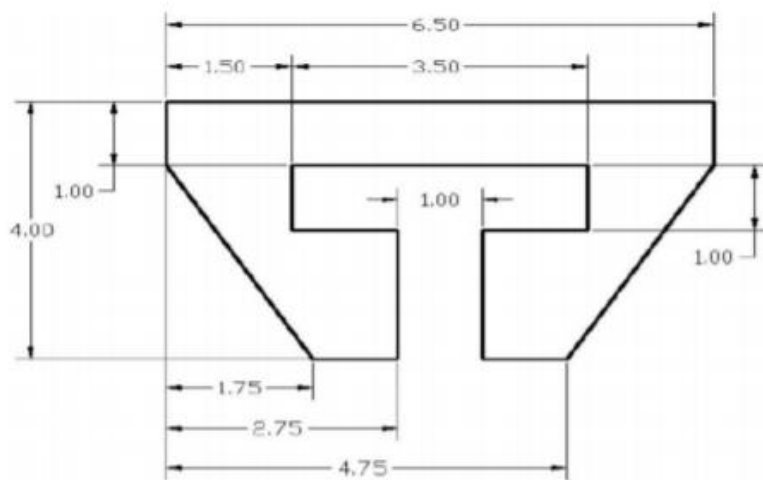
4. Draw isometric view of a cube of 100mm side by using any CAD software.

PART-B

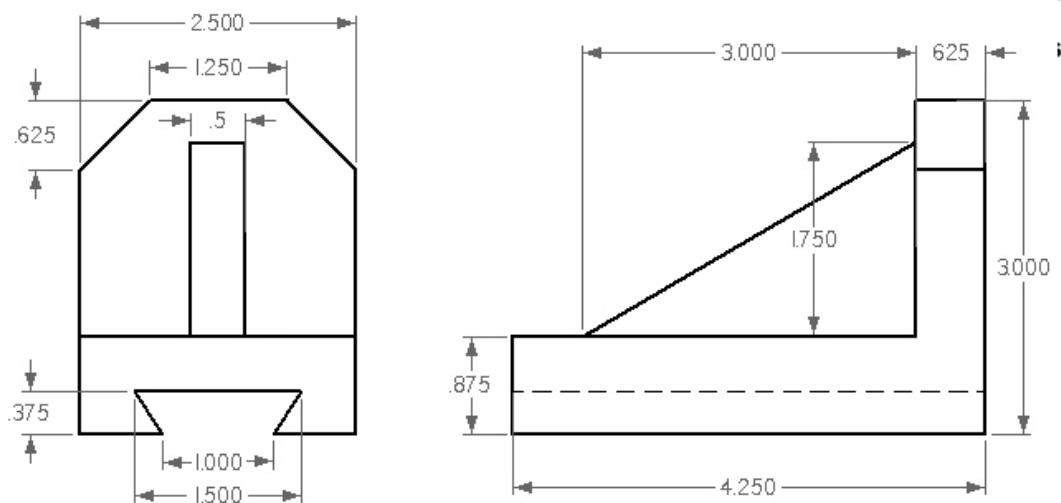
NOTE: Answer any one questions

1 X 24 = 24marks

5. (a) Draw the following using any CAD software and add dimensioning. 15+5+4 marks
(b) List the commands in sequence and also write the procedure
(c) Add title box containing Student PIN, name and college name



6. (a) Draw the following using any CAD software and add dimensioning. 15+5+4 marks
(b) List the commands in sequence and also write the procedure
(c) Add title box containing Student PIN, name and college name



ME-108-BASIC WORKSHOP LAB

Course Title	Basic Workshop Lab	Course Code	ME-108
Semester	I	Course Group	Core
Teaching Scheme in Hrs (L: T: P)	1:0:2	Credits	1.5
Methodology	Lecture + Practice	Total Contact Hours :	45
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic skills of Handling Domestic tools; this course also requires the basic knowledge of basic mathematics at secondary school level.

Unit No	Unit name	Periods	Questions for SEE	Marks weightage	%of Weightage
			Handling/Manipulation/Precision		
1	General Introduction & safety precautions	3		40	100
2	Fitting shop	12	1		
3	Forging shop	12	1		
4	Carpentry shop	9	1		
5	Sheet metal work	9	1		
	Total	45	4	40	100
Note: 1. At beginning of each trade Workshop Supdt/ Senior faculty should demonstrate all the tools and equipment available in that shop explaining its purpose/ application and also guide the students about safety precautions to be followed 2. At the end of every practice class the object prepared by student should be evaluated for 20 marks before student pointing the mistakes committed by student. 1. Student can answer any one question out of 4 questions. 2. To pass in practical Exam student should acquire 50% marks in both CIE and SEE separately and CIE & SEE put together. 3. If the students acquire less than 50% in CIE, accordingly the students have to acquire more than 50% in SEE to get overall 50 % to pass					

On completion of course the student should be able to

CO1	Know the importance of general safety precautions on different shop floors.
CO2	Understand the basics of removal of material from work piece surface to attain specific shape.
CO3	Ability to Identify and use the appropriate tools and equipment in Fitting Shop to perform fitting operations as per specified dimensions.
CO4	Ability to Identify and use the tools to perform forging operations and prepare simple shapes as per specification.

CO5	Ability to identify and use the tools to perform Carpentry operations and prepare simple wooden joints.
CO6	Ability to identify and use the tools to perform operations in sheet metal shop and prepare simple prototypes such as rectangular open type tray and hollow cylinder.

COURSE CONTENTS

FITTING SHOP

1. Marking and Filing of 12/6 mm thick MS Flat to required size and Right angle.
2. Cutting with hack saw M.S. Flats of 6 mm thick and sawing.
3. Marking, cutting, drilling Practice

FORGING SHOP

1. Conversion of round to square.
2. Conversion of Square to Round
3. Conversion of round to Hexagon.

CARPENTRY SHOP

1. Cutting of wood with hand saw and planning practice.
2. Planning and Chiselling of wood.
3. Preparation of T Joint

SHEET METAL WORK

1. Practice on cutting of sheet with straight and curved snips
2. Formation of joints like grooved joints, locked groove joint
3. Preparation of a rectangular open type tray

REFERENCE BOOKS

1. Manufacturing Technology (Vol I) by P N Rao (McGraw Hill)
2. Principles of Foundry Technology by P L Jain (McGraw Hill)
3. Mechanical Workshop & Laboratory Manual By K. C. John

Competencies and Key competencies to be achieved by the student.

Title of the Job	Competencies	Key Competencies
Fitting shop		
1. Marking and Chipping on Mild steel flat of 12 mm thick	• Identify appropriate measuring tool • Handle appropriate marking tool • Mark the dimensions • Handle appropriate filing tool • Remove the material by filing from MS flats • File corner to exact right angles	• Mark the dimensions • Remove the material by chipping from MS flats
2. Cutting with hack saw of MS flats of 6mm thick	• Check the raw material for size • Fix the work piece in vice • Mark the work as per given dimensions • Perform sawing • Load and unload hack saw blade from its frame • Use the hack saw to perform cutting operation	• Load and unload hack saw blade from its frame • cut the work as per marked dimensions using Hack saw
3. Drilling on a MS flat of 2 mm thick	• Check the raw material for size • Apply the chalk on the surface and on all sides of the flat • Layout the dimensions and mark the lines using dot punch • Chamfer the edges through filing • Locate the hole centres using odd leg callipers and centre punching • Identify appropriate drill bit • Load and unload drill bit from the machine	• Load and unload drill bit from the machine • Identify appropriate taps • Tap the hole

Title of the Job	Competencies	Key Competencies
Forging shop		
1. Conversion of Round to Square	• Identify the holding and striking tools • Heat the specimen to the appropriate temperature • Remove the specimen and hold it on the anvil • Hammer the specimen to the required shape	• Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
2. Conversion of square to round	• Identify the holding and striking tools • Heat the specimen to the appropriate temperature • Remove the specimen and hold it on the anvil • Hammer the specimen to the required shape	• Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape
3. Conversion of Round to Hexagon	• Identify the holding and striking tools • Heat the specimen to the appropriate temperature • Remove the specimen and hold it on the anvil • Hammer the specimen to the required shape	• Heat the specimen to the appropriate temperature • Hammer the specimen to the required shape

Title of the Job	Competencies	Key Competencies
Carpentry Shop		
1. Cutting of wood with hand saw	• Identify the orientation of grains and seasoning of wood • Select appropriate saw for cutting in each of the directions viz. across and along the grains • Select appropriate work holding device • Handle appropriate measuring and marking tools(Steel rule, Try square, Marking gauge) • Mark dimensions on work using Marking gauge • Fix the work in the vice • Perform cutting along the grains using Rip saw • Change the position of work in the vice • Perform cutting perpendicular the grains using cross cut saw	• Identify the orientation of grains • Mark dimensions on work using marking gauge • Perform cutting along and perpendicular the grains using appropriate saw
2. Planning of wood	• Identify the direction for planning wood stock • Select appropriate jack plane • Prepare the jack plane for planning • (Load and unload the blade of a jack plane • Select appropriate work holding device • Perform marking on work using appropriate tool • Fix the work in the vice • Plane the surfaces on all four sides using jack plane	• Identify the direction for planning wood stock • Prepare the jack plane for planning • Plane the surfaces on all four sides using jack plane
3. Chiselling of wood	• Select appropriate chisels and saw • Select appropriate work holding device • Select appropriate measuring and marking tools • Fix the work in the vice • Mark the position of grooves on work using marking gauge • Cut sides of grooves by hand saw • Chip the material using firmer chisel by applying pressure with mallet • Finish the grooves with rasp file	• Select appropriate chisels and saw • Mark the position of grooves on work using marking gauge • Cut sides of grooves by hand saw • Chip the material using firmer chisel by applying pressure with mallet

4. Preparation of a T joint	• Select the appropriate cutting tools and work holding devices • Plane the wooden pieces on all sides • Mark to cut groove with try square • Cut the groove on one piece • Finish the groove • Assemble the two pieces to prepare T joint by using mallet	• Trim the dovetail by chisel to exact size • Mark at an angle of 75° with bevel square • Cut the dovetail groove on second piece • Assemble the two pieces to prepare dovetail halving joint by using mallet

Title of the Job	Competencies	Key Competency
Sheet metal Work		
1. Practice on cutting of sheet	• Cut the required sheet from the stock using snip • Mark the dimensions on the sheet using scribe & steel rule • Draw the circular shapes using divider • Perform rough cutting of the curved shapes using chisel and finish cutting using snips • Cut the straight edges using straight snips	• Identify the marking and cutting tools • Cut the sheet of different shapes using appropriate tools
2. Formation of joints like grooved joint, locked groove joint	• Cut the sheet in to two halves • Form the flange on the sheet by folding the sheet along scribed lines using mallet & stakes • Perform bending edges of sheets applying moderate pressure using mallet • Inter lock the bent edges and apply pressure with mallet to make required joint	• Identify the marking and cutting tools • Cut the sheet • Perform bending along the marked lines.
3. Preparation of a rectangular open type tray	• Draw the development of the object to be made • Place the pattern on the sheet • Mark the dimensions using scribe • Shear the required piece from the stock using straight snips • Mark the lines on the sheet to form bends • Strengthen the sides of sheet by single hem using hatchet stake • Form the sheet in to desired shape using stakes • Seam the corners by inserting laps of the adjacent sides with single hem	• Drawing development of objects • Cut the sheet • Seam the corners by inserting laps of the adjacent sides with single hem

Course Outcome (CO)		Cognizant Level	Linked Program Outcomes (PO)	Teaching periods
CO1	Know the importance of general safety precautions on different shop floors.	R/U/A		1
CO2	Understand the basics of removal of material from work piece surface to attain specific shape.	R/U/A	1,2,3,7	
CO3	Ability to Identify and use the appropriate tools and equipment in Fitting Shop to perform fitting operations as per specified dimensions.	R/U/A	1,2,3,7	11
CO4	Ability to Identify and use the tools to perform forging operations and prepare simple shapes as per specification.	R/U/A	1,2,3,7	11
CO5	Ability to Identify and use the tools to perform Carpentry operations and prepare simple wooden joints.	R/U/A	1,2,3,7	11
CO6	Ability to Identify and use the tools to perform operations in sheet metal shop and prepare simple prototypes such as rectangular open type tray and hollow cylinder.	R/U/A	1,2,3,7	11
R: Remembering, U: Understanding, A: Applying				

Course Articulation Matrix

CO-PO Attainment Matrix:

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	-	-	-	1
CO2	3	2	3	-	-	-	1
CO3	3	2	3	-	-	-	1
CO4	3	3	3	-	-	-	1
CO5	3	2	3	-	-	-	1
CO6	3	3	3	-	-	-	1

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

ME-108 -BASIC WORKSHOP LAB
Mid Sem-I (CEE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Mark and Prepare the square by filing as per the given figure.
2. Prepare the component by sawing as per the given figure.
3. Chamfer and drill the hole on work piece as per the given figure.
4. Prepare square section from the round bar as per the given figure.
5. Prepare hexagon section from the round bar as per the given figure.
6. Plane the wood as per the given figure.
7. Prepare grooves on wooden block as per the given figure
8. Prepare dovetail lap joint as per the given figure
9. Cut the sheet metal as per the given figure.
10. Prepare single seam joint as per the given figure.
11. Prepare double seam joint as per the given figure.
12. Prepare rectangular open tray as per the given figure.

Note: 1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice

2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

State Board of Technical Education, Telangana State

Model Paper
ME-108 -BASIC WORKSHOP LAB
Mid Sem-II (CEE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Mark and Prepare the square by filing as per the given figure.
2. Prepare the component by sawing as per the given figure.
3. Chamfer and drill the hole on work piece as per the given figure.
4. Prepare square section from the round bar as per the given figure.
5. Prepare hexagon section from the round bar as per the given figure.
6. Plane the wood as per the given figure.
7. Prepare grooves on wooden block as per the given figure
8. Prepare dovetail lap joint as per the given figure
9. Cut the sheet metal as per the given figure.
10. Prepare single seam joint as per the given figure.
11. Prepare double seam joint as per the given figure.
12. Prepare rectangular open tray as per the given figure.

Note: 1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record

and 2 marks For Viva voice

2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

State Board of Technical Education, Telangana State
Model Paper
ME-108 -BASIC WORKSHOP LAB
(SEE)

Time : 3 Hours

Total Marks : 40 M

Note: Answer any one question.

1. Mark and Prepare the square by filing as per the given figure.
2. Prepare the component by sawing as per the given figure.
3. Chamfer and drill the hole on work piece as per the given figure.
4. Prepare square section from the round bar as per the given figure.
5. Prepare hexagon section from the round bar as per the given figure.
6. Plane the wood as per the given figure.
7. Prepare grooves on wooden block as per the given figure
8. Prepare dovetail lap joint as per the given figure
9. Cut the sheet metal as per the given figure.
10. Prepare single seam joint as per the given figure.
11. Prepare double seam joint as per the given figure.
12. Prepare rectangular open tray as per the given figure.

Note: marks are to be awarded for conduct of Experiment, writing of procedure, Record and viva voce

SC-109 - BASIC SCIENCE LAB

Course Title	Basic Science Lab	Course Code	SC-109
Semester	I	Course Group	Practical
Teaching Scheme in Pds/Hrs(L:T:P)	1:0:2	Credits	1.5
Type of course	Tutorial & Practical	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

Physics Lab

Pre requisites: Knowledge of basic concepts of basic High school science and basic mathematics

Course objectives: To provide practical knowledge about the basics of Physics instrumentation and calculations/measurements.

Course Outcomes	
CO1	Understand Vernier caliper principle and calculate accurate measurement of lengths and volumes of various objects
CO2	Understand Screw Gauge principle and calculate accurate measurement of thickness of various thin objects
CO3	Understand vectors and resultant of vectors and verify Parallelogram law of forces and Triangle law of forces
CO4	Understand the concept of viscosity and calculate Coefficient of viscosity of a liquid by capillary method
CO5	Verify Boyle's law employing Quill tube.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3			-	-	1	1
CO2	3			-	-	1	1
CO3	3			-	-	1	1
CO4	3			-	-	1	1
CO5	3			-	-	1	1
	3					1	1

Learning outcomes

On successful completion of the course, the student will have ability to:

1. Determine the volumes of objects like cylinder, sphere and piece of pipe.
2. Determine thickness /diameter of small objects like glass plate and wire.
3. Verify the parallelogram law and triangle law of forces.
4. Determine the viscosity of liquid using capillary method
5. Verify Boyle's law employing Quill tube.

Course Delivery:

The course will be delivered through lectures, class room interaction, group discussions, graded exercises, demonstration and practice.

Tutorial: 1Periodd /Experiment:

1. Introduction to Physics practical and its importance, safety precautions in maintenance of equipment in the laboratory.
2. Maintenance of apparatus and equipment.
3. Follow of Do's and Don'ts.
4. Maintenance of data in manual and record book.
5. Write the procedure of the experiment before the commencement of each experiment.
6. Strictly following of instructions given from time to time by the lecturer-in-charge.
7. Demonstration of each experiment by the lecturer in charge.

Conduction of experiments: 2 periods/Experiment.

Student must perform experiment individually under the supervision of the lecturer-in charge.

EXAMINATION & EXPERIMENTS		
S.NO	EXAMINATION	EXPERIMENTS
1	MIDSEM-I	EXPERIMENT NO 1 & 2
2	MIDSEM-II	EXPERIMENT NO 3 & 4
3	SEMESTER END EXAMINATION	EXPERIMENT NO 1,2,3,4 and 5

Scheme of Valuation of SEE		
S.No	Particulars	Marks
1.	Objective/Aim	01
2.	Apparatus/Equipment	02
3.	Observations	02
4.	Principle including formula	02
5.	Experiment (Tabular form, readings, etc)	05
6.	Calculation and Result	05
7.	Viva Voce	03
	Total	20

References:

1. Basic Applied Physics – R.K. Gaur
2. Laboratory manual for class XI and XII – NCERT

Chemistry Lab

Prerequisite:

Knowledge of basic concepts of chemistry of secondary education.

Course Objectives:

To provide practical knowledge about the basics of preparation of chemical solutions and volumetric analysis of chemical compounds.

Course Outcomes:

On successful completion of the course, the student will have ability to attain CO:

Course Outcome	
CO1	Prepare the standard solution.
CO2	Estimate the amount of the HCl in the given sample of solutions
CO3	Estimate the amount of the NaOH in the given sample of solutions.
CO4	Estimate the amount of the H ₂ SO ₄ in the given sample of solutions.
CO5	Determine the hardness of water in the given sample.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	1	-	1	1
CO2	3	-	-	-	-	1	1
CO3	3	-	-	-	-	1	1
CO4	3	-	-	-	-	1	1
CO5	3	-	-	-	2	1	1

Course Delivery:

The course will be delivered through lectures, classroom interaction, group discussion, demonstration and practicals.

Conduction of experiments: Lecture 1 period + Experiment 2 periods.

Student must conduct experiment individually under the supervision of the staff-in-charge.

Lecture and Demonstration: 1 Period

1. Introduction of chemistry practical and its importance, safety precautions in maintenance of cleanliness and orderliness of chemicals in the laboratory.
2. Maintenance of apparatus and equipment.
3. Follow of Do's and Don'ts.
4. Maintenance of data in record book.
5. Write the procedure of the experiment before the commencement of each experiment.
6. Strict following of instructions given from time to time by the staff-in-charge.
7. Demonstration of each experiment by the staff in charge.

Course Content**Volumetric Analysis: (22.5 Periods)****Volumetric Analysis by Titrimetric Method:-**

Volumetric Analysis -Titration – Standard Solutions - Concentration of solutions - Indicators - Acid base indicators - Selection of indicators - Endpoint of titration- Neutralization.

List of experiments:

1. Preparation of 0.05M sodium carbonate solution.
2. Estimation of hydrochloric acid present in 250 ml of solution by using standard sodium carbonate solution.
3. Estimation of sodium hydroxide present in 250ml of solution by using standard hydrochloric acid solution.
4. Estimation of sulphuric acid present in 250ml of solution by using standard sodium hydroxide solution.
5. Determination of total hardness of water sample by 0.02N EDTA solution.

Specific Learning Outcomes**Upon completion of the course, the student will have ability to**

1. Prepare standard sodium carbonate solution and dilute to desired concentration.
2. Estimate hydrochloric acid present given volume of solution by using standard sodium carbonate solution.
3. Estimate sodium hydroxide present in the given volume of solution by using standard hydrochloric acid solution.
4. Estimate sulphuric acid present in the given volume of solution by using standard sodium hydroxide solution.
5. Determine the total hardness of water sample by using 0.02N EDTA solution.

Reference Books:

1. Vogel's Inorganic Qualitative and Quantitative Analysis.
2. Practical chemistry by O.P.Pande& others.
3. Qualitative and quantitative analysis by Alex.

EXAMINATION & EXPERIMENTS		
S.NO	EXAMINATION	EXPERIMENTS
1	MIDSEM-I	Experiment No. 1 & 2
2	MIDSEM-II	Experiment No. 3 & 4
3	SEMESTER END EXAMINATION	Experiment No. 1,2,3,4 and 5

Scheme of Valuation for MID I & II and SEE		
Sl. No.	Particulars	Marks
1	Identification of apparatus/equipment/chemical compounds/tools/etc.	2
2	Writing Principle and Procedure	5
3	Experiment and Observations	6
4	Calculation and Results	4
5	Viva-voice	3
Total		20

BOARD DIPLOMA EXAMINATION, (C-21)

MIDSEM – I

FIRST SEMESTER EXAMINATION

SC-109 - BASIC SCIENCE LAB

TIME: 1 Hour

TOTAL MARKS: 20

Instructions: (1) Answer both PART-A AND PART-B on separate answer sheets.

(2) Each question carries **TEN** marks.

PART-A (PHYSICS LAB)

Perform ONE experiment allotted by the examiner.

1 x 10 = 10

1. Find the volume of given sphere using Vernier caliper.
2. Find the volume of given cylinder using Vernier caliper.
3. Find the volume of given piece of pipe using Vernier caliper
4. Determine the thickness of given glass plate using Screw gauge.
5. Find the cross sectional area of given wire using Screw gauge.

PART-B (CHEMISTRY LAB)

Perform ONE experiment allotted by the examiner.

1 x 10 = 10

1. Prepare 250 ml of 0.05M sodium carbonate solution.
2. Estimate the amount of hydrochloric acid present in 500 ml of the given solution using 0.02M sodium carbonate solution.
3. Estimate the amount of hydrochloric acid present in 250 ml of the given solution using 0.05M sodium carbonate solution.

BOARD DIPLOMA EXAMINATION, (C-21)

MIDSEM – II

FIRST SEMESTER EXAMINATION

SC-109 - BASIC SCIENCE LAB

TIME: 1 Hour

TOTAL MARKS: 20

Instructions: (1) Answer both PART-A AND PART-B on separate answer sheets.

(2) Each question carries **TEN** marks.

PART-A (PHYSICS LAB)

Perform ONE experiment allotted by the examiner.

1 x 10 = 10

1. Verify parallelogram law of forces.
2. Verify triangle law of forces
3. Determine coefficient of viscosity of water using capillary method.

PART-B (CHEMISTRY LAB)

Perform ONE experiment allotted by the examiner.

1 x 10 = 10

1. Estimate the amount of NaOH present in 500 ml solution using 0.02M HCl solution
2. Find the Molarity and estimate the amount of Sulphuric acid present in 250 ml solution using 0.01M NaOH solution.

BOARD DIPLOMA EXAMINATION, (C-21)
SEMESTER END EXAMINATION
FIRST SEMESTER EXAMINATION
SC-109 - BASIC SCIENCE LAB

Time: 2 Hours]

[Total Marks: 40

Instructions: (1) Answer both PART-A AND PART-B on separate answer sheets.
(2) Each question carries **TWENTY** marks.

PART-A (PHYSICS LAB)

Perform ONE experiment allotted by the examiner.

1 x 20 = 20

1. Find the volume of given sphere using Vernier caliper.
2. Find the volume of given cylinder using Vernier caliper.
3. Find the volume of given piece of pipe using Vernier caliper
4. Determine the thickness of given glass plate using Screw gauge.
5. Find the cross sectional area of given wire using Screw gauge.
6. Verify parallelogram law of forces
7. Verify triangle law of forces.
8. Determine coefficient of viscosity of water using capillary method.
9. Verify Boyle's law using Quill tube.

PART-B (CHEMISTRY LAB)

Perform ONE experiment allotted by the examiner.

1 x 20 = 20

10. Prepare 250 ml of 0.05M sodium carbonate solution.
11. Estimate the amount of hydrochloric acid present in 500 ml of the given solution using 0.02M sodium carbonate solution.
12. Estimate the amount of hydrochloric acid present in 250 ml of the given solution using 0.05M sodium carbonate solution.
13. Find the Molarity and estimate the amount of NaOH present in 100 ml of the given solution using 0.01M HCl solution.
14. Estimate the amount of Sulphuric acid present in a litre of solution using 0.01M NaOH solution.
15. Determine the total hardness of the given water sample using 0.02N EDTA solution

CS-110 - Basic Computer Science Lab

Course Title	Basic Computer Science Lab	Course Code	CS-110
Semester	I	Course Group	Practical
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture +Tutorial	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

Pre-requisite: The students should have basic knowledge of and basic knowledge of using computer

COURSE OUTCOME

CO1	Creating and saving a document, Formatting of text in MS-WORD
CO2	Spell checking, Mail merging and Printing of Documents in MS-WORD
CO3	Creating and Saving a presentation, inserting text and pictures & Formatting the text and pictures, Slide transition and Animation effects in MS-POWER POINT
C04	Building Worksheet & Charts In Ms-Excel and Printing Of Worksheet
C05	Creating Database, Tables, Forms, Queries, Reports In Ms-Access

Course Contents

1. Unit-I: Creating, Saving a document, Formatting of text in MS-WORD

Duration: 5 hrs

- MS_WORD - Creating and saving a document, Formatting of text

2. Unit-II: Spell checking, Mail merging and Printing of Documents in MS-WORD MS Word

Duration: 10 hrs

- MS-WORD - Spell Checking - Mail merging - Printing of Documents

3. Unit-III: Creating and Saving a presentation in MS Powerpoint and Slide transition and Animation effects

Duration: 10 hrs

- MS-POWER POINT - Creating and saving a presentation - Inserting text and pictures
- Formatting the text and pictures- MS-POWER POINT - Effects of slide transition - Animation effects - Slide show & views of slides

4. Unit-IV Building & Charts in MS-Excel and Printing Of Worksheet

Duration: 10 hrs

- Building Worksheets – Building Charts, Printing EXCEL Worksheet

5. Unit-V Creating Database, Tables, Queries, Forms ,Reports & Printing

Duration: 10 hrs

- Creating Table, Viewing(ACCESS) – Creating Forms – Creating Queries and Viewing Database
- Creating of ACCESS Reports – Printing of ACCESS Tables, Forms, Reports

Specific Learning Outcomes:

1.0 Practice Operation of MS-Word.

- 1.1 Demonstrate starting MS word.
- 1.2 Identify the word screen elements.
- 1.3 Identify the tool bars on the screen.
- 1.4 Demonstrate loading different tool bars for their functionality.
- 1.5 Identify the drop down menus of the main menu and their functionality.
- 1.6 Demonstrate creating a sample text.
- 1.7 Demonstrate text formatting.
- 1.8 Demonstrate page formatting.
- 1.9 Demonstrate selecting, deselecting the text from menu and Copying.
- 1.10 Demonstrate importing text from other packages.

2.0 Spell checking, Mail merging and Printing of Documents in MS-WORD

- 2.1 Demonstrate search and replace of text.
- 2.2 Demonstrate spell checking.
- 2.3 Demonstrate creating tables.
- 2.4 Demonstrate mail merging of documents.
- 2.5 Demonstrate printing documents, merge printing of documents.
- 2.6 Demonstrate word procedure for importing figures, charts from other installed software.

3.0 Practice operation of MS-Power Point and Slide transition and Animation effects.

- 3.1 Demonstrate starting MS Power Point.

- 3.2 Identify the opening screen elements.
- 3.3 Identify the tool bars in the opening screen.
- 3.4 Demonstrate the selection of the methods of creating a new presentation.
- 3.5 Identify the different Auto Layouts of a slide.
- 3.6 Demonstrate creating a new slide
- 3.7 Demonstrate inserting a new slide.
- 3.8 Demonstrate slide transition effects.
- 3.9 Demonstrate a slide show.
- 3.10 Demonstrate animation effects.
- 3.11 Demonstrate creating an organization chart.
- 3.12 Identify the different slide views.

4.0 Building Worksheets & Charts in MS-Excel

- 4.1 Start EXCEL from the start
- 4.2 Identify the various parts of the window.
- 4.3 Identify the tabs and groups in ribbon layout
- 4.4 Identify and customizing the quick access toolbar
- 4.5 Identify the office button and commands of the drop down menu.
- 4.6 Practice loading of the existing worksheet or create a new worksheet.
- 4.7 Practice entering into the worksheet.
- 4.8 Practice formatting the cells.
- 4.9 Practice formatting the texts in the cells.
- 4.10 Practice changing the height and width of the cells.
- 4.11 Practice freezing the rows, columns.
- 4.12 Practice splitting the screens.
- 4.13 Enter formulas into the cells.
- 4.14 Enter formulas with built in functions.
- 4.15 Create a range name for the cells for group operations.
- 4.16 Create graph for the data in the worksheet.

5.0 Creating Database, Tables, Queries and Forms

- 5.1 Practice loading Ms Access from the start menu.
- 5.2 Create a database table using Database Wizard.
- 5.3 Enter data into the table.
- 5.4 Edit data in the table.

- 5.5 View data from the database.
- 5.6 Design a query.
- 5.7 View data using the query.
- 5.8 Demonstrate creating Forms.
- 5.9 View the database through Forms.
- 5.10 Practice navigating through the database through Forms.
- 5.11 Practice creating Custom Form using Forms Wizard.
- 5.12 Practice creating Reports using the Report Wizard.
- 5.13 Practice printing the tables, forms and reports.

EXERCISES

- 1. Create and save a document using MS WORD.
- 2. Format the Text document.
- 3. Change the page set-up and Insert Header/Footer.
- 4. Spell checking in the document.
- 5. Print the document.
- 6. Create main document and data file for mail merging.
- 7. Print the document with mail merging.
- 8. Create a table in the document.
- 9. Add row, column to a table.
- 10. Create and save a new presentation using MS Power Point.
- 11. Choose Auto Layout for a new slide.
- 12. Inserting text and pictures into a blank slide.
- 13. Inserting new slides into the presentation.
- 14. Applying slide transition effects.
- 15. Demonstrate a slide show.
- 16. Set animation to text and pictures in a slide.
- 17. Set the sounds, order and timing for animation.
- 18. Create and save a new work book in Excel
- 19. Operating Mouse to selecting tabs, groups, cells, group of cells
- 20. Entering Data into Worksheet
- 21. Editing of Worksheet
- 22. Formatting the text in the cells
- 23. Formatting the numbers in the cells.

24. Changing the height and width of cells.
25. Freezing Titles, splitting screen
26. Enter formulae for calculation in the cells.
27. Copying the formula over a range of cells.
28. Inserting built-in functions in to the cells.
29. Create graphs for the data using Chart Wizard.
30. Practice Data Forms in Excel.
31. Printing of worksheet
32. Creating Tables using wizard in Access
33. Creating Tables using Design View in Access.
34. Entering Data into tables
35. Viewing the data in table.
36. Creating a new query using wizard.
37. Creating a new query using design view.
38. Viewing the data using a Select Query.
39. Updating the data in table using Update Query.
40. Linking two Tables on Relational Aspect.
41. Create forms using Form Wizard.
42. Create reports using Report Wizard.
43. Printing the tables, forms and reports

Suggested Student Activities

1. Student visits Library to refer to Manual for the specifications
2. Student inspects the available equipment in the Lab to identify the components
3. Visit nearby Industry to familiarize with fabrication techniques
4. Analyze the connections in the UPS available in the Institution facility
5. Quiz , Group discussion, Surprise test

RECOMMENDED BOOKS:

1. Teach yourself Office 2007 for Windows – Coray Sandler, Tom Badgett, Jan Weingarten, BPB Publications.
2. The ABC s of MS Office 2007– Guy Hard-Davis, BPB Publications.
3. Working in MS Office - Ran Mansfield, Tata McGraw Hill Publications.

Student E-Learning reference

1. <https://www.tutorialspoint.com/word/index.htm>
2. <https://www.tutorialspoint.com/powerpoint/index.htm>

CO / PO MAPPING MATRIX

	COURSE OUTCOME	CL	Linked PO	Teaching Hrs
CO1	Creating and saving a document, Formatting of text in MS-WORD	R/U/A	1,2,3,4,7	5
CO2	Spell checking, Mail merging and Printing of Documents in MS-WORD	R/U/A	1,2,3,4,7	10
CO3	Creating and Saving a presentation, inserting text and pictures & Formatting the text and pictures and Slide transition and Animation effects in MS-POWER POINT	R/U	1,2,3,4,7	10
C04	Building Worksheet & Charts In Ms-Excel and Printing Of Worksheet	R/U/A	1,2,3,4,7	10
C05	Creating Database, Tables, Forms, Queries, Reports In Ms-Access	R/U/A	1,2,3,4,7	10

MODEL PAPER OF MID SEM- I EXAM

TIME: 1 hr

MARKS: 20

ANSWER ANY ONE QUESTION. EACH QUESTION CARRIES TWENTY MARKS.

20 x 1 = 20

1. Demonstrate Starting MS word and identify the word screen elements.
2. Draw and explain the groups and commands in Home tab under ribbon in Ms word.
3. Demonstrate text formatting in Ms word.
4. Demonstrate procedure for checking of spelling and grammar using dictionaries.
5. Demonstrate paragraph formatting in Ms word.
6. Draw and explain the groups and commands in page layout tab under ribbon in Ms word.
7. Demonstrate page formatting in Ms word.
8. Demonstrate procedure for creating Mail merging process in Ms word.
9. Demonstrate creating of table and adding rows and columns to the existing table in Ms word.
10. Demonstrate finding and replacing of text & searching for a bookmark.
11. Demonstrate starting of MS Power Point and identify the opening screen elements.
12. Draw and explain the groups and commands in Home tab under ribbon in MS Power Point.
13. Demonstrate different Auto Layouts of a Slide in MS Power Point.
14. Demonstrate Slide Transition effects in Ms Power Point.
15. Demonstrate different Animation effects in Ms Power Point.
16. Draw and explain the groups and commands in Animations tab under ribbon in MS Power Point.
17. Demonstrate different Slide views in MS Power Point.
18. Draw and explain the groups and commands in Review tab under ribbon in MS Power Point.
19. Demonstrate inserting and formatting of text and pictures in MS Power Point.

MODEL PAPER OF **MID SEM- II** EXAM

TIME: 1 hr

MARKS: 20

ANSWER ANY ONE QUESTION. EACH QUESTION CARRIES TWENTY MARKS. 20
x 1 = 20

1. Write procedure to open Excel window and Draw and label the parts in Excel window.
2. Draw and Write about groups and commands under Formulas tab under the ribbon in MS-Excel.
3. Write procedure to format the text in the cells.
4. Write procedure to enter formulas with built in functions.
5. Write procedure for creating chart in MS-excel.
6. Write Procedure for formatting numbers in MS-Excel.
7. Write procedure for writing criteria and extract the data.
8. Write procedure for printing of a worksheet.
9. Write procedure for formatting of chart in Ms-excel.
10. Write procedure to jump to different workbooks & import worksheet from different workbook.
11. Write procedure to create a database.
12. Write procedure to create a table using design view.
13. Write procedure to create form using forms wizard.
14. Write procedure for creating reports using report wizard.
15. Write procedure for creating a Custom Form.
16. Write the procedure to create custom reports.
17. Write the procedure to print active sheet.
18. Write the procedure for Printing of reports.
19. Draw and explain the groups and commands in create tab under ribbon in Ms access.
20. Write the procedure for creating Filter by form.

MODEL PAPER OF END SEMESTER EXAM

TIME: 2hr

MARKS : 40

ANSWER ANY ONE QUESTION. EACH QUESTION CARRIES TWENTY MARKS.

20 x 1 = 20

1. Write procedure for Creating and saving a document and draw and label the different parts of opening screen elements in Ms word.
2. Draw and explain the groups and commands in Home tab under ribbon in MS Power Point.
3. Write procedure for applying sounds, order, timing and effects of animation in a presentation.
4. Write procedure for character formatting in Ms word.
5. Draw and explain the groups and commands in Home tab under ribbon in Ms word.
6. Write procedure for creating main document and data file for mail merging.
7. Write procedure for page formatting in Ms word.
8. Write procedure for checking spelling and grammar using dictionary in Ms word.
9. Write procedure for printing of document in Ms word.
10. Draw and explain the groups and commands in Animations tab under ribbon in MS Power Point.
- . 11. Write procedure to open Excel window and Draw and label the parts in Excel window.
12. Draw and Write about groups and commands under Formulas tab under the ribbon in MS-Excel.
13. Write procedure to format the text in the cells.
14. Write procedure to enter formulas with built in functions.
15. Write procedure for creating chart in MS-excel.
16. Write Procedure for formatting numbers in MS-Excel.
17. Write procedure for writing criteria and extract the data.
18. Write procedure for printing of a worksheet.
19. Write procedure for formatting of chart in Ms-excel.

20. Write procedure to jump to different workbooks & import worksheet from different workbook.
21. Write procedure to create a database.
22. Write procedure to create a table using design view.
23. Write procedure to create form using forms wizard.
24. Write procedure for creating reports using report wizard.
25. Write procedure for creating a Custom Form.
26. Write the procedure to create custom reports.
27. Write the procedure to print active sheet.
28. Write the procedure for Printing of reports.
29. Draw and explain the groups and commands in create tab under ribbon in Ms access.
30. Write the procedure for creating Filter by form.

Record book :- 10 marks

Viva-voce:- 10 marks

ME-111-SKILL UPGRADATION

Course Title	Skill Upgradation	Course Code	ME-111
Semester	I	Course Group	Practical
Teaching Scheme in Periods (L:T:P)	0:0:8	Credits	2.5
Methodology	Lecture +Tutorial	Total Contact Periods	120

Basic English – Skills Upgradation

TASK:

LEVEL 1: Collection of material for learning skills

LEVEL2: Analysis of the material

LEVEL 3: Practice the activities

LEVEL 4: Assessment of the skills acquired

Activity before the activities:

Collect the material useful for learning Listening, Speaking, Reading, Writing (LSRW skills), Grammar and Vocabulary.

- 1. Collect newspaper clippings, books, puzzles, pictures, audio and video programmes in English.*
- 2. Talk to your classmates, seniors, alumni, teachers, successful people in job interviews and celebrities.*
- 3. Visit libraries to gather information.*
- 4. Visit useful websites for acquiring language learning skills.*

Activities:

1. Collect / Go through the different kinds of dictionaries and find out the differences.
 - a) List out the English words which are originated from Telugu, Hindi, Sanskrit and other Indian languages.
 - b) Prepare a list of technical words related to your branch.
 - c) Prepare the list of Homonyms, Homophones. Heteronyms, Heterophones and Capitonyms.
2. Collect the vocabulary building games and activities. Practice them individually, in pairs and groups.
3. Learn different kinds of reading a text. Practice various kinds of reading material.

4. Find out the differences between reading aloud and silent reading. Identify the advantages and disadvantages of speed reading.
5. Conduct a survey on the need for English. Talk to your classmates or seniors and find out the difficulties while learning English.
6. Practice dialogues on
 - a) Feelings
 - b) Likes & dislikes
 - c) Requests
 - d) Obligations(Dramatize the dialogues)
7. Introduce yourself through a line up activity or inner and outer circle activity.
8. Introduce tenses:
 - a) Write the diary using present tense.
 - b) Write an anecdote in past tense.
 - c) Prepare the weather forecast for the next week in future tense.
9. Observe the picture / photo and describe the persons, places and things using the describing words and prepositions.
10. Role play: Interview a celebrity using 'wh' and 'yes/no' questions.
11. Identify what is there in the bag using 'yes/no' questions.
12. Arrange the jumbled sentences in an order to make a meaningful paragraph.
13. Write a paragraph on your goals.
14. Write a letter to God / a celebrity.
15. Collect the letters written by great leaders, celebrities and officers.

Note: The above activities are indicative. The teacher may assign any other activity relevant to the skills introduced in the semester.

COURSE OUTCOMES

No.	At the end of the course, the students will have the ability to:
101.1	Use a dictionary and acquire vocabulary for social interaction.
101.2	Comprehend, identify main ideas, make inferences, visualize, and answer questions. Analyze and evaluate the written material.
101.3	Speak and write grammatically correct sentences, communicate effectively, express their likes, dislikes, feelings, make requests, express obligations and introduce themselves.
101.4	Use verbs in the different tenses according to the situations. Use Voice to express an action clearly
101.5	Describe people and objects, ask questions, use prepositions and write grammatically correct sentences.
101.6	Convey ideas in the form of paragraphs and letters

CO-PO Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	Mapping POs
101.1	-	-	-	-	3		3	5,7
101.2	-	-	-	-	3	2	3	5,6,7
101.3	-	-	-	-	3	3	3	5,6,7
101.4	-	-	-	-	2	2	3	5,6,7
101.5	-	-	-	-	2	2	3	5,6,7
101.6		-	--	--	2		3	5,7

Model Rubric:

Note: Separate rubric may be prepared according to the activity.

[illegible]

I SEMESTER

SKILL UPGRADATION IN - BASIC ENGINEERING MATHEMATICS

ACTIVITY ASSESSMENT Steps

1. Mathematical concepts
2. Procedure
3. Explanation
4. Working with others
5. Mathematical errors

ACTIVITIES

1. Prepare a presentation to explain Logarithms.
2. Prepare a list of articles purchased from a super market and arrange in a matrix form to Compute the total amount using matrix multiplication.
3. Prepare a presentation to resolve a Partial fraction into simpler fractions.
4. Prepare a presentation stating the applications of Trigonometry.
5. List the methods to solve system of equations using Matrices and Determinants. Describe their features.
6. Visit the library, refer books on Mathematics and collect the details related to 2 Mathematicians.
7. Prepare a presentation to solve a triangle ABC in different cases.

CO / PO - MAPPING OF ACTIVITIES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	1			1	2	2	3
CO2	3	2	2	1	1		1	2	2	3
CO3	3	2	2	1			1	2	2	3
CO4	3	2	2	1			1	2	2	3
CO5	3	2	2	1			1	2	2	3
CO6	3	2	2	1			1	2	2	3
CO7	3	2	2	1			1	2	2	3

Rubrics for Activity assessment

CATEGORY	4	3	2	1
Mathematical Concepts	Explanation shows complete understanding of the mathematical concepts used to solve the problem(s).	Explanation shows substantial understanding of the mathematical concepts used to solve the problem(s).	Explanation shows some understanding of the mathematical concepts needed to solve the problem(s).	Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written.
Procedures	Typically, uses an efficient and effective procedure to solve the problem(s).	Typically, uses an effective procedure to solve the problem(s).	Sometimes uses an effective procedure to solve problems, but does not do it consistently.	Rarely uses an effective procedure to solve problems.
Explanation	Explanation is detailed and clear.	Explanation is clear.	Explanation is a little difficult to understand, but includes critical components.	Explanation is difficult to understand and is missing several components OR was not included.
Working with Others	Student was an engaged partner, listening to suggestions of others and working cooperatively throughout lesson.	Student was an engaged partner but had trouble listening to others and/or working cooperatively.	Student cooperated with others, but needed prompting to stay on-task.	Student did not work effectively with others.
Mathematical Errors	90-100% of the steps and solutions have no mathematical errors.	Almost all (85-89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.

STUDENT ASSESSMENT by RUBRICS

[illegible]

SEMESTER – I

SKILL UPGRADATION – C21 BASIC PHYSICS

TASK

LEVEL 1: Concept, Ethical Data, Materials, Source (Library/internet/others)

LEVEL 2: Methodology/procedure

LEVEL 3: Analysis/experiment

LEVEL 4: Interpretation/inference/evaluation.

Bridge activity: - Visiting your college Library:

(A) Prepare a list of available reference books in Physics with details such as author, publisher, edition etc.

(B) Prepare a list of Physics/Science journals, magazines, monographs with details.

(C) Prepare a log book of your visits to college library with brief description.

Activities:-

1. Discover some physical equations and apply principle of homogeneity.
2. Visit your College Physics laboratory. Collect equal amounts (mass in gm) of water and mercury. Calculate the density of each in CGS units. Express them in SI system of units using dimensional analysis. Infer the result.
3. Identify the bodies which have rolling objects like wheels, ball bearings. Prepare a chart with drawings and explain the importance of rolling friction.
4. Identify the objects where you apply various methods of reducing friction. Make each method as a module to one individual. Integrate all modules and generate a chart with brief explanation by the use of drawings.
5. Take two vectors with varying angles of inclination. Find the resultant using triangle law of vector addition by drawing the vectors in each case on a graph paper. Draw the conclusions. Correlate the result using parallelogram law of vector addition.
6. Three forces F_1 , F_2 and F_3 are acting on a body with angles θ_1 , θ_2 , and θ_3 with the horizontal respectively. Calculate the resultant force acting on that body. Draw the diagram.
7. Survey the places where curved paths are banked. Take photographs and reconstruct on the chart. Prepare a report.
8. Verify Hooke's Law by performing experiment using weights, spring and ruler.
9. Explore the internet. Prepare a power point report on surface tension and wetting, viscosity.
10. Debate on Green house effect and global warming. Justify the advantage of green house effect. Prepare a video clip and power point report with diagrams.

11. Design a mini wind mill/solar cooker/biomass plant as an application of conversion of energy.
12. Construct a model thermometer having centigrade scale, Fahrenheit and absolute scale with the help of available simple objects. Formulate the method of development.

NOTE: The above activities are indicative. The teacher may assign any other activity relevant to the course based on resources available.

Course Outcomes (CO)		Linked Pos	Activity Hours
CO1	Apply principle of homogeneity	PO1, PO2	3
CO2	Convert unit from one system to other system using dimensions	PO1, PO2, PO3	3
CO3	Prepare a chart with drawings explaining the importance of friction	PO1, PO2, PO7	3
CO4	Prepare a chart on reducing friction	PO1, PO2, PO4, PO5, PO7	3
CO5	Triangle law of vector addition - graphical analysis – correlation with parallelogram law of vector addition	PO1, PO4,	3
CO6	Calculate resultant force by component method	PO1, PO2, PO4	3
CO7	Banking of roads – practical observations	PO1, PO2, PO5	3
CO8	Verify Hooke's law with simple materials	PO1, PO2, PO3, PO4	3
CO9	Power point report on surface tension and wetting, viscosity by exploring internet	PO1, PO2, PO7	3
CO10	Debate on Green house effect and global warming. Advantage of green house effect - justification. Prepare a video clip and power point report with diagrams.	PO5, PO6, PO7	3
CO11	Design a mini wind mill/solar cooker/biomass plant as an application of conversion of energy-working models.	PO5, PO6, PO7	3
CO12	Construct a model thermometer having centigrade scale and absolute scale. Formulate the development.	PO1, PO2, PO4	3

Rubrics for Task Assessments

General Scale for scoring student performance in Skill Upgradation

Type of Skill/Score	4	3	2	1
Data/Material Collection	All Data/Material was collected one time independently.	All Data/Material was collected more than one time independently.	All Data/Material was collected several times independently.	All Data/Material was collected several times with assistance.
Methodology/ Procedure	Procedures were outlined in a step-by-step fashion that could be followed by anyone without additional explanations.	Procedures were outlined in a step-by-step fashion that could be followed by anyone without additional explanations. Expert help was needed to accomplish this.	Procedures were outlined in a step-by-step fashion, but had 1 or 2 gaps that require explanation even after expert feedback.	Procedures that were outlined were incomplete or not sequential, even after Expert feedback had been given.
Activity/ Development	Quality of Skill is high.	Skill is mastered to the level of expectation.	Skill is present but with errors and omissions.	Skill needs improvement.
Interpretation/ summary	Student provided a detailed conclusion clearly.	Student provided a somewhat detailed conclusion clearly.	Student provided a conclusion with some reference.	No conclusion was apparent.

NOTE: The above types of skills are indicative. The teacher may change the skills depending on type of activity.

STUDENT ASSESSMENT (RUBRICS)

[illegible]

SC-104 - GENERAL ENGINEERING CHEMISTRY

Suggested Skill Upgradation Activities

Activity Assessment Steps:

Level-1: Concept, Data collection and summarization, Material etc

Level-2: Prepare Chart, explain the process, perform the experiment etc, and prepare a report etc

Level-3: Oral or power point presentation of the activity.

Level-4: Submission of report.

Activity – 1

Prepare a chart or model of different types of orbitals and electronic configuration.

Activity – 2

Prepare the models/ charts on ionic and covalent bonding.

Activity – 3

Prepare and study the physical properties of True Solution, Colloidal Solution, and Suspension.

Activity – 4

Study of the acidic, basic or neutral nature of water sample collected from various sources.

Activity – 5

Compare the renewable and non-renewable energy sources.

Activity – 6

Study and analysis of ecosystem (lake, pond etc) existing in your surroundings.

Activity – 7

Study of bio diversity in your surroundings.

Activity – 8

Study and report the importance of forest resources.

Activity – 9

Study and report the importance of osmosis and reverse osmosis.

Activity – 10

Explain the method of purification of drinking water adopted at your residence.

Activity – 11

Preparation of the models/ charts on the softening of water by different methods and comparison.

Activity – 12

Study of electrolytes and non-electrolytes

Note: Any other skill upgradation activity related to the course may be taken up.

Mapping of POs to Skill Upgradation Activities

S.No	Name of the activity	Linked POs
1	Prepare a chart or model of different types of orbitals and electronic configuration.	1, 6,7
2	Prepare the models/ charts on ionic and covalent bonding.	1, 6,7
3	Prepare and study of physical properties of True Solution, Colloidal Solution, and Suspension.	1,4, 6,7
4	Study of the acidic, basic or neutral nature of water sample collected from various sources.	1,4, 6,7
5	Compare the renewable and non renewable energy sources.	1, 5, 6,7
6	Study and analyze the ecosystem (lake, pond etc) existing in your surroundings	1, 5, 6,7
7	Study of bio diversity in your surroundings	1, 5, 6,7
8	Study and report the importance of forests resources.	1,5, 6,7
9	Study and report the importance of osmosis and reverse osmosis.	1, 6,7
10	Explain the method of purification of drinking water adopted at your residence.	1, 6,7
11	Preparation of the models/ charts on the softening of water by different methods and comparison.	1, 6,7
12	Study of electrolytes and non-electrolytes	1, 6,7

Method of evaluation of the student activities (Rubrics)**Model Rubrics**

S. No	Sub activity	Performance Level (Score)			
		Excellent (4)	Good (3)	Satisfactory (2)	Need improvement (1)
1	Level-1 (Data and Material collection)	All materials and data required for the activity were accurately prepared based on the data collected independently	Almost all materials and data required for the activity were accurately prepared based on the data collected independently	The materials and data required for the activity were accurately prepared based on the data collected with the help of teacher.	The materials and data required for the activity were inaccurately prepared .
2	Level-2 (Chart, Model, Experiment or Study)	Procedures were outlined in a step-by-step fashion that could be followed by anyone & performed the activity effectively.	Procedures were outlined in a step-by-step fashion, require explanation & performed the activity effectively.	Procedures that outlined were complete with 1 or 2 gaps and require explanation & performed the activity normally	Procedures that outlined were not sequential, & performed the activity in a poor way
3	Level-3 (Oral or Power point presentation)	Presented/ explained the information about the activity in logical, interesting sequence with attractive visuals or diagrams.	Presented/ explained the information about the activity in logical sequence with visuals or diagrams.	Presented/ explained the information about the activity in logical sequence with less visuals or diagrams.	Presented/ explained the information about the activity without sequence and visuals or diagrams.
4	Level-4 (Submission of Report)	Provided a detailed conclusion/ summary clearly based on the data and activity	Provided a conclusion / summary clearly based on the data and activity	Provided a conclusion/ summary less effectively	Conclusions /summary was not relevant.

Note: The above rubrics are indicative. Separate rubrics may be prepared according to the activity. Minimum passing score is 2.5.

Basic Manufacturing Technology Model Rubric

Suggested Student Activities:

1. Visit to library to refer to manual of ASME, IET,
2. Inspect the available equipment in the laboratories to identify the components
3. Visit nearby industry to familiarize with fabrication techniques, advanced manufacturing processes and maintenance of machines
4. Know the basic manufacturing processes of olden days and compare with the modern ones
5. Group discussion on various topics of the subject.
6. Prepare a list of basic tools used at home.
7. Utilize various e-learning sources available to the student to upgrade themselves

Note: Any other skill upgradation activity related to the course may be taken up.

C21_ Curriculum

DIPLOMA IN MECHANICAL ENGINEERING



OFFERED BY

STATE BOARD OF TECHNICAL EDUCATION & TRAINING,

TELANGANA: HYDERABAD

II SEMESTER

	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			Instruction periods per week			Total Periods per semester	Credits	Continuous internal Evaluation(CIE)			Semester end examination (SEE)		Total Marks	Min marks for passing including CIE
			L	T	P			Mid Sem1	Mid Sem 2	Internal Evaluation	Max marks	Min marks		
1	HU-201	Advanced English	4	1	0	75	3	20	20	20	40	14	100	35
2	SC-202	Engineering Mathematics	4	1	0	75	3	20	20	20	40	14	100	35
3	SC-203	Applied Physics	4	1	0	75	3	20	20	20	40	14	100	35
4	SC-204	Engineering Chemistry & Environmental Studies	4	1	0	75	3	20	20	20	40	14	100	35
5	CS-205	Programming In C	4	1	0	75	3	20	20	20	40	14	100	35
6	ME-206	Advanced Engineering Drawing	1	0	2	45	1.5	20	20	20	40	20	100	50
7	ME-207	Advanced AutoCAD Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
8	ME-208	Advanced Workshop Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
9	SC-209	Applied Science Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
10	CS-210	Programming In C Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
11	ME-211	Skill Upgradation	0	0	8	120	2.5	0	0	Rubrics			--	-
	Activities: student performance is to be assessed through Rubrics													

HU-201_Advanced English

Course Title	Advanced English	Course Code	HU-201
Semester	II	Course Group	Foundation
Teaching Scheme in Minutes (L:T)	4:1:0	Credits	3
Methodology	Communicative Language Teaching + Assignments	Total Contact Hours	75
CIE	60 Marks	SEE	40 Marks

Prerequisites: Basic knowledge of English Language and Listening, Speaking, Reading and Writing skills.

COURSE CONTENTS

MODULE 1: VOCABULARY

Periods: 12 (L-9 T-3)

1. How to Learn a New Word
 - a) Spelling, pronunciation, syllabification, word class, inflections and the other forms of the word,
 - b) Meanings, usage, derivatives, idiomatic expressions, context for using the word and compound words.
 - c) Phrasal verbs, etymology, word families, collocations.
2. Synonyms, Antonyms and One Word Substitutes
3. Prefixes, Suffixes and Roots

MODULE 2: READING

Periods: 12 (L-8 T-4)

Unit 1:

Innovation, Science and Technology: Process, Cause and Effect, Problem Solution, Evaluation of ideas, reasons and conclusion. (Focus on One-word Substitutes / Scientific terms/ Analyses/ Application/ meanings/ synonyms)

Unit 2:

Descriptive: Biography, Travel Writing, Nature Writing and Journal (Focus on Analysis/ Vocabulary/ Noun / Verbs/ Adjectives / Chronological order).

Unit 3:

Reading for Pleasure: Story / Fable / Drama (Focus on factual, main idea, sequencing, inferring, morals and values).

NOTE: Each reading unit should contain the following word limit.

- a) Paragraph should contain minimum 50 words for answering one mark question.

- b) Paragraph should contain minimum 100 words for answering three one-mark questions.
- c) Paragraph should contain minimum 150 words for answering five one-mark questions.

MODULE 3: SPEAKING

Periods: 12 (L-8 T-4)

1. Fixing, Cancelling and Rescheduling the Appointments.
(Focus on using expressions to fix, cancel and reschedule an appointment)
2. Extending, Accepting and Declining Invitations.
(Focus on using expressions in conversations)
3. Giving Instructions.
4. Asking for and Giving Directions.
5. Describing Objects.
 - a) Use adjectives (Size, shape, colour, weight/ quantity, feel or touch, material, taste, state, purpose/uses)
6. Talking about the Past.
 - a) Events, Incidents and Situations using past tense and passive voice.
7. Offering Help, Opinions and Suggestions.

MODULE 4: WRITING-I

Periods: 13 (L- 8 T-5)

1. Mechanics of Writing
 - a) Spelling, punctuation, capitalization and special symbols.
 - b) Fonts type, font size, bold, italics, underline, superscript, subscript, alignment, margins.
2. Data Interpretation -I
 - a) Understand the information and analyze the flow charts and stating the main idea.
 - b) Describe the process (events or chronological order) interpret flow chart.
 - c) Use connectives and sequence markers, writing a meaningful paragraph.
3. Data Interpretation -II
 - a) Understand the information in a tree diagram and analyze the data.
 - b) State the main idea and describe the process from key word.
 - c) Explain one branch completely and move to the branches down words and write horizontal direction.
 - d) Use linkers and sequence markers.
4. Data Interpretation –III
 - a) Understand the data given in a table and pie charts.
 - b) Analyze and state the main idea of the table and pie charts.
 - c) Identify the similarities, differences and mention figures.
 - d) Use linkers.

MODULE 5: GRAMMAR

Periods: 14 (L-9 T-5)

- a. Reported Speech.
- b. Conversion from Direct to Indirect speech but not vice versa.
- c. Error Analysis on nouns, pronouns and verbs.

- d. Error Analysis on articles, adjectives, adverbs, nouns, Prepositions, Spellings, Concord and Connectives.
- e. Error Analysis on Questions, Vocabulary, Homophones and other kinds of errors.

MODULE6: WRITING-II

Periods: 12 (L-8 T-4)

1. Writing a Resume
 - a) Different formats of a resume.
 - b) Analyze strengths and weaknesses.
2. Writing a Cover Letter
 - a) Importance of cover letter.
 - b) Format of cover letter.
 - c) Write a Cover letter as per given direction.
3. Note Making
 - a) Understand the Benefits of Note-Making.
 - b) Cue Method.
 - c) Mind – Mapping or Pattern Note-Making.
 - d) Cornell Method.
 - e) Exercises should be given on how to make notes to practice in the classroom.
4. Writing a Report
 - a) Understand the concept of report writing and formats of various reports.
 - b) Report on an incident.
 - c) Technical reports.
 - d) Report on an industrial visit.
 - e) General reports.
 - f) Report on events.
 - g) Revising and editing reports (features of good report writing).
5. Writing an Email
 - a) Structure of personal e-mail.
 - b) Composition and structure of professional e-mail (subject line, greetings, e-mail text, closing).
 - c) Proof reading email.
 - d) Strategies to write Email text.
 - e) Do's and don'ts of e-mail writing.

COURSE OUTCOMES

CO NO	At the end of the course the students will have the ability to
201.1	Learn vocabulary and use them in professional and social interactions.
201.2	Comprehend the main idea and minute details related to engineering courses.
201.3	Communicate effectively in English in terms of basic sciences, mathematics and engineering fundamentals.
201.4	Learn English grammar to speak and write flawlessly so as to interpret the data.
201.5	Learn the mechanics of writing to make the technical writing practical and meaningful.
201.6	Make notes, write resumes, prepare cover letters, write technical emails and draft reports.

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
201.1	-	-	-	-	3		3	5,7
201.2	-	-	-	-	3	2	3	5,6,7
201.3	-	-	-	-	3	3	3	5,6,7
201.4	-	-	-	-	2	2	3	5,6,7
201.5	-	-	-	-	2	2	3	5,6,7
201.6		-	--	--	2		3	5,7

Test	Units	Marks	Pattern
Mid Sem- I	1. Vocabulary 2. Reading	20	Part A: 4 short answer questions Part B: 2 short essay questions with internal choice Part C: 2 essay questions with internal choice
Mid Sem - II	1. Speaking 2. Writing-1	20	Part A: 4 short answer questions Part B: 2 short essay questions with internal choice Part C: 2 essay questions with internal choice
Slip Test 1	1. Vocabulary 2. Reading	5	2 questions out of 3 questions
Slip Test 2	1. Speaking 2. Writing-1	5	2 questions out of 3 questions
Assignment	One assignment per one semester	5	Different group assignments of higher order questions that develop problem solving skills and critical thinking should be given
Seminars	One seminar per one semester	5	Oral presentations using audio –visual equipment, charts, etc.
	Total	60	

MID SEM - I EXAM					
S. No.	Unit Name	R	U	A	Remarks
1	Unit - I	1, 2	5 (a) 5 (b)	7 (a) 7 (b)	
2	Unit - II	3, 4	6 (a) 6 (b)	8 (a) 8 (b)	
Total Questions		4	4	4	
MID SEM - II EXAM					
S. No.	Unit Name	R	U	A	Remarks
1	Unit - I	1, 2	5 (a) 5 (b)	7 (a) 7 (b)	
2	Unit - II	3, 4	6 (a) 6 (b)	8 (a) 8 (b)	
Total Questions		4	4	4	

SEMESTER END EXAM							
Sl. NO.	Unit No.	Question to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9 (a)	13 (a)	
2	II						
3	III		2		10 (a)	14 (a)	
4	IV						
5	V		3	5, 6	9 (b)	13 (b)	
					11 (a)	15 (a)	
					11 (b)	15 (b)	
6	VI			7, 8	10 (b)	14 (b)	
					12 (a)	16 (a)	
					12 (b)	16 (b)	
Total Questions		8		8	8		

Legend:

Remembering: one mark

Understanding: three marks

Application: five marks

Suggested Learning Outcomes:

On completion of the course the students will be able to:

- Enhance their vocabulary.
- Learn synonyms, antonyms and use one-word substitutes.
- Read and understand main ideas and answer the questions.
- Communicate effectively in various situations.
- Fix, cancel and reschedule appointments.
- Extend, accept and decline invitations.
- Give instructions and directions.
- Describe objects.
- Talk about past incidents/experiences.
- Offer help, opinions and suggestions.
- Write in reported speech.
- Identify and correct common errors.
- Interpret data and write a paragraph.
- Learn to prepare cover letter and resume.
- Make notes, write reports and write emails.
- Confidently take diploma based competitive exams in terms of General English.

Suggested Student Activities:

- Practice conversation / dialogue / speech and answer the questions.
- Group Discussions.
- Seminars.
- Review a movie.
- Review a book.
- Narrating a story.
- Chain stories.
- JAM.
- Speak about incidents /events /memories /dreams /role model.
- Interview with famous personalities.
- Reading for main ideas and specific details.
- Summarizing.
- Picture description.
- Writing a recipe.
- Describing a process.
- Giving directions using maps.
- Surveys.
- Filling forms.
- e-mail etiquette.
- Preparing reports on field visits, experiments, projects.
- General English for competitive exams – Practice the previous year's question papers of SSC, RRB, TS TRANSCO, TSGENCO, etc.

REFERENCES:

1. Practical English Grammar by A.J Thomson and A.V. Martinet
2. A Course in Phonetics and Spoken English by J. Sethi and P.V Dhamija

3. Word Power Made Easy by Norman Lewis.
4. Keep Talking by Friederike Klippel.
5. More Grammar Games by Mario Rinvoluceri and Paul Davis.
6. Essential English Grammar by Raymond Murphy.
7. Spoken English-A Self Learning Guide to Conversation Practice by V Sasi Kumar.

E-learning resources:

1. www.duolingo.com
2. www.bbc.co.uk
3. www.babbel.com
4. www.merriam-webster.com
5. www.ello.org
6. www.lang-8.com
7. youtube.com
8. Hello English (app)
9. mooc.org
10. <https://onlinecourses.nptel.ac.in>
11. <https://www.indeed.com/career-advice/>
12. Dictionary.com
13. Online Dictionaries
14. <https://englishsentences.com>
15. <https://englishcub.com/vocabulary/dictionary-thesaurus.htm>
16. TEDx talks.
17. Toastmasters International on YouTube.

BOARD DIPLOMA EXAMINATION (C-21)
II SEMESTER – MID EXAMINATION - I
HU-201 - ADVANCED ENGLISH

Time: 1 Hour

Total Marks: 20 Marks

PART-A

4 X 1 = 4

Instructions: Answer all questions. Each question carries **one** mark.

1. Write the other forms of the word for the following words.
 - a) Impress
 - b) Create
2. Write two examples of the root word “Tele” which means “far”.
3. Read the following paragraph and answer the question that follows.

Each one of us must realize that the only future for India and her people is one of tolerance and co-operation which has been the basis of our culture from ages past. We have laid down in our constitution that India is secular state. This does not mean we are irreligious. It means equal respect for all faiths and equal opportunities for those profess faith.

- a) What is the basis of our culture?
4. Read the following paragraph and answer the question that follows.

The sun rises and sets at different times in different places. As the earth rotates from west to east, places in the east see the sun earlier than those in the west. If the earth were flat, the whole world would have sunrise and sunset at the same time. But we know this is not so.

- a) Why the places in the east see the sunrise earlier than the places in the west?

PART-B

2 X 3 = 6

Instructions: Answer the following questions. Each question carries **three** marks.

5. i) Use the following idioms in your own sentences.
 - a. once in a blue moon
 - b. beyond wildest dreams
 - c. turn a deaf ear

(OR)

- ii) Form antonyms for the given words using prefixes.

- a) Loyal
 - b) Legal
 - c) necessary

6. i) Read the following paragraph and answer the questions that follow.

Punctuality helps us to plan our work in advance and also enables us to do a lot of work. On the other hand, if we are unpunctual or the others are not punctual, everything gets upset and we are not able to do much of a work in a day. Our mood is upset. When others are unpunctual, we curse them and vice versa. If we are punctual, we make things smooth for ourselves and others and so we earn the appreciation and respect of others. So, punctuality is a quality that should be cultivated by every Indian. The derisive expression “Indian Punctuality” should go, once and for all, from usage.

- a) How does punctuality help us?
 - b) Write the antonym of the word ‘curse’.
 - c) When do we earn the appreciation and respect of others?

(Or)

ii) Read the following passage and answer the questions that follow.

Incredible innovations in robotics are taking place in Japan, in attempt to make the lives of the aged more comfortable. One company is developing a bed that transforms into a wheelchair. The bed splits in half, with one half folding into a chair and removing the need to lift someone out of the bed and into a wheelchair. Another company has developed Robear, a high-tech robot which uses 'paws' to help elderly people to get up or lift them out of bed into a wheelchair. These robots are prohibitively expensive at present, but the costs are expected to decrease over the years.

- a) What is the synonym of the word incredible?
- b) How does Robear help elderly people?
- c) What is the antonym of the word expensive?

PART-C

2x5 = 10

Instructions: Answer the following questions. Each question carries **five** marks.

7. i) Write five things you learn from a word with suitable examples.

(OR)

ii) Write one- word substitutes of the following definitions.

- a. A study of some one's life written by another person.
- b. People who work in the same organization or office.
- c. Confinement to one place to prevent the spread of infection.
- d. One who looks at bright side of things.
- e. A person who fits and repairs water pipes.

8. i) Read the following passage and answer the questions that follow.

Stephen Hawking was born in Oxford on 8th Jan 1942. He joined the University College, Oxford where he studied Physics, as a subject of his first choice, Mathematics was unavailable. He pursued his Ph.D., despite being diagnosed with amyotrophic lateral sclerosis (ALS), a rapid progressive disease that cripples all nerves and muscles, in 1985, he became ill with pneumonia and since then he was required 24-hour nursing care. Through his incredible determination and with the help of his family and associates, he continued to pursue research, write books, give lectures, travel widely and inspired millions of persons. His research on black holes, and his books like "A brief History of Time", "Black Holes", "Baby Universe ", bear testimony to the fact that he is a unique person with extraordinary mind.

- a. What did Stephen Hawking study in Oxford?
- b. What did Hawking want to study actually?
- c. Name the disease Hawking was diagnosed with when he was just a student.
- d. What happened because of his illness in 1985?
- e. Name two of Hawking's books and the area of his research.

Or

ii) Read the following passage and answer the questions that follow.

Nelson Mandela was born on 18th July 1918 in South Africa. He had thirteen siblings by the same father but different mothers. His father died when he was nine. He was the first member of his family who was sent to school. In 1941 he was expelled from university because he led a group of students on a political strike.

Mandela was sent to prison for life in 1962 for protesting the poverty, in equality and racism against black people in South Africa during apartheid. The apartheid was when people were divided by their race and forced to live separately. Black people could not do the same things as white people, such as going to certain places or voting. Mandela stayed in Prison for 27 years of his life

until 1990, when there was greater political freedom in South Africa, and he was set free. He received the Noble Peace Prize in 1993 and in 1994 he was elected as the first black South African president. He lived a simple life, donated lots of money to charity. He retired from public life in 2004. He passed away on 5th December 2013. He will be remembered as a man who encouraged people to live more loving lives and who took a stand against injustice.

- a. Why was Nelson Mandela expelled from university?
- b. Why was he sent to prison for life?
- c. How many years did he stay in the prison?
- d. How is he remembered by the people?
- e. Select the word from the passage that gives the meaning “a person’s brothers or sisters”.

BOARD DIPLOMA EXAMINATION (C-21)
II SEMESTER – MID EXAMINATION - II
HU-201- ADVANCED ENGLISH

Time: 1 Hour

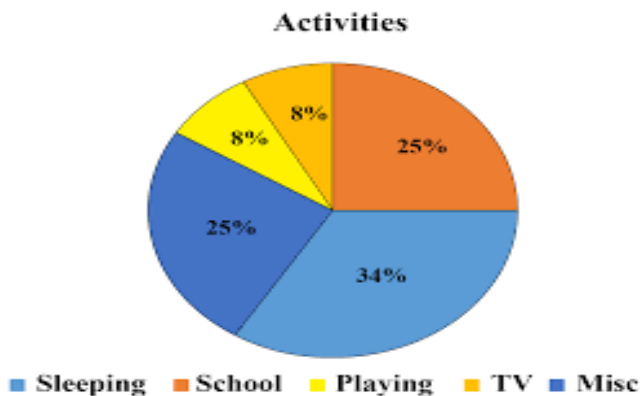
Total Marks: 20 Marks

PART-A

4 X 1=4

Instructions: Answer all questions. Each question carries **one** mark.

1. How do you fix an appointment with a doctor on phone? Write in a sentence.
2. How do you invite your friend to your sister's marriage? Write in a sentence.
3. Write a short paragraph based on the pie chart given below.



4. Rewrite the following sentence using appropriate punctuation marks and capital letters.
(i) he said to rohit did you buy english textbook

PART-B

2X3=6

Instructions: Answer the following questions. Each question carries **three** marks.

5. a) Write a short paragraph on a memorable incident or event of your school days.

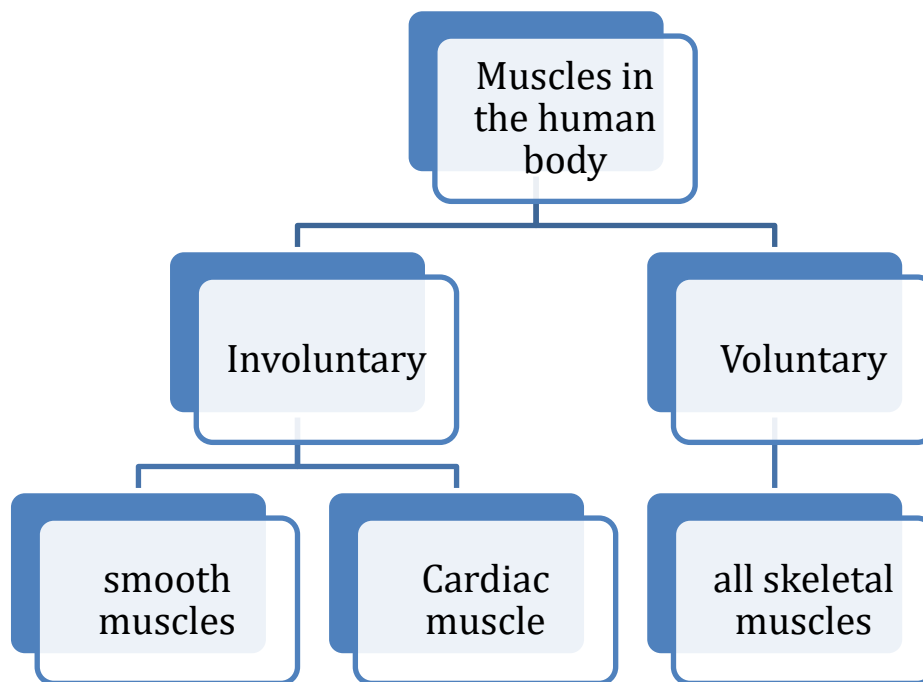
(OR)

b) Describe desk top computer using appropriate words.

6. a) Rewrite the following sentences using appropriate punctuation marks and capital letters.
(ii) this is my cousins phone.
(iii) i have an xmas tree.
(iv) Do you believe in god.

(OR)

b) Write a short paragraph on the following tree diagram.



PART-C

2x5 = 10

Instructions: Answer the following questions. Each question carries **five** marks.

7. a) Write instructions for opening an account in a bank.

(OR)

b) Give suggestions to your brother on how to improve English communication skills.

8. a) Write a paragraph using the information in the following table.

Human Teeth

Incisors	Canine	Premolars	Molars
Cut and bite food	Hold and tear food	Crush and grind food	Grind food

(OR)

b) Draw a flow chart of sending an e-mail and write a paragraph on it.

BOARD DIPLOMA EXAMINATION (C-21)
II SEMESTER - SEMESTER END EXAMINATION
HU-201- ADVANCED ENGLISH

Time: 2 Hours

Total Marks: 40 Marks

PART-A

8 X 1 = 8

Instructions: Answer all questions. Each question carries **one** mark.

1. Write one- word substitutes of the following definition
 - a) Great lover of books.
 - b) Something cannot be read.
2. You saw that your friend was suffering from fever and unable to go to hospital. (Offer help)
3. Subha said, "I can sing songs". (Change it into indirect speech)
4. Write the correct spelling of the following words.
 - a) Enthuciastic
 - b) Challenje
5. Correct the following sentences.
 - a) I bought seven goldfishes.
 - b) Ramana prefers coffee than tea.
6. Correct the following sentences.
 - a) When did she visit her grandmother?
 - b) It is very hot.
7. What will you write under skills/tools section in your resume?
8. What do you write under closing section in a professional email?

PART-B

4x3 = 12

Instructions: Answer the following questions. Each question carries **three** marks.

9. a) Explain the following features of any word and give one example to each feature.
 - (i) Meanings
 - (ii) Inflections
 - (iii) Compound words

(OR)

- b) Correct the following sentences.
 - (i) Pavani is a cleverest girl in our institute.
 - (ii) Latha has bought books three days ago.
 - (iii) He works hardly.

10. a) Describe your smart phone using six describing words.

(OR)

- b) Write your strengths and limitations.

11. a) Change the following sentences into indirect speech.

- (i) Vimala said, "the sun rises in the East".
- (ii) Robert said to Ajay, "When will you pay the examination fee?"
- (iii) Hari said, "I have seen Charminar".

(OR)

- b) Correct the following sentences.

- (i) We discuss about tenses.

- (ii) He is awaiting for the orders.
- (iii) Mount Everest is the most highest peak in the world.

12. a) Read the following paragraph and make notes using Cue Method.

We all knew that “we are what we eat”. So, a healthy diet may improve optimal health. In nutrition, diet is the sum of food consumed by a person or other organism. The word diet often implies the use of specific intake of nutrition for health or weight-management reasons. Complete nutrition requires ingestion and absorption of vitamins, minerals, essential amino acids from protein and essential fatty acids from fat-containing food, also for energy in the form of carbohydrate, protein and fat. Dietary habits and choices play a significant role in the quality of life, health and longevity. Many surveys recommend that people maintain a normal weight by limiting consumption of energy-dense foods and sugary drinks, eating plant-based food, red meat and alcohol intake. A particular diet may be chosen to promote weight loss or weight gain. If a person is overweight or obese, changing to a diet and lifestyle that allows them to burn more calories than they consume may improve their overall health by preventing diseases.

(OR)

- b) Write an e-mail to your friend requesting him or her to help you in completing your project work.

Part-C

5 X 4 = 20M

Instructions: Answer the following questions. Each question carries **five** marks.

13. a) Read the following paragraph and answer the questions that follow.

Florence Nightingale rendered a unique service when the call came to her from the government to help the wounded and the suffering in the hospital at Scutari during the Crimean War. The conditions in the hospital were horrible. There was dust, indifference and inefficiency. There was hospitality to a woman who was assuming such a great public responsibility. It was an insult to the vanity of men. They raised all possible obstacles in the way. But she was an autocrat. She bore down and swept away all opposition.

The hospital became an ideal place and the wounded soldiers worshipped her like an angel. The ‘lady with the lamp’, as the soldiers lovingly called her, became a national heroine. The nation showed its gratitude to her by raising a huge sum for her benefit, but Florence showed herself to be greater by contributing that sum for the setting up of an institution for the training of nurses. Her ambition was not merely to build a profession of nurses but an entire nation of nurses. And she succeeded admirably in her mission.

Questions:

- (i) Why did government call Florence Nightingale?
- (ii) How were the conditions in the hospital?
- (iii) What was her ambition?
- (iv) Write the synonym of the word ‘unique’.
- (v) Write one word substitute for the following definition:
A ruler who has absolute power.

(OR)

b) Correct the following sentences:

- (i) The book is belonging to him.

- (ii) The price of gold is more expensive than silver.
- (iii) When you are coming?
- (iv) Kamala sat besides Vinaya.
- (v) I requested the clerk to refund back my deposit.

14. a) Read the table and write a paragraph based on the details.

Year	Female Literacy	Male Literacy	Literacy rate
1961	15.35%	40.45%	28.30%
1971	21.97%	45.96%	34.45%
1981	29.76%	56.38%	43.57%
1991	39.29%	63.13%	52.21%
2001	54.67%	75.26%	64.84%
2011	65.46%	82.14%	74.04%

(OR)

(b) Write a resume to apply for the post of Sub-Engineer in TSGENCO.

15. a) Change the following into indirect speech.

- (i) Ganesh says, "I am coming".
- (ii) Madhu said to Sahasra, "I prefer Science fiction".
- (iii) Hari said, " I shall learn English language".
- (iv) Ravi said to Srikara, "Why did you go to Hyderabad yesterday?"
- (v) Hanuma said to Bhoomika, "Are you a teacher?"

(OR)

b) Read the following paragraph and make necessary corrections.

Myself is Abhay. My age is 16 years old. Every day I am getting up in the morning at 6.00 a.m. I am eaten breakfast at 7:30 a.m. I go to Polytechnic by walk. Umesh is my cousin brother. Umesh and me play cricket in the evening. We both drinks coffee at 6:30 p. m. He taught physics every day at 7:00p.m. I see television for an hour in the night.

16. a) Write a cover letter to the Managing Director, Nagarjuna Cements, Karimnagar, applying for the post of Assistant Executive Engineer.

(OR)

b) Write a report to your Head of the section on an industry you visited

SC-202 - ENGINEERING MATHEMATICS

Course Title	Engineering Mathematics	Course Code	SC-202
SEMESTER	II	Course Group	Foundation
Teaching Scheme in periods (L : T : P)	4:1: 0	Credits	3 Credits
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites:

This course requires the basic knowledge of Algebra, Trigonometry in Mathematics at Secondary school level and Basic Engineering Mathematics at Diploma 1st Semester level

Course Outcomes: COs

At the end of the course, the student will have the ability to:

CO 1	Formulate the equations of Straight Line, Circle and Conic Sections
CO 2	Evaluate the Limits of different Functions
CO 3	Determine the Derivatives of Various Functions
CO 4	Find the Successive Derivatives and Partial Derivatives of Functions
CO 5	Use Differentiation in Geometrical Applications
CO 6	Use Differentiation in real life applications and for finding Maxima and Minima.

Course Contents:

Co-ordinate geometry

Unit – I

Duration: 12Periods (L: 9– T: 3)

- Straight lines:** Write the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form - Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines - perpendicular distance from a point to a line - Solve simple problems on the above forms
- Circle:** Define locus of a point, circle and its equation. Find equation of the Circle given (i) Centre and radius, (ii) two ends of a diameter (iii) Centre and a point on the circumference (iv) three non collinear points and (v) Centre and tangent equation - general equation of a circle - finding Centre, radius - tangent, normal to circle at a point on it - simple problems.

Unit – II

Duration: 10Periods (L: 8 – T:2)

- Conic Sections:** Define a conic section, focus, directrix, eccentricity, axes and latus rectum – Find equation of a conic when focus, directrix and eccentricity are given. Properties of parabola, ellipse and hyperbola - standard forms with Vertex (Centre) at the Origin and Axis (Axes) along Co – Ordinate Axes only – Simple Problems.

Differential Calculus

Unit-III

Duration: 14Periods (L: 12– T:2)

1. **Functions & Limits :** Concept of Limit- Definition- Properties of Limits and Standard Limits

(without proof) $-\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}, \lim_{x \rightarrow 0} \frac{\sin x}{x}, \lim_{x \rightarrow 0} \frac{\tan x}{x}, \lim_{x \rightarrow 0} \frac{a^x - 1}{x}, \lim_{x \rightarrow 0} \frac{e^x - 1}{x}, \lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}},$
 $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$ - Simple Problems. Evaluate the limits of the type $\lim_{x \rightarrow l} \frac{ax^2 + bx + c}{\alpha x^2 + \beta x + \gamma}$ and
 $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)}$

2. **Differentiation – I: Concept** of derivative - definition from first principle as

$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ - different notations - derivatives of elementary functions like $x^n, a^x, e^x,$

$\log x, \sin x, \cos x, \tan x, \sec x, \operatorname{cosec} x$ and $\cot x$. Derivatives of sum, product, quotient, scalar multiplication of functions - problems. Derivative of function of a function (Chain rule) with illustrative examples such as

$$(i) \sqrt{t^2 + \frac{2}{t}} \quad (ii) x^2 \sin 2x \quad (iii) \frac{x}{\sqrt{x^2 + 1}} \quad (iv) \log(\sin(\cos x)).$$

Unit – IV

Duration: 10Periods (L: 8 – T: 2)

1. **Differentiation – II:** Derivatives of inverse trigonometric functions, derivative of a function with respect to another function, derivative of parametric functions, derivative of hyperbolic, implicit functions, logarithmic differentiation – problems in each case. Higher order derivatives - examples – functions of several variables – partial differentiation, Euler's theorem-simple problems.

Applications of Derivatives:

Unit – V

Duration: 14Periods (L: 11– T:3)

1. **Geometrical Applications:** Geometrical meaning of the derivative, equations of Tangent and normal to a curve at any point on the curve. Lengths of tangent, normal, sub tangent and subnormal to the curve at any point on it. Angle between two intersecting curves - problems.

Unit – VI

Duration: 15Periods (L:12– T:3)

1. **Physical Applications:** Physical applications of the derivative – Explain the derivative as a rate of change in distance-time relations to find the velocity and acceleration of a moving particle with examples. Explain the derivative as a rate measure in the problems where the quantities like volumes, areas vary with respect to time- illustrative examples– Simple Problems.

2. **Maxima & Minima:** Applications of the derivative to find the extreme values – Increasing and decreasing functions, finding the maxima and minima of simple functions - problems leading to applications of maxima and minima.

References

1. Co - Ordinate Geometry – by S.L. Loney
2. Thomas Calculus, Pearson Addison – Wesley Publications
3. Calculus – I By Shanti Narayan and Manicavachagam Pillai, S.V Publications.
4. NCERT Mathematics Text Books of Class XI, XII.
5. Intermediate Mathematics Text Books (Telugu Academy)

Suggested E-Learning references

1. www.freebookcentre.net/mathematics/introductory-mathematics-books.html
2. E- books : www.mathebook.net

Suggested Learning Outcomes

At the end of the course, the student will have the ability to:

Coordinate Geometry

Unit – I

1.0 Solve the problems on Straight lines:

- 1.1 Understand the different forms of a straight line – point slope form, two point form, intercept form, normal form and general form
- 1.2 Solve simple problems on the above forms
- 1.3 Find distance of a point from a line, acute angle between two lines, intersection of two non-parallel lines and distance between two parallel lines.

Solve the problems on Circles:

- 1.4 Define locus of a point, circle and its equation.
- 1.5 Find the equation of a circle given
 - (i) Centre and radius
 - (ii) Two ends of a diameter
 - (iii) Centre and a point on the circumference
 - (iv) Three non collinear points
 - (v) Centre and tangent
- 1.6 Write the general equation of a circle and find the centre and radius.
- 1.7 Write the equation of tangent and normal at a point on the circle.
- 1.8 Solve the problems to find the equations of tangent and normal.

Unit – II

2.0 Appreciate the properties of Conics in engineering applications:

- 2.1 Understand the concept of a conic section.
- 2.2 Understand the terms focus, directrix, eccentricity, axes and latus rectum of a conic with illustrations.
- 2.3 Find the equation of a conic when focus, directrix and eccentricity are given
- 2.4 Describe the properties of Parabola, Ellipse and Hyperbola
- 2.5 Solve problems in simple cases of Parabola, Ellipse and Hyperbola.

Differential Calculus

UNIT - III

3. Use the concept of Limit for solving the problems

- 3.1 Understand the concept of limit and meaning of $\lim_{x \rightarrow a} f(x) = l$ and state the properties of limits.

- 3.2 Mention the Standard limits $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a}$, $\lim_{x \rightarrow 0} \frac{\sin x}{x}$, $\lim_{x \rightarrow 0} \frac{\tan x}{x}$, $\lim_{x \rightarrow 0} \frac{a^x - 1}{x}$, $\lim_{x \rightarrow 0} \frac{e^x - 1}{x}$,

$$\lim_{x \rightarrow 0} (1+x)^{\frac{1}{x}}, \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$$

- 3.3 Solve the problems using the above standard limits

- 3.4 Evaluate the limits of the type $\lim_{x \rightarrow l} \frac{ax^2 + bx + c}{\alpha x^2 + \beta x + \gamma}$ and $\lim_{x \rightarrow \infty} \frac{f(x)}{g(x)}$

3.0 Appreciate Differentiation and its meaning in engineering situations

- 3.5 Understand the concept of derivative of a function $y = f(x)$ – definition, first principle as

$$\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} \quad \text{and also provide standard notations to denote the derivative of a function.}$$

- 3.6 Know the significance of derivative in scientific and engineering applications.
- 3.7 Find the derivatives of elementary functions like x^n , e^x , a^x , $\log x$, $\sin x$, $\cos x$, $\tan x$, $\sec x$, $\operatorname{cosec} x$ and $\cot x$ using the first principles.
- 3.8 Find the derivatives of simple functions from the first principle.
- 3.9 Use the rules of differentiation of sum, difference, scalar multiplication, product and quotient of functions to solve simple problems.
- 3.10 Find the derivatives using the method of differentiation of a function of a function (Chain rule)

Unit – IV

4.0 Appreciate Differentiation and its meaning in engineering situations

- 4.1 Find the derivatives of Inverse Trigonometric functions.
- 4.2 Understand the method of differentiation of a function with respect to another function and also differentiation of parametric functions.
- 4.3 Find the derivatives of hyperbolic functions.
- 4.4 Use the above procedures for finding the derivatives of implicit function with examples.
- 4.5 Use logarithms for differentiating some functions with examples like $[f(x)]g(x)$.
- 4.6 Use the concept of the higher order derivatives of second and third order to solve problems in engineering.
- 4.7 Use the concept of functions of several variables, partial derivatives to solve simple examples.
- 4.8 Use Euler's theorem for homogeneous functions to solve simple problems of partial derivatives.

Applications of Differentiation

UNIT - V

5.0 Understand the Geometrical Applications of Derivatives

- 5.1 State the geometrical meaning of the derivative as the slope of the tangent to the curve $y=f(x)$ at any point on the curve.
- 5.2 Use the concept of derivative to find the slope of tangent and to find the equation of tangent and normal to the curve $y = f(x)$ at any point on it.
- 5.3 Find the lengths of tangent, normal, sub-tangent and sub normal at any point on the curve $y=f(x)$
- 5.4 Use the concept of angle between two curves and procedure for finding the angle between two given curves with illustrative examples.

Unit – VI

6. Understand the Physical Applications of Derivatives

- 6.1 Explain the derivative as a rate of change in distance-time relations
- 6.2 To find the velocity and acceleration of a moving particle using the derivative. Use derivative as a rate measurer in the problems where the quantities like volumes, areas vary with respect to time.

6.0 Use Derivatives to find extreme values of functions

6.3 Identify the increasing and decreasing functions.

6.4 Use the conditions to find points where the given function is increasing or decreasing.

6.5 Find the extreme values (maxima or minima) of a function of single variable – Solve simple problems yielding maxima and minima.

6.6 Solve problems on maxima and minima in applications like finding areas, volumes, etc.

Suggested Student Activities

1. Student visits Library to refer Standard Books on Mathematics and collect related material.
2. Quiz
3. Group discussion
4. Surprise tests
5. Seminars
6. Home assignments.
7. Mathematics for preparing competitive exams . Solving old question papers on arithmetical ability.

CO / PO - MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapped POs
CO1	3	1					3	1,2,7
CO2	3	2					3	1,2,7
CO3	3	2	2				3	1,2,7
CO4	3	2	2				3	1,2,7
CO5	3	2	2				3	1,2,7
CO6	3	2	3				3	1,2,7

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I		5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1	9(a)	13(a)		
2	II						
3	III		2	10(a)	14(a)		
4	IV						
5	V		3	5, 6	9(b)	13(b)	
						11(a)	
					11(b)	15(b)	
6	VI		7,8	10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEMESTER EXAMINATIONS – I
SC-202- ENGINEERING MATHEMATICS

TIME: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions 04 X 01 = 04
2 Each question carries **ONE** mark

1. Write the equation of a straight line in intercept form.
2. Write the equation of circle whose centre (h, k) and radius r given.
3. Define conic section.
4. Find the latus rectum of the parabola $y^2 = 6x$

PART-B

Instructions: 1. Answer any **TWO** questions 02 X 03 = 06
2. Each question carries **THREE** marks

5. a) Find the distance between parallel lines $3x + 4y + 5 = 0$ and $3x + 4y + 8 = 0$

OR

- b) Find the centre and radius of the circle $x^2 + y^2 - 6x + 4y - 12 = 0$.
6. a) Find the vertex, focus, equation of directrix and length of latus-rectum of the parabola $y^2 = 20x$

OR

- b) Find the centre, vertices and foci of Ellipse $\frac{x^2}{36} + \frac{y^2}{25} = 1$

PART C

Instructions: 1. Answer any **TWO** questions 2 X 05 = 10
2. Each question carries **FIVE** marks

7. a) Find the angle between the lines $2x - y + 3 = 0$ and $x + y - 2 = 0$

OR

- b) Find the equation of the Circle passing through the points (0, 0), (1, 0) and (0,2)
8. a) Find the equation of the Parabola with focus at (2, -3) and whose directrix is $3x - 4y + 16 = 0$

Or

- b) Find the Centre, Vertices, Eccentricity, Foci, Lengths of axes, Length of Latus Rectum, and equations of directrices of the Hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$

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BOARD DIPLOMA EXAMINATIONS (C21)
MID SEMESTER EXAMINATIONS - II
SC-202- ENGINEERING MATHEMATICS

TIME: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions 04 X 01 = 04
2 Each question carries **ONE** mark

1. Evaluate $\lim_{x \rightarrow 0} \frac{2x^3 - 3x^2 + 1}{9x^2 + 8x + 7}$
2. Differentiate $3 \log x + \sec x$ w. r. t. x
3. Differentiate $\log (\sin x)$ w.r.t x
4. Find $\frac{\partial u}{\partial x}$ if $U = 2x^2 + 3y^2$

PART-B

Instructions: 1. Answer any **TWO** questions 02 X 03 = 06
2. Each question carries **THREE** marks

5. a) Evaluate: $\lim_{\theta \rightarrow 0} \left(\frac{1 - \cos \theta}{\theta \sin \theta} \right)$

OR

- b) If $y = x \sin x$ then find $\frac{dy}{dx}$

6. a) Find $\frac{dy}{dx}$ if $y = \sin^{-1}(3x - 4x^3)$

OR

- b) If $2x^2 + 3y^2 + x y = 5$, then find $\frac{dy}{dx}$

PART C

Instructions: 1. Answer **ALL** questions 02 X 05 = 10
2. Each question carries **FIVE** marks

7. a) Find $\frac{dy}{dx}$, If $x^y = e^{x-y}$

OR

- b) If $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$, find $\frac{dy}{dx}$
8. a) If $y = \sin(\log x)$, prove that $x^2 y_2 + x y_1 + y = 0$.

OR

- b) If $U = \sin^{-1} \left(\frac{x^2 + y^2}{x + y} \right)$ then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \tan u$

@@@

[Total Marks: 40]

(b) Find the minimum value of $x^3 - 6x^2 + 9x + 1$

PART C

Instructions: 1. Answer any **FOUR** questions

04 X 05 = 20

2. Each question carries **FIVE** marks

13. (a) Find the equation of the parabola whose focus is the point (3, -4) and directrix is the line $x - y + 5 = 0$.

OR

- (b) Find the angle between the curves $x^2 = 2y$, $x + y = 8$ at their point of intersection (2, 2)

14. (a) Find $\frac{dy}{dx}$, $\frac{d^2y}{dx^2} = \frac{d}{dx}(\frac{dy}{dx})$, $\frac{d^3y}{dx^3} = \frac{d^2}{dx^2}(\frac{dy}{dx})$.

OR

- (b) The sum of two numbers is 24. Find them if their product is maximum

15. (a) Find the lengths of the tangent, normal, sub tangent and sub normal to the curve $y = x^3 - 3x + 2$ at (0, 2)

OR

- (b) Show that the curves $y^2 = 4ax$ and $x^2 = 4by$ cut at right angles if $8a^2 - b = 0$.

16. (a) A circular metal plate expands by heat so that its radius is increasing at the rate of 0.02 cm/sec. At what rate its area is increasing when the radius is 10 cm.

OR

- (b) A wire of length 40 cm is bent so that it has to form a rectangle. Find the maximum area that can be enclosed by the wire.

SC-203 - APPLIED PHYSICS

Course Title	Applied Physics	Course Code	SC-203
Semester	Semester-II	Course Group	Foundation
Teaching Scheme in Pds (L:T:P)	4:1:0	Credits	3
Type of course	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites: High School Science and Mathematics.

Course Objectives: After studying this course, the student will be able to understand and appreciate the role of Physics in different areas of engineering and technology.

Course outcomes: On successful completion of the course, the student will have the ability to attain below Course Outcomes (CO):

Course Outcomes	
CO1	Apply the knowledge of Simple Harmonic Motion to solve engineering problems
CO2	Understand the characteristics of waves, sound, Doppler effect, noise pollution and apply to engineering problems
CO3	Apply principles of magnetism and electricity as tools in engineering
CO4	Apply various electromagnetic radiations to engineering problems
CO5	Understand the principles of Laser, Optical fiber and nano technology and apply to engineering problems.
CO6	Apply the knowledge of Semiconductors to diodes and rectifiers.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	-	-	-	2
CO2	3	1	-	1	-	-	2
CO3	3	1	-	-	-	-	2
CO4	3	1	-	1	-	-	2
CO5	3	1	-	1	-	-	2
CO6	3	1	-	-	1	-	2
	3	1		1	1		2

SC-203 - APPLIED PHYSICS

Course Contents

1. UNIT – 1 SIMPLE HARMONIC MOTION

Duration: 12 periods

Periodic motion - Simple Harmonic Motion (SHM)– definition – examples, Conditions for SHM, Time period, frequency, amplitude and phase of a particle in SHM, Expressions for Displacement, Velocity, Acceleration, Time period and frequency of a particle executing SHM – derivations, Ideal simple pendulum – time period of simple pendulum –derivation – application of simple pendulum to determine the acceleration due to gravity experimentally, laws of simple pendulum, Second's pendulum- related numerical problems

2. UNIT – 2 SOUND

Duration: 13 periods

Wave motion – definition and characteristics, audible range – infrasonic and ultrasonic, longitudinal and transverse waves – examples, Relation among wavelength, frequency and velocity of a wave – derivation, Stationary waves, beats - applications of beats, echo – definition - applications - relation between time of echo and distance of obstacle, Doppler effect in sound (no derivation, formulae only) – list the applications – ultrasound and radar in medicine and engineering- –derivation- Reverberation and time of reverberation - Sabine's formula - Free and forced vibrations - Resonance - Conditions of good auditorium, noise pollution – causes, effects and methods to minimize noise pollution, related numerical problems.

3. UNIT – 3 MAGNETISM AND ELECTRICITY

Duration: 13 periods

Basics of magnetism, Coulomb's inverse square law in magnetism, moment of couple on a bar magnet placed in a uniform magnetic field – derivation, expression for magnetic induction field strength at a point on the axial line of a bar magnet –derivation, Kirchhoff's laws in electricity, Wheatstone bridge – balancing condition, application of Wheatstone bridge –Meter bridge, Concept of electromagnetic induction - self-induction and mutual induction, Faraday's Laws, Lenz's law, principle and working of transformer-types of transformers, types of magnetic materials – dia, para and ferromagnetic materials, related numerical problems.

4. UNIT – 4 OPTICS

Duration: 12 periods

Electromagnetic spectrum – various types of electromagnetic radiations (gamma rays, x-rays, uv, visible, infrared, microwave and radio waves)-wavelength range-applications (microwave oven, microwave communication, x-rays in medicine, uv lamps, infrared remote controllers), Light theories-dual nature, reflection, refraction, and interference, Photo

electric effect - Einstein's photo electric equation – Work function and threshold frequency - laws of photo electric effect - applications of photo electric effect – photo cell.

5. UNIT – 5 MODERN PHYSICS

Duration: 12 periods

LASER – definition, Spontaneous emission and Stimulated emission –principle and working of LASER, characteristics of LASER- types of LASER, applications of LASER, Total internal reflection, critical angle, conditions for total internal reflection, Principle and working of Optical fiber –types- Applications of optical fiber –Nanotechnology, nano particles and nano materials-applications and devices, Superconductivity-basic concept-applications of Superconductors.

6. UNIT -6 SEMICONDUCTOR PHYSICS

Duration: 13 periods

Energy bands in solids- valence band- conduction band – forbidden gap – Energy band diagram of conductors, insulators and semiconductors – concept of Fermi level - Intrinsic semiconductors - examples - Concept of holes in semiconductors - Doping - Extrinsic semiconductors - P-type and N-type semiconductors, PN Junction diode – Forward Biasing and Reverse Biasing - Volt-Ampere (V-I) characteristics - Applications of PN diode - Diode as rectifier (half wave rectifier), Light Emitting Diode – principle and working, solar cell – principle and working.

LEARNING OUTCOMES:

Upon completion of the course the student shall be able to

SIMPLE HARMONIC MOTION

- 1.1 Define periodic motion and Simple Harmonic Motion (SHM).
- 1.2 List the examples of SHM.
- 1.3 List the conditions of Simple Harmonic Motion.
- 1.4 Define the terms time period, frequency, amplitude and phase of a particle in SHM.
- 1.5 Develop the expressions for Displacement, Velocity, Acceleration, Time period and Frequency of a particle executing in SHM.
- 1.6 Define Ideal simple pendulum and develop the expression for time period of simple pendulum.
- 1.7 Make use of simple pendulum to determine the acceleration due to gravity at a place.
- 1.8 Develop the laws of simple pendulum.
- 1.9 Define second's pendulum.
- 1.10 Solve related numerical problems

SOUND

- 2.1 Define wave and outline the characteristics of wave (frequency, wavelength, amplitude, and time period).
- 2.2 Explain audible range, infrasonic and ultrasonic waves.
- 2.3 Explain longitudinal and transverse wave motion with examples.
- 2.4 Develop the expression relating wave velocity, frequency and wavelength.
- 2.5 Explain stationary waves with neat diagram.
- 2.6 Explain the phenomenon of beats and list the applications of beats.
- 2.7 Explain echo and list the applications of echo.
- 2.8 Apply principle of echo to find the distance of an obstacle from the observer.
- 2.9 Explain Doppler Effect in sound (no derivation, formulae only-source and observer in relative motion-toward and away from each other).
- 2.10 List the applications of Doppler Effect.
- 2.11 Apply Doppler Effect as a tool in medicine (ultrasound) and engineering (radar).
- 2.12 Explain Reverberation, reverberation time and outline Sabine's formula.
- 2.13 Define free and forced vibrations and resonance with examples.
- 2.14 List the conditions of a good auditorium.
- 2.15 Explain noise pollution and list the causes, effects and methods to minimize noise pollution.
- 2.16 Solve related numerical problems.

MAGNETISM AND ELECTRICITY

- 3.1 Summarize magnetic field, magnetic lines of force and magnetic induction field strength.
- 3.2 Explain Coulomb's inverse square law of magnetism.
- 3.3 Develop an expression for moment of couple on a bar magnet placed in a uniform magnetic field.

- 3.4 Develop an expression for magnetic induction field strength at a point on the axial line of a bar magnet.
- 3.5 Explain Kirchhoff's laws in electricity.
- 3.6 Explain Wheatstone's bridge with legible sketch.
- 3.7 Apply Kirchhoff's laws to develop formula for balancing of Wheatstone's bridge.
- 3.8 Apply principle of Wheatstone's bridge to Meter Bridge.
- 3.9 Explain Faraday's laws of electromagnetic induction.
- 3.10 Explain self-induction and mutual induction.
- 3.11 Explain Lenz's law.
- 3.12 Explain the principle and working of Transformer.
- 3.13 Explain types of transformers (Step up and Step down).
- 3.14 Explain types of magnetic materials (dia, para and ferro magnetic materials).
- 3.15 Solve related numerical problems.

OPTICS

- 4.1 Explain various frequency/wavelength windows of electromagnetic spectrum (gamma rays, x-rays, uv, visible, infrared, microwave and radio waves).
- 4.2 Summarize the emission process of electromagnetic radiation.
- 4.3 Apply electromagnetic radiations to microwave oven, microwave communication, x-rays in medicine, uv lamps and infrared remote controllers.
- 4.4 Outline light theories (Newton's Corpuscular theory, Huygen's Wave theory, Maxwell's Electromagnetic wave theory and Planck's Quantum theory).
- 4.5 Explain reflection, refraction and interference.
- 4.6 Explain dual nature of light.
- 4.7 Explain Photo electric effect.
- 4.8 Explain Einstein's photo electric equation, work function and threshold frequency.
- 4.9 Summarize laws of photo electric effect.
- 4.10 List the applications of photo electric effect.
- 4.11 Explain the working of photocell.

MODERN PHYSICS

- 5.1 Define LASER.
- 5.2 Explain concept of energy levels (Ground state, excited state and Meta stable state).
- 5.3 Explain Spontaneous emission and Stimulated emission.
- 5.4 Explain principle and working of LASER.
- 5.5 List the characteristics of LASER.
- 5.6 List the types of LASER.
- 5.7 Utilize LASER in Engineering and Medicine (Bar code reading, Laser welding and cutting, Laser eye surgery).
- 5.8 Explain Total internal reflection.
- 5.9 Define Critical angle.
- 5.10 List the conditions of total internal reflection.
- 5.11 Explain the principle and working of Optical fiber.

- 5.12 Explain types of optical fiber (Step index and Graded index).
- 5.13 List the applications of optical fiber.
- 5.14 Define Nano scale and properties at nano scale.
- 5.15 Explain Nano particles and Nano materials (zero, one, two and three dimensional).
- 5.16 Outline Nano technology-based devices and application (Nano tubes, Ultra-high-definition displays, drug delivery, energy applications for clean environment)
- 5.17 Explain basic concept of Superconductivity.
- 5.18 List the applications of Superconductors.

SEMICONDUCTOR PHYSICS

- 6.1 Explain Valence band, Conduction band and Forbidden energy gap in solids.
- 6.2 Explain Conductors, Insulators and Semiconductors on the basis of energy band diagram.
- 6.3 Explain the concept of Fermi level.
- 6.4 Explain Intrinsic semiconductors.
- 6.5 List the examples of intrinsic semiconductors.
- 6.6 Explain the concept of hole and doping in semiconductors.
- 6.7 Explain Extrinsic semiconductors - P-type and N-type semiconductors.
- 6.8 Explain PN Junction Diode.
- 6.9 Explain Forward bias and Reverse bias of PN diode (biasing and flow of majority and minority carriers with diagram).
- 6.10 Summarize Volt-Ampere (V-I) characteristics of PN Diode.
- 6.11 List the applications of PN Diode.
- 6.12 Explain the principle of diode as a Rectifier – half wave rectifier.
- 6.13 Explain working principle of Light Emitting Diode (LED).
- 6.14 Explain the working principle of Solar cell.

References:

1. Principles of Physics by N. Subrahmanyam and Brijlal, S. Chand & Co, New Delhi, edition, 1982
2. Engineering. Physics by R.K. Gaur, S.L. Gupta, Dhanpatrai Publications, New Delhi.
3. ISC Physics, Book I&II, P. Vivekanandan, DK Banerjee, S Chand, New Delhi.
4. Intermediate Physics, Vol. I&II, Telugu Academy, TS, Hyderabad.
5. Fundamentals of Physics by Halliday and Resnick.

E-learning resources:

1. Hyper Physics website: <http://hyperphysics.phy-astr.gsu.edu/>

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
				11(b)	15(b)		
6	VI		7,8	10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8			8	8	

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

BOARD DIPLOMA EXAMINATION, (C-21)
MID SEM-I
SECOND SEMESTER EXAMINATION
SC- 203 - APPLIED PHYSICS

Time: 1 Hour

Total Marks: 20

PART-A

4 X 1 = 4

Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

1. Define Simple harmonic motion.
2. Define Ideal simple pendulum.
3. Define wave.
4. Define resonance.

PART-B

2 X 3 = 6

Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

- 5 (a) Explain the conditions for SHM.

(OR)

- 5 (b) Explain the laws of simple pendulum

- 6 (a) Explain longitudinal and transverse wave motion with examples.

(OR)

- 6 (b) List three applications of beats

PART-C

2 X 5 = 10

Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

- 7 (a) Develop the expressions for velocity and acceleration of a particle executing SHM

(OR)

- 7 (b) Develop the expression for time period of a simple pendulum

- 8 (a) Explain echo and apply principle of echo to find the distance of an obstacle from the observer.

(OR)

- 8 (b) List five causes of noise pollution.

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BOARD DIPLOMA EXAMINATION, (C-21)
MID SEM-II
SECOND SEMESTER EXAMINATION
SC-203 - APPLIED PHYSICS

Time: 1 Hour

Total marks: 20

PART-A

4 X 1 = 4

Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

1. Define magnetic field
2. Define magnetic lines of force.
3. What is refraction?
4. Define work function in photoelectric effect.

PART-B

2 X 3 = 6

Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

5(a) Explain Faradays laws of electromagnetic induction.

(OR)

5(b) Explain Lenz's law.

6(a) Summarize the laws of photo electric effect

(OR)

6(b) Summarize the emission process of electromagnetic radiation.

PART-C

2 X 5 = 10

Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

7(a) Develop an expression for balancing condition of Wheatstone bridge with legible sketch.

(OR)

7(b) Explain the principle of working of transformer.

8(a) Outline light theories.

(OR)

8(b) Explain the working of photocell.

** ** *

BOARD DIPLOMA EXAMINATION, (C-21)
FIRST SEMESTER EXAMINATION
SC-203 - APPLIED PHYSICS

Time: 2 Hours

Total marks :40

PART-A

8 X 1 = 8

Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark

1. Define ultrasonic sound.
2. Define magnetic field.
3. Define critical angle.
4. Define Simple Harmonic Motion.
5. Define Nano scale.
6. Define superconductivity.
7. What is forbidden gap?
8. What is doping in semiconductors?

PART-B

4 X 3 = 12

Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

9(a) Develop the laws of simple pendulum.

(OR)

9(b) Explain concept of meta stable state.

10(a) Explain Coulomb's inverse square law of magnetism.

(OR)

10(b) Explain the concept of Fermi level.

11(a) List the characteristics of LASER.

(OR)

11(b) List the applications of superconductors.

12(a) Explain P-type and N-type semiconductors.

(OR)

12(b) List the applications of PN Diode.

PART-C

4 X 5 = 20

- Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

13(a) Explain echo and apply principle of echo to find the distance of an obstacle from the observer.

(OR)

13(b) Explain working principle of LASER.

14(a) Derive the expression for magnetic induction field strength at a point on the axial line of a bar magnet.

(OR)

14(b) Explain forward and reverse bias of PN diode

15(a) Explain the principle and working of optical fiber.

(OR)

15(b) Explain Nano particles and zero, one, two- and three-dimensional Nano materials.

16(a) Explain the principle of diode as a rectifier.

(OR)

16(b) Explain working principle of Light Emitting Diode (LED).

SC-204 - Engineering Chemistry and Environmental Studies

Course Title	Engineering Chemistry and Environmental Studies	Course Code	SC-204
Semester	II	Course Group	Foundation
Teaching Scheme in Periods (L:T:P)	4:1:0	Credits	3
Methodology	Lecture +Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Prerequisite:

Basic knowledge of Chemistry in Secondary Education.

Course Objectives: After studying this course the student will be able to understand and appreciate the role of chemistry and environmental studies in different spheres of industries.

Course Outcome:

On successful completion of the course, the students will have ability to attain below Course Outcomes (CO):

CO1	Understand and explain the different metallurgical processes and apply the knowledge to solve engineering problems.
CO2	Understand and explain the various corrosion processes, protection methods and apply the knowledge to reduce the corrosion in new equipment and constructions.
CO3	Understand and explain the different methods of preparation, moulding and industrial uses of organic polymers and apply the knowledge to select suitable polymer for domestic and industrial use.
CO4	Understand the concept of calorific value, gaseous fuels, explosives and lubricants and apply the knowledge to use the relevant fuel and lubricant for domestic and industrial applications.
CO5	Understand and explain construction and applications of Galvanic Cell, Batteries and Cells and apply the knowledge to identify and compare the materials best suited for construction of Battery and Fuel Cells.
CO6	Explain the causes, effects and controlling methods of air pollution, water pollution and soil pollution and apply relevant methods to solve domestic and industrial problems.

CO -PO Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	-	-	2
CO2	3	-	-	-	1	-	2
CO3	3	-	-	-	-	-	2
CO4	3	1	-	-	1	-	2
CO5	3	1	-	-	1	-	2
CO6	3	-	-	-	3	-	3

ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES
COURSE CONTENTS

UNIT - I: MTALLURGY:**12 Periods**

Characteristics of metals - Distinguish between metals and non metals - Mineral, Ore, Gangue, Flux, Slag - Concentration of ore - Construction and operation of Reverboratory furnace and Blast furnace - Methods of extraction of crude metal - Roasting, Calcination, Smelting – Alloys-Purpose of making alloys – Composition and uses of Brass, German Silver, Nichrome, Stainless Steel and Duralumin.

UNIT – II: CORROSION:**12 Periods**

Corrosion - Factors influencing the rate of corrosion – Dry and wet theories of corrosion – Composition cell, Stress cell and Concentration cell - Rusting of iron and its mechanism - Prevention of corrosion – Protective coatings, - Cathodic protection - Paints – Constituents of paint – Functions of constituents of paint.

UNIT – III: POLYMERS:**13 Periods**

Polymers - Polymerization - Types of polymerization – Addition polymerization, Condensation polymerization - Plastics - Types of plastics - Advantages of plastics over traditional materials - Disadvantages of using plastics - Preparation and uses of the following plastics: 1. Polythene 2. PVC 3.Teflon 4. Polystyrene 5.Urea formaldehyde 6. Bakelite - Compounding and moulding of plastics – Natural rubber – Vulcanization of natural rubber - Elastomers – Preparation and uses of Butyl rubber, Buna-s, Neoprene rubber - Fibre -Preparation and uses of Nylon 6,6, and Polyester (Polyethylene terephthalate) - Biodegradable polymers and their general applications.

UNIT – IV: FUELS AND LUBRICANTS:

12 Periods

Definition and classification of fuels- Characteristics of good fuel - Calorific value - HCV and LCV - Calculation of oxygen required for combustion of methane and ethane – Preparation method, composition, calorific value, and uses of gaseous fuels- a) CNG b) LPG c) Water gas, d) Producer gas, e) Coal gas, and f) Bio gas – Explosives – Classification of explosives – Applications of explosives – Lubricants – Classification and functions of lubricants.

UNIT – V: ELECTROCHEMICAL CELL – BATTERIES:

13 Periods

Galvanic cell – Standard electrode potential – Reference electrodes – Types of reference electrodes - Electro chemical series - EMF of cell – Batteries -Types of batteries - Fuel cells.

UNIT – VI: ENVIRONMENTAL STUDIES:

13 Periods

Introduction- Classification of air pollutants based on origin and states of matter-Air pollution – Causes, effects, and controlling methods of air pollution - Water pollution – Causes, effects, and controlling methods of water pollution – Soil pollution – Causes of soil pollution – General effects of soil pollution - Controlling methods of soil pollution – Carbon Trading.

Reference Books:

1. Engineering chemistry – Jain & Jain – DhanpatRai Publishing Company.
2. A Text book of Engineering Chemistry – S.S.Dara – S.Chand Publications.
3. Environmental Studies – A.K.De.
4. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press
5. Intermediate Chemistry I and II – Telugu Academy TS
6. Engineering chemistry – Prasanta Rath, B. Ramadevi, Ch. Venkataramana Reddy& Subhendu Chakroborty – CENGAGE

E learning links:

<https://iupac.org/>

<https://www.khanacademy.org/>

www.nptel.ac.in

Specific Learning Outcomes

Upon completion of the course, the student will have ability to

UNIT – I: METALLURGY

- 1.1 List the characteristics of metals.
- 1.2 Distinguish between metals and non metals
- 1.3 Define and explain the terms 1. Mineral, 2. Ore, 3. Gangue, 4. Flux and 5. Slag
- 1.4 List the minerals and ores of iron, aluminium and copper.
- 1.5 Apply the Hand picking, Levigation, Froth floatation and Electromagnetic methods for the concentration of ore.
- 1.6 Explain the construction and operation of Reverboratory furnace and Blast furnace
- 1.7 Explain the following methods involved in extraction of crude metal- Roasting, Calcination, Smelting.
- 1.8 Define an alloy
- 1.9 Explain the purpose of making of alloys
- 1.10 Write the composition of the following alloys: i) Brass, ii) German silver, iii) Nichrome iv) Stainless Steel, v) Duralumin
- 1.11 List the uses of following alloys: i) Brass, ii) German Silver, iii) Nichrome, iv) Stainless Steel, v) Duralumin.

UNIT – II: CORROSION

- 2.1 Define the term corrosion
- 2.2 Explain the factors influencing the rate of corrosion based on i) Nature of metal ii) Nature of environment of metal.
- 2.3 Explain the dry and wet theories of corrosion.
- 2.4 Describe the formation of a) Composition cell, b) Stress cell c) Concentration cell
- 2.5 Define rust and explain the mechanism of rusting of iron with chemical reactions.
- 2.6 Explain the following methods of prevention of corrosion:
 - a) Proper designing
 - b) Modification of environment.
 - c) Protective coatings i) Metallic coatings (Anodic coating and Cathodic coating)
ii) Inorganic coatings iii) Organic coatings
 - d) Cathodic protection -Sacrificial anode method and Impressed voltage method.

- 2.7 Define the term paint.
- 2.8 Write the characteristics of good paint.
- 2.9 List the constituents of paint (pigment, vehicle or drying oil, thinner, drier, filler and plasticizers) and state the functions of constituents of paint.

UNIT – III: POLYMERS

- 3.1 Define polymerization
- 3.2 State and explain the types of polymerization (Addition polymerization and Condensation polymerization) with examples.
- 3.3 Define the term plastic
- 3.4 List the characteristics of plastics.
- 3.5 State and explain the advantages of plastics over traditional materials
- 3.6 State the disadvantages of using plastics.
- 3.7 Explain the types of plastics with examples.
- 3.8 Distinguish between thermoplastics and thermosetting plastics
- 3.9 Explain the methods of preparation and uses of the following plastics:
 - 1. Polythene, 2. Polyvinyl chloride, 3. Teflon, 4. Polystyrene 5. Urea formaldehyde
 - 6. Bakelite (Only flow chart for Bakelite i.e. without chemical equations).
- 3.10 Explain the concept of compounding of plastic.
- 3.11 List the types of additives (Fillers, Binders, Plasticizers, Stabilizers and Colouring materials with examples) used in compounding of plastic and their impact on properties of plastic.(Elementary level only)
- 3.12 Explain the types of moulding of plastics (Compression moulding, Injection moulding and Extrusion moulding)
- 3.13 Define the term natural rubber
- 3.14 Explain processing of natural rubber from latex.
- 3.15 Write the structural formula of natural rubber
- 3.16 List the characteristics of natural rubber
- 3.17 Explain the process of vulcanization
- 3.18 List the characteristics of vulcanized rubber
- 3.19 Define the term elastomer
- 3.20 Describe the preparation and uses of the following synthetic rubbers a) Butyl rubber, b) Buna-s and c) Neoprene rubber.
- 3.21 Define fibre.

- 3.22 Explain the preparation and uses of fibres–Nylon 6,6 and Polyethylene terephthalate (PET)
- 3.23 Define biodegradable polymers and state their general applications

UNIT – IV: FUELS AND LUBRICANTS

- 4.1 Define the term fuel.
- 4.2 Classify the fuels based on physical state - solid, liquid and gaseous fuels with examples.
- 4.3 Classify the fuels based on occurrence- primary and secondary fuels with examples.
- 4.4 List the characteristics of a good fuel
- 4.5 Explain the advantages of gaseous fuels
- 4.6 Define Calorific value - HCV and LCV.
- 4.7 Explain the terms i) Knocking ii) Octane number and iii) Cetane number
- 4.8 Calculate the oxygen required for the combustion of methane and ethane.
- 4.9 State the method of preparation (Without description), composition, calorific value and uses of the following gaseous fuels:
- a) CNG b) LPG c) Water gas, d) Producer gas,
e) Coal gas, and f) Bio gas
- 4.10 Define and understand the term explosive.
- 4.11 Classify the explosives (Primary explosives (Detonators), Low explosives (Propellants) and High explosives with examples).
- 4.12 State the constructive and destructive applications of explosives.
- 4.13 Define the term lubricant.
- 4.14 Classify the lubricants.
- 4.15 Explain the functions of lubricants.

UNIT – V: Electrochemical cell – Batteries

- 5.1 Define galvanic cell
- 5.2 Explain the construction and working of galvanic cell
- 5.3 Distinguish between electrolytic cell and galvanic cell
- 5.4 Explain standard electrode potential
- 5.5 Understand the need of reference electrode and types of reference electrodes.
- 5.6 Explain primary reference electrode (standard hydrogen electrode) and Secondary reference electrode (Calomel electrode).
- 5.7 Define electrochemical series and explain its significance.
- 5.8 Define and explain EMF of a cell.
- 5.9 Solve the numerical problems on EMF of cell

- 5.10 Define battery and explain the types of batteries with examples
- 5.11 Explain the construction, working and applications of Dry cell (Leclanche cell), Lead storage battery, Ni-Cd cell
- 5.12 Explain the construction, working and advantages of Hydrogen - Oxygen fuel cell

UNIT – VI: ENVIRONMENTAL STUDIES

- 6.1 Define air pollution
- 6.2 Classify the air pollutants- based on origin and states of matter
- 6.3 Explain the causes of air pollution
- 6.4 Explain the effects of air pollution on human beings, plants and animals
- 6.5 Explain the Green house effect - Ozone layer depletion and Acid rain
- 6.6 Explain the controlling methods of air pollution
- 6.7 Define water pollution
- 6.8 Explain the causes of water pollution
- 6.9 Explain the effects of water pollution on living and non living things
- 6.10 Explain the methods of control of water pollution.
- 6.11 Explain the process of sewage treatment.
 - i) Primary treatment (Coagulation)
 - ii) Secondary treatment (Trickling filters and Activated sludge process)
 - iii) Tertiary treatment (Brief note on tertiary treatment)
- 6.12 Define soil pollution.
- 6.13 State and explain the causes of soil pollution.
- 6.14 List the general effects of soil pollution.
- 6.15 Explain the controlling methods of soil pollution.
- 6.16 Understand the concept of Carbon Credits and Carbon Trading (Elementary level only)
- 6.17 Understand the advantages and disadvantages of Carbon Trading

Blue Print**MID SEM-I EXAM**

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
				11(b)	15(b)		
6	VI		7,8	10(b)	14(b)		
					12(a)		16(a)
				12(b)	16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

BOARD OF DIPLOMA EXAMINATIONS (C21)
MID SEM EXAMINATION – I
SC-204 - ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

Time: 1 Hour

Max. Marks: 20

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark 4 X 1 = 4 marks

1. Define the terms mineral and ore.
2. Define an alloy.
3. Define corrosion.
4. What is paint?

PART – B

Instructions: Answer the **following** questions. Each question carries **three** marks 2 x 3 = 6

Marks

5. a. List any six characteristics of metals.
(OR)
b. Explain the process of roasting of ore with an example.
6. a. List any six factors influencing the rate of corrosion.
(OR)
b. Explain the formation of stress cell with an example.

PART – C

Instructions: Answer the **following** questions. Each question carries **five** marks 2 x 5 = 10

Marks

7. a. Explain the froth floatation process of concentration of ore .
(OR)
b. Explain the construction and operation of Reverboratory furnace
8. a. Explain the mechanism of rusting of iron with chemical equations.
(OR)
b. Explain sacrificial anode method of prevention of corrosion with a neat diagram.

BOARD OF DIPLOMA EXAMINATIONS (C21)
MID SEM EXAMINATION – II
SC-204 - ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

Time: 1 Hour

Max. Marks: 20

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark.

4 X 1 = 4 marks

1. What is the chemical name of natural rubber?
2. Define polymerization.
3. What are fuels?
4. Mention any two characteristics of good fuel.

PART – B

Instructions: Answer the **following** questions. Each question carries **three** marks

2 x 3 = 6 Marks

5. a. Write any three advantages of plastics over traditional materials.
(OR)
b. Write any three differences between thermoplastic and thermosetting plastic.
6. a. Define calorific value and differentiate lower and higher calorific values.
(OR)
b. Classify the fuels based on their physical state.

PART – C

Instructions: Answer the **following** questions. Each question carries **five** marks

2 x 5 = 10 Marks

7. a. What is vulcanization of rubber and explain with chemical equations.
(OR)
b. Explain Compression Moulding, and Injection Moulding of plastics
8. a. Write the composition and uses of water gas and producer gas.
(OR)
b. Calculate the mass and volume of the oxygen required for the complete combustion of 8 grams of CH₄.

BOARD OF DIPLOMA EXAMINATIONS (C21)
END SEMESTER EXAMINATION
SC-204 - ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

Time: 2 Hours

Max. Marks: 40

PART – A

Instructions: Answer **all** questions. Each question carries **one** mark.

8 X 1 = 8 marks

1. Define gangue.
2. What are the different types of plastics?
3. Define Galvanic cell.
4. What is the chemical formula of rust?
5. What is electrochemical series?
6. What are the different types of batteries?
7. Define air pollution.
8. Define water pollution.

PART – B

Instructions: Answer the **following** questions. Each question carries **three** marks

4 x 3 =12 Marks

9. a. Write any three differences between metals and non-metals.
(OR)
b. Write any three significances of electrochemical series.
10. a. Write a method of preparation and two uses of polystyrene.
(OR)
b. Classify the pollutants based on origin and give examples.
11. a. Write any three differences between electrolytic cell and galvanic cell.
(OR)
b. Write the electrode reaction of lead storage battery during discharging.
12. a. Write a short note on Green house effect.
(OR)
b. Write a note on Ozone layer depletion.

PART – C

Instructions: Answer the **following** questions. Each question carries **five** marks

4 x 5 =20 Marks

13. a. Explain the formation of composition cell and stress cell.

(OR)

b. Describe the construction and working principle of Leclanche cell.

14. a. Calculate the mass and volume of oxygen required for the complete combustion of 15 gm of ethane(C_2H_6).

(OR)

b. Explain the controlling methods of water pollution.

15. a. Explain the construction and functioning of Galvanic cell.

(OR)

b. Explain working principle of H_2 - O_2 fuel cell.

16. a. Explain the control methods of air pollution.

(OR)

b. What is Carbon Trading? Explain the advantages of Carbon Trading

CS – 205 - PROGRAMMING IN C

Course Title	Programming in C	Course Code	CS-205
Semester	II	Course Group	Core
Teaching Scheme in Periods (L:T:P)	4:1:0	Credits	3
Methodology	Lecture +Tutorial	Total Periods Contact	75
CIE	60 Marks	SEE	40 Marks

Prerequisites

Knowledge of basic mathematics and IT skills.

Course Outcome

Upon completion of the course the students shall be able to:

Course Outcome	
CO1	Write Algorithms and draw flow charts for given problems
CO2	Use data types and classify operators
CO3	Develop programs using Decision making and looping statements
CO4	Create arrays and know usage of strings
CO5	Develop programs using different types of functions
CO6	Develop programs using Structures and Files

COURSE CONTENTS:

1. Programming Methodology and Introduction to C Language

Duration: 10 Periods

Steps involved in problem solving - Define Algorithm - Characteristics of algorithm - Steps involved in algorithm development - Algorithms for simple problems - Define flowchart - Symbols used in flowchart - Flowcharts for simple problems - Differentiate algorithm and flowchart - Define Program - Differentiate between algorithm and program - Define High level language and low level language- Define Compiler, Assembler, Linker and Loader - Define source code, assembly code, object code, machine code - importance of C language — structure of C program – different stages in converting the C program source code into an executable code - steps in executing the C program.

2. Understand Constants, Variables and Data Types in C and Understand Operators and Expressions in C

Duration: 10 Periods

Character set - C Tokens - Keywords and Identifiers- Constants and Variables - data types and classification - declaration of a variable - Assigning values to variables - Define operator -Classify operators - List and explain various arithmetic operators with examples -Illustrate the concept of relational operators - List logical operators - various assignment operators - Increment and decrement operators - List bitwise operators - Conditional operator - List various special operators - precedence and associativity of operators - Define expression - Evaluation of Arithmetic expressions - Evaluation of Logical expressions - Evaluation of Relational expressions - type conversion techniques – Know Preprocessor directives – Know Header Files - Reading and writing characters - formatted input and output.

3. Decision making and Looping statements

Duration: 14 Periods

Decision making in C programming - simple if statement – *if-else* statement – nested if statement - *else-if* ladder – break and continue statements - Switch statement - Classification of various loop statements- while loop – *do-while* loop - for loop - nesting of loops- Comparisons of different loop statements - Infinite loop and steps to avoid it.

4. Arrays and Strings

Duration: 14 Periods

Arrays – definition, declaration and initialization of One Dimensional -Array -Accessing the elements in the Array - ‘accessing array out of bounds’ problem - Reordering an array in ascending order – average of elements in an array – largest element in an array - Declaration and initialization of two Dimensional Arrays - sample programs on matrix addition and matrix multiplication, transpose- Strings – Definition, Declaration and initialization of String variables - Reading of strings from terminal - writing strings to screen - String handling functions with sample programs

5. User defined functions

Duration: 13 Periods

Function – Definition - Need for user defined functions - Advantages of functions - elements of function - Return values and their types - function prototype - function call - function definition – Scope, visibility and lifetime of variables in functions- Local and External variables -Global variable-Functions with no arguments and no return values - functions with arguments with no return values - functions with arguments with return values - functions with no arguments with return values - Recursion - sample programs on recursion - passing arrays to functions .

6. Structures and Unions and File Management

Duration: 14 Periods

Structures and Unions Structure- Definition - Creating a structure - Declaring structure variables - Accessing the structure members - Concept of structure assignment - Find size of a structure - Nested structure - Structure as function arguments - Array of structures - Structure containing arrays - array of structures containing arrays - Union and illustrate usage of a union – difference between Structures and Union.

Files management File – Definition - Declare file pointer to a file - file opening modes - Concept of closing of a file - Input / Output operations on a file - Random access to files.

REFERENCE BOOKS

1. Let Us C	--	Yeshwanth Kanetkar	BPB Publications
2. Programming in ANSI C	--	E. Balaguruswamy	Tata McGrawHill
3. Programming with C	--	Gottfried Schaum's	outline
4. C The complete Reference	--	Schildt	Tata McGraw Hill

Specific Learning Outcomes:

Upon completion of the course the student shall be able to

1.0 Programming Methodology and Introduction to C Language

- 1.1. State different steps involved in problem solving
- 1.2. Define algorithm and know its characteristics
- 1.3. State the steps involved in algorithm development
- 1.4. Develop algorithms for simple problems.
- 1.5. Define flowchart and know symbols used in drawing flowcharts
- 1.6. Draw flowchart for simple problems.
- 1.7. Differentiate algorithm and flowchart
- 1.8. Define program and differentiate between program and algorithm
- 1.9. Define High level language and low level language
- 1.10. Define Compiler, Assembler, Linker and Loader
- 1.11. Define source code, assembly code, object code, machine code.
- 1.12. state the importance of C language
- 1.13. Explain the structure of C program
- 1.14. List and Explain different stages in converting the C program source code to executable code.
- 1.15. Explain the steps involved in executing the C program

2.0 Constants, Variables , Data Types in C and Operators and Expressions and Input , Output functions in C

- 2.1 Describe character set, C Tokens-Keywords, Variables, Identifiers, Constants and Variables.
- 2.2 Define Data type. Classify data types and explain with examples
- 2.3 Explain declaration of a variable and assigning values to variables
- 2.4 Define operator.
- 2.5 Classify and Explain operators with examples
- 2.6 Describe precedence and associativity of operators
- 2.7 Define expression
- 2.8 Describe evaluation of Arithmetic, Relational and logical expressions
- 2.9 Illustrate type conversion techniques.
- 2.10 Define and List Pre-processor directives
- 2.11 Discuss #include and #define Pre-processor directives.
- 2.12 Define Header file and discuss stdio.h, conio.h, math.h, string.h Header files.
- 2.13 Illustrate getchar(), putchar(), scanf(), printf() with programs.

3.0 Decision making , Looping statements

- 3.1 Discuss decision making in programming and
- 3.2 Explain decision making statements- if , if-else, nested if, else-if ladder - with syntax and programs
- 3.3 Discuss break and continue statements.
- 3.4 Explain decision making statement- switch statement - with syntax and programs
- 3.5 Define looping and list loop statements
- 3.6 Explain the loop statements – while, do- while, for statement- with syntax and programs
- 3.7 Define nesting of loops and implement it
- 3.8 Compare different loop statements
- 3.9 Know about Infinite loop and steps to avoid it

4.0 Arrays and Strings

- 4.1 Define Array. Describe declaration and initialization of One Dimensional Array with syntax and program
- 4.2 Explain about ‘accessing array out of bounds’ problem
- 4.3 Explain reading elements of an array, accessing the elements and display them with program
- 4.4 Explain sorting elements in an array in ascending order
- 4.5 Explain finding the average of elements in an array and finding the largest element in an array
- 4.6 Explain declaration and initialization of two Dimensional Arrays
- 4.7 Illustrate the concept of two dimensional arrays with sample programs on matrix addition, subtraction, matrix multiplication and transpose of a matrix
- 4.8 Define String and know about declaration and initialization of a String variable.
- 4.9 Know about reading & writing of strings with programs

4.10 Explain about various String handling functions with sample programs.

5.0 User defined functions and Applications

5.1 Define function, state the need for user defined functions, advantages of functions

5.2 Know the elements of function and return values.

5.3 Define and discuss function prototype, function call, and function definition with syntax and program.

5.4 Discuss the scope, visibility and lifetime of variables in functions

5.5 Differentiate Local and Global variables

5.6 Illustrate functions with no arguments and no return values with programs

5.7 Illustrate functions with no arguments and with return values with programs

5.8 Illustrate functions with arguments and with no return values with programs

5.9 Illustrate functions with arguments and with return values with programs

5.10 Illustrate passing arrays to functions with programs

5.11 Define recursion and Illustrate recursion with programs

6.0 Structures and Unions and File Management

Structures and Unions

6.1 Define structure

6.2 Illustrate creating a structure tag and declaring structure variables,

6.3 Explain accessing structure members and structure assignment

6.4 Know size of a structure.

6.5 Discuss nested structure concept.

6.6 Illustrate array of structures, structures containing arrays, arrays of structures containing arrays.

6.7 Illustrate structure as function arguments and returning of structure variables as function values.

6.8 Define Union and illustrate usage of a union.

6.9 Know the differences between Structure and Union

Files management

6.10 Define file

6.11 Know how to declare file pointer to a file

6.12 Illustrate the concept of file opening in various modes

6.13 Illustrate the concept of closing of a file

6.14 Illustrate the concept of Input / Output operations on a file

6.15 Illustrate the concept of random access to files

Suggested Student Activities:

Student activity like mini-project, surveys, quizzes, etc. should be done in group of 5-10 students.

1. Each group should do any one of the following type of activity or any other similar activity related to the course with prior approval from the course coordinator and programme coordinator concerned.
2. Each group should conduct different activity and no repetition should occur.
3. Explore and analyse topics to improve the level of creativity and analytical skill by taking Quiz/ tests/ assignments. Documents have to be maintained as a record.
4. Create a power point presentation on the topic relevant to course or advanced topic as an extension to the course to improve the communication skills. Documents have to be maintained as a record.
5. Visit different sites relevant to topics. Listen to the lectures and submit a handwritten report
6. Coding competitions

Suggested E-learning links:

1. <http://www.tutorialspoint.com/cprogramming/>
2. <http://www.indiabix.com/online-test/c-programming-test/>
3. <https://www.w3schools.in/c-tutorial/>
4. <https://nptel.ac.in/courses/106/104/106104128/>
5. https://onlinecourses.nptel.ac.in/noc19_cs42/preview

CO-PO Mapping Matrix:

Course Outcome		CL	Linked PO	Teaching Hours
CO1	Write Algorithms and draw flow charts for given problems	R, U, A	1,2,3,4,7	10
CO2	Use data types and classify operators	R, U, A	1,2,3,4,7	10
CO3	Develop programs using Decision making and looping statements	U, A	1,2,3,4,7	14
CO4	Create arrays and know usage of strings	U, A	1,2,3,4,7	14
CO5	Develop programs using different types of functions	U, A	1,2,3,4,7	13
CO6	Develop programs using Structures and Files	R, U, A	1,2,3,4,7	14
		Total Sessions		75

MID SEM – I Exam

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM – II Exam

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

S.No	Unit Name	R		U	A	Remarks	
1	Unit-I	4	1		9(a)	13(a)	
2	Unit-II						
3	Unit-III		2		10(a)	14(a)	
4	Unit-IV						
5	Unit-V		3	5,6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	
6	Unit-VI			7,8	10(b) 11(a) 11(b)	14(b) 16(a) 16(b)	
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MODEL QUESTION PAPER
BOARD DIPLOMA MID-SEM-1 EXAMINATION (C-21)
CS-205– PROGRAMMING IN C

TIME: 1 HOUR

MAXIMUM MARKS:

20

PART-A

MARKS: 4 X 1=4

NOTE: 1. Answer all questions.

2. Each question carries one mark.

1. List any two differences between algorithm and flowchart.
2. Define Low level language
3. List various types of constants.
4. Define an expression.

PART-B

MARKS: 2 X 3=6

NOTE: 1. Answer any one question from 5 and 6.

2. Each question carries three marks.

- 5.a) Write any three differences between algorithm and flowchart
(OR)
b) Write any three differences between high level language and low level language
- 6.a) How to declare variable in C ? Give examples.
(OR)
b) Evaluate an expression $(2+5)*(10-4)\%10$.

PART-C

MARKS: 2 X 5=10

NOTE: 1. Answer any one question from 7 and 8.

2. Each question carries five marks.

7. a) Draw a flowchart to find factorial of given number N.
(OR)
b) Draw a flowchart to find biggest of three numbers.
8. a) Explain different data types in C with examples.
(OR)
b) Explain operators in C with examples.

MODEL QUESTION PAPER
BOARD DIPLOMA MID-SEM-2 EXAMINATION (C-21)
CS-205– PROGRAMMING IN C

TIME: 1 HOUR

MAXIMUM MARKS: 20

PART-A

MARKS: 4

X1=4

NOTE: 1. Answer all questions.

2. Each question carries one mark.

1. Give the syntax of if statement in C.
2. Give the syntax of while statement in C.
3. Define an array.
4. Give the syntax for declaring and initializing of one dimensional array.

PART-B

MARKS: 2 X3=6

NOTE: 1. Answer any one question from 5 and 6.

2. Each question carries three marks.

5. a) Write any three differences between break and continue statements.
(OR)
5. b) Write any three differences between while and do-while statements.
6. a) Write a C program to find largest number in array.
(OR)
6. b) Explain any three String handling functions .

PART-C

MARKS: 2 X

5=10

NOTE: 1. Answer any one question from 7 and 8.

2. Each question carries five marks.

7. a) Explain do-while statement with syntax and sample program
(OR)
7. b) Explain switch statement with syntax and sample program .
8. a) Write a C program to find the multiplication of two matrices.
(OR)
8. b) Write a C program to find the addition of two matrices.

MODEL QUESTION PAPER
BOARD DIPLOMA END SEMESTER EXAMINATION (C-21)
CS-205– PROGRAMMING IN C

TIME: 2 HOURS

MAXIMUM MARKS: 40

PART-A

MARKS: 8 X 1=8

NOTE: 1. Answer all questions.

2. Each question carries one mark.

1. List any two differences between algorithm and flowchart..
2. Give the syntax of if statement in C.
3. List any two advantages of functions.
4. Give the syntax for declaring and initializing of one dimensional array.
5. Define function.
6. Define recursion.
7. What is a structure?

8. What is a file?

PART-B

NOTE: 1. Answer any one question from 9, 10, 11 and 12.

MARKS: 4 X 3=12

2. Each question carries three marks.

9. a) Write any three differences between algorithm and flowchart.

(OR)

9. b) Write a C program to find factorial of a number using recursion.

10. a) Write any three differences between break and continue statements.

(OR)

10. b) Write any three differences between structure and union statements.

11. a) Explain elements of function in C.

(OR)

11. b) Write any three differences between local variable and global variable statements.

12. a) Explain various modes to open a file.

(OR)

12. b) Explain how to access structure members.

PART-C

NOTE: 1. Answer any one question from 13, 14, 15 and 16

MARKS: 4 X 5=20

2. Each question carries five marks.

13. a) Draw a flowchart to find biggest of three numbers.

(OR)

13. b) Write a C program to illustrate functions without arguments and without return values.

14. a) Write a C program to find the multiplication of two matrices.

(OR)

14. b) Explain random handling functions.

15. a) Write a C program to illustrate functions with arguments and without return values.

(OR)

15. b) Write a C program to illustrate functions with arguments and with return values.

16. a) Write a C program to implement nested structures.

(OR)

16. b) Write a C program to implement array of structures.

ME-206 ADVANCED ENGINEERING DRAWING

(This Course is Common to all programs of Diploma in Level offered by the State Board of Technical Education, Hyderabad, Telangana State)

Course Title	Advanced Engineering Drawing	Course Code	ME-206
Semester	II	Course Group	Core
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Teaching + Practice	Total Contact Periods:	45
CIE	60 Marks	SEE	40 Marks

Pre-requisites: Knowledge of Basic Engineering Drawing pictorial intelligence to learn this course.

COURSE OUTCOMES (CO)

Upon successful completion of the course, the students will be able to

Course Outcome		CL	Linked Program Objectives (PO)
CO1	Apply the principles of Projection of solids also draw the projections of solids.	R / U / A	1, 2, 3, 4, 7
CO2	Appreciate the need of Sectional views also draw the sectional views and true sections of the engineering components.	R / U / A	1, 2, 3, 4, 7
CO3	Escalate the need of auxiliary views and draw the auxiliary views of the given engineering components.	R / U / A	1, 2, 3, 4, 7
CO4	Gain the knowledge of Isometric views of engineering components also draw the isometric views of given components.	R / U / A	1, 2, 3, 4, 7
CO5	Grasp the knowledge and draw the development of surfaces of different engineering components	R / U / A	1, 2, 3, 4, 6,7
CO6	Appraise the drawing principles and appreciate its applications in engineering field.	R / U / A	1, 2, 3, 4, 7

BLUEPRINT OF MARKS FOR SEE

Unit No	Name of the Unit	Periods	Questions to be set for SEE		
			R	U	A
			PART-A (2M Questions)		PART-B (6 M Questions)
1	Projection of Solids	08	Q1		Q9(a)
2	Sectional Views	08	Q2		Q9(b)
3	Auxiliary views	06	Q3		Q10(a)
4	Pictorial drawing	09	Q4		Q10(b)
5	Development of surfaces	14	Q5, Q6, Q7, Q8		Q11(a), Q11(b), Q12(a), Q12(b)
Total Periods / Total Questions		45	8		4
[R: Remembering, U: Understanding – 2 Marks] [A: Application – 6 Marks]					
Note: Question Paper consists PART – A and PART-B, Total Marks: 40, Time: 2 Hours					
PART – A consists of 8 and student have to answer ALL questions, each question carries 2 marks (8x2 = 16)					
PART – B consists of 4 questions and student have to answer ALL questions, each question carries 6 marks (4x6=24)					

CIE Question Paper Pattern and Syllabus

Unit No	Unit Name	Questions to be set for CIE		
		R	U	A
		2M Questions		6M Questions
Mid Semester - I				
1	Projection Solids	Q1, Q2		Q5(a), Q5(b),
2	Sectional Views	Q3, Q4		Q6(a), Q6(b)
	Total	4		2
Mid Semester - II				
3	Auxiliary views	Q1, Q2		Q5(a), Q5(b),
4	Pictorial drawing	Q3, Q4		Q6(a), Q6(b)
	Total	4		2
[R: Remembering, U: Understanding – 2 Marks] [A: Applying – 6 Marks]				
<u>CIE Question Paper Pattern: Total Marks : 20, Time: 1 Hour</u> Maximum Marks: 20, Time: 1 Hour <u>Part A:</u> Consists of 4 Short questions, students have to attempt ALL questions and each question carries 2 Marks.(4 x 2 = 8 Marks) <u>Part B:</u> Consists of 2 Essay type questions, students have to attempt ALL questions and each question carries 6 Marks.(2 x 6 = 12 Marks)				

COURSE CONTENT

1.0 Projection of solids

(08 periods)

Projection of regular solids

- a) Axis perpendicular to one of the planes
- b) Axis parallel to VP and inclined to HP and vice versa.

2.0 Sectional views

(08 periods)

Need for drawing sectional views – what is a sectional view - Location of cutting plane – Purpose of cutting plane line – Selection of cutting plane to give maximum information (vertical and offset planes) - Hatching – Section of regular solids inclined to one plane and parallel to other plane

3.0 Auxiliary views periods)

(06

Need for drawing auxiliary views -Explanation of the basic principles of drawing an

auxiliary views - explanation of reference plane and auxiliary plane -Partial auxiliary view.

4.0 Pictorial Drawings

(09 periods)

Brief description of different types of pictorial drawing viz., Isometric, oblique, and perspective and their use - Isometric drawings: Iso axis, angle between them, meaning of visual distortion in dimensions - Need for an isometric scale, difference between Isometric scale and ordinary scale difference between Isometric view and Isometric projection - Isometric and non-Isometric lines -Isometric drawing of common features like rectangles, circular shapes, non-isometric lines - Use of box and offset methods.

5.0 Development of Surfaces

(14 periods)

Need for preparing development of surface with reference to sheet metal work - Concept of true length of a line with reference to its orthographic projection when the line is (i) parallel to the plane of projection (ii) inclined to one principal and parallel to the other -Development of simple solids like cubes, prisms, cylinders, cones, pyramid (sketches only) -Types of development: Parallel line and radial line development -Procedure of drawing development, drawings of trays, funnels, elbow pipes and rectangular ducts.

REFERENCE BOOKS

1. Engineering Drawing by Kapil dev – (Asian Publisher)
2. Engineering Drawing by Basant Agarwal&C.M Agarwal - (McGraw-hill)
3. Engineering Drawing by N.D.Bhatt. (Charotar Publishing House Pvt. Ltd.)
4. A Textbook on Engineering Drawing by P. Kannaiah, K. L. Narayana, K. Venkata Reddy

ONLINE RESOURCES

1. <https://nptel.ac.in/courses>
2. www.slideshare.net/shameem.mist/engineering-drawing
3. <https://www.powershow.com/viewfl/76303a>
OWI5M/Engineering_Drawing_powerpoint_ppt_presentation
4. <https://www.powershow.com/view0/91a2bf>
N2Q2N/Basic_engineering_drawing_solved_question_powerpoint_ppt_presentation

SPECIFIC LEARNING OUTCOMES

1.0 Apply Principles of Projection of solids

- 1.1. Draw the projections of solids to axis of solids parallel to one plane.
- 1.2. Draw the projections of solids to axis of solid inclined to other plane.

2.0 Appreciate the need of Sectional Views

- 2.1 Explain the need to draw sectional views.
- 2.2 Select the section plane for a given component to reveal maximum information.
- 2.3 Explain the positions of section plane with reference planes
- 2.4 Differentiate between true shape and apparent shape of section
- 2.5 Draw sectional views and true sections of regular solids discussed in 6.0
- 2.6 Apply principles of hatching.

3.0 Understand the need of auxiliary views

- 3.1 State the need of Auxiliary views for a given engineering drawing.
- 3.2 Draw the auxiliary views of a given engineering component
- 3.3 Differentiate between auxiliary view and apparent view

4.0 Prepare pictorial drawings

- 4.1 State the need of pictorial drawings.
- 4.2 Differentiate between isometric scale and true scale.
- 4.3 Prepare Isometric views for the given orthographic drawings.

5.0 Interpret Development of surfaces of different solids

- 5.1 State the need for preparing development drawing.
- 5.2 Prepare development of simple engineering objects (cubes, prisms, cylinders, cones, pyramid) using parallel line and radial line method.
- 5.3 Prepare development of surface of engineering components like trays, funnel, 90° elbow & rectangular duct.

COURSE-PO ATTAINMENT MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	1	3	-	-	3
CO2	3	2	1	2	-	-	3
CO3	3	1	1	2	-	-	2
CO4	3	1	2	3	-	-	2
CO5	3	2	2	3	-	1	1
CO6	3	1	3	3	-	-	3

BOARD DIPLOMA EXAMINATION, (C-21)
DME – II SEMESTER
MID SEM - I EXAMINATION
ADVANCED ENGINEERING DRAWING

Time: 1 Hours]

[Total Marks: 20

PART-A

4x2=8

Instructions :

1. Answer **ALL** questions.
2. Each question carries **TWO** marks.

1. Draw the projections of a triangular prism of base side 35 mm, resting on H.P. on its base such that one of its base side is perpendicular to V.P.
2. Draw the projections of a cone of base diameter 40 mm and height 60 mm resting on H.P. on its base.
3. A cube of base side 30 mm resting on its base on H.P. such that one of its base side is making an angle of 30° to V.P. A sectional plane parallel to H.P passes through the axis at a distance of 20 mm from the base. Draw the sectional top view of the truncated cube.
4. Draw the sectional top view of the square pyramid of base side 30 mm and height 60 mm is resting on HP on its base with one of its base side is parallel to V.P. when it is cut by a horizontal section plane at a distance of 30 mm from the apex.

PART-B 2x6=12

Instructions :

1. Answer any **ALL** questions.
2. Each question carries **SIX** marks.

5. (a) .Draw the projections of a pentagonal pyramid, base 30 mm edge and axis 50 mm long, having its base on the H.P. and an edge of the base parallel to the V.P. Also draw its side view.

(Or)

5. (b). A tetrahedron of 50 mm long edges is resting on the H.P. on one of its faces, with an edge of that face parallel to the V.P. Draw its projections.

6. (a) A cube of 35 mm long edges is resting on the H.P. on one of its faces with a vertical face inclined at 30° to the V.P. It is cut by a section plane parallel to the V.P. and 9 mm away from the axis and further away from the V.P. Draw its sectional front view and the top view.

(Or)

6. b) A cylinder of 40 mm diameter, 60 mm height and having its axis vertical, is cut by a section plane, perpendicular to the V.P., inclined at 45° to the H.P. and intersecting the axis 32 mm above the base. Draw its front view, sectional top view and true shape.

BOARD DIPLOMA EXAMINATION, (C-21)
DME – II SEMESTER
MID SEM- II EXAMINATION
ADVANCED ENGINEERING DRAWING

Time: 1 Hours]

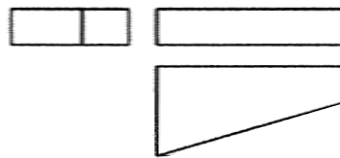
[Total Marks: 20

PART-A

4x2=8

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **TWO** marks.

1. What is the need for an auxiliary view?
2. A cube of side 30 mm placed on HP and sectioned diagonally, draw the auxiliary view of the inclined surface.
3. Draw the isometric view of a block whose orthographic projections are given below assume proper dimensions.



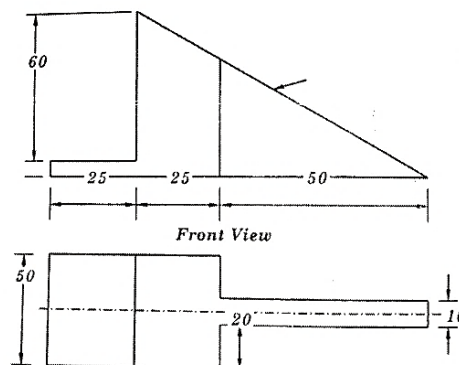
4. Draw the isometric view of a hexagonal plane of base side 30 mm when one of its side is parallel to H.P, when it is horizontal.

PART-B

2x6=12

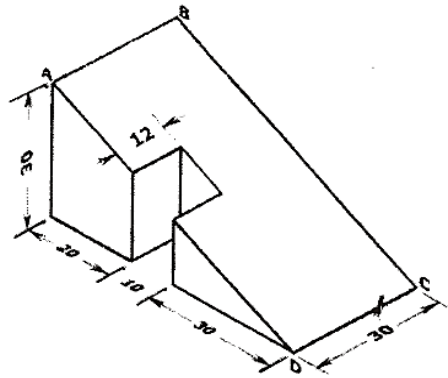
- Instructions :**
1. Answer any **ALL** questions.
 2. Each question carries **SIX** marks.

5. (a) Draw the auxiliary view of a component given below.

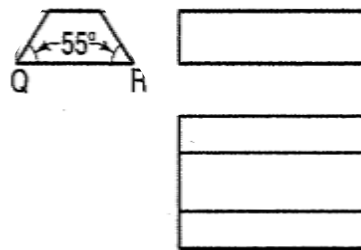


(Or)

5. (b) Draw the auxiliary view of the slopping surface of the cast iron block as shown in the figure.

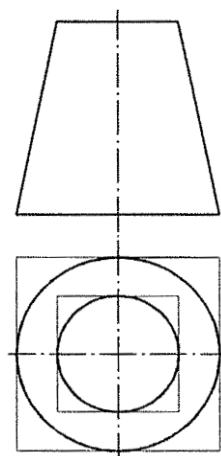


6. (a) Draw the isometric view of the block whose orthographic projections are given below by assuming proper dimensions.



(Or)

6. (b) Draw the isometric drawing of the frustum of a cone shown in figure with proper dimensions.



BOARD DIPLOMA EXAMINATION, (C-21)
DME-II SEMESTER END EXAMINATION
ADVANCED ENGINEERING DRAWING

Time: 2hours]

[Total Marks:40

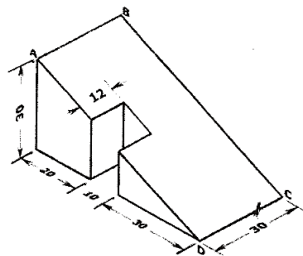
Important Note: Wherever any question has choice, marks will be allotted only to first attempted question. **No marks will be allotted for extra questions answered.**

PART-A

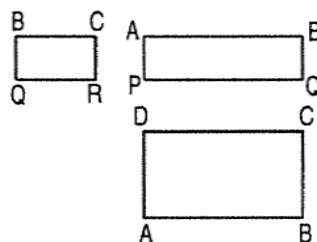
8x2=16

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **TWO** marks.
 3. All the dimensions are in mm.

1. Draw the projections of the cone with 30 mm height and 10 mm base circle radius, resting on H.P. on its base.
2. A cylinder with base radius 20 mm and height 60 mm resting on the ground, a 30° inclined section plane perpendicular to V.P. cuts the cylinder axis at mid point. Draw the sectional top view of the cylinder.
3. Draw the auxiliary view of sloping surface of the object whose isometric view is given below.



4. Draw the isometric view of a block whose orthographic views are given below by assume proper dimensions.



5. Develop the lateral surface of a cube of side length 30 mm.
6. Develop the lateral surface of a triangular pyramid of base side 25 mm and height 50 mm.
7. Develop the lateral surface of a cylinder of base diameter 60 mm.
8. Develop the lateral surface of a hexagonal prism of base side 25 mm and 60 mm height.

PART-B

4x6=24

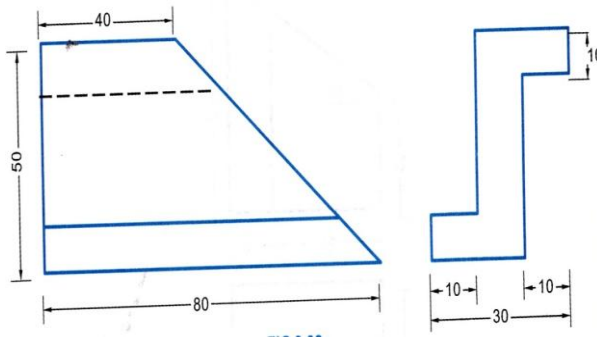
- Instructions :**
1. Answer any **ALL** questions.
 2. Each question carries **SIX** marks.
 3. All the dimensions are in mm.

9. a) Draw the projection of a cone of base diameter 50 mm and height 80 mm when its axis is making an angle of 45° to H.P and parallel to the V.P.

(Or)

9. b) A triangular prism, base 30 mm side and axis 50 mm long, is lying on the H.P. on one of its rectangular faces with its axis inclined at 30° to the V.P. It is cut by a horizontal section plane, at a distance of 12 mm above the ground. Draw its front view and sectional top view.

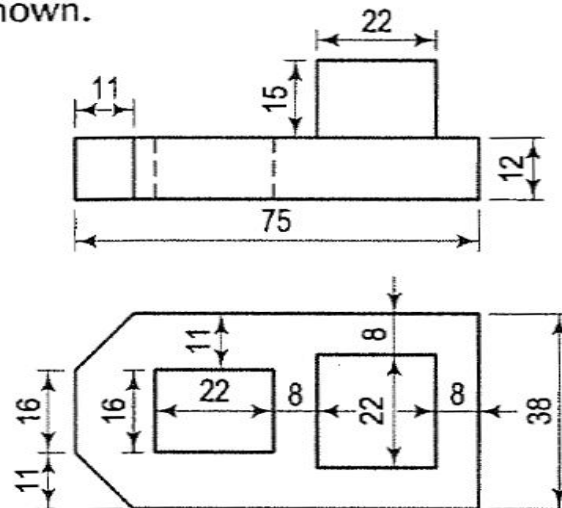
10. a) Draw the auxiliary view of sloping surface of an object shown in figure.



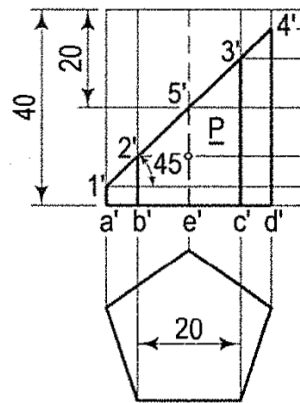
(Or)

10. b) Draw the isometric view of the block, whose orthographic views are shown in figure.

is shown.

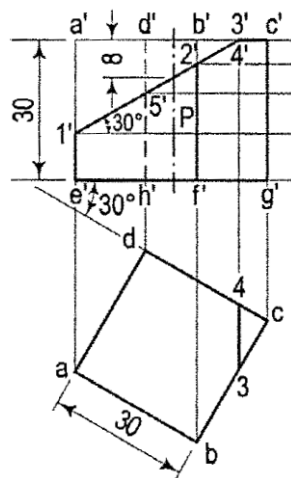


11. a) Develop the lateral surface of the truncated pentagonal prism as shown in figure.

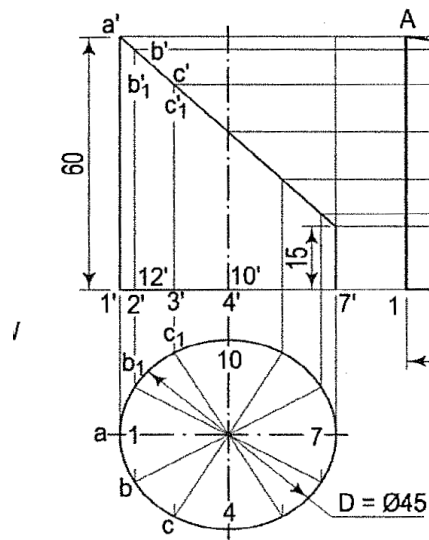


(Or)

11. b) Draw the development of a truncated cube shown in below figure.

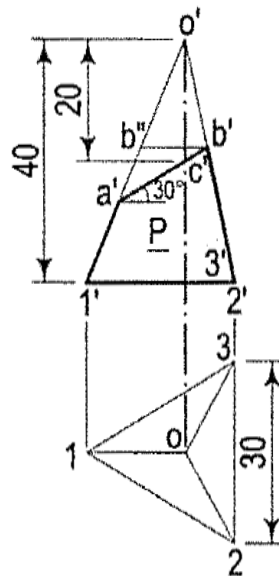


12. a) Develop of bottom portion of the truncated cylinder.



(Or)

12. b) Develop the portion 'P' in the below figure.



ME-207 ADVANCED AUTOCAD LAB

Course Title :	Advanced AutoCAD Lab	Course Code	ME-207
Semester	II	Course Group	Core
Teaching Scheme in Periods(L:T:P)	1:0:2	Credits	1.5
Methodology	Lectures+ Practice	Total Contact Periods :	45
CIE	60 Marks	SEE	40 Marks

Pre requisites This course requires the Basic CAD Skills and concepts of engineering drawing

COURSE OUTCOMES

CO1	Significance of Layers. Create and assign properties to layers and modify layers
CO2	Importance and advantages of blocks. Use of standard blocks and user defined blocks
CO3	Need of solid modeling and various methods of solid modeling with different surfaces
CO4	Create 3D drawings
CO5	Practice 3D object modifying skills
CO6	Practice rendering and selection of material

COURSE CONTENTS

UNIT -1

Duration: 15 periods (T:5 + P:10pds)

1.0 Layers

1.1 Organize the information on layers

Setting a current layer, layers color, line type, line weight, print style locking and unlocking of layers, the layer visibility and layer printing. Setting of current line type. The loading of additional line types, creating and naming of line type, editing of line type.

1.2 Use the Blocks, Attributes and External references to manage the drawing blocks

The purpose of a block, creating a block, inserting a block, redefining a block, exploding a block

1.3 Attribute

Editing attribute definitions, attaching attribute to blocks. Editing attributes attached to blocks, Extracting attributes information.

UNIT -2

Duration: 15 periods (T:5 + P:10)

2.0 Viewing entities in three dimensions

2.1 Creation of three-dimensional entities using different methods

Drawing of two dimensional entities in three dimensional space.

Converting two dimensional planar entities into three dimensional entities by applying elevation and thickness.

Converting two dimensional planar entities into three dimensional entities by revolving or extruding.

Creation of three-dimensional faces, rectangular meshes, ruled surface meshes, extruded surface meshes, revolved surface meshes, three dimensional entities such as boxes, Cylinders, Cones, Spheres, wedges, torus, Regions, extruded solids, revolved solids, composite solids, intersect solids

Boolean operations like union, subtract and interfere.

2.2 Editing in three dimensions

Rotating in three dimensions, Array in three dimensions (Rectangular and polar).

Mirroring in three dimensions, aligning in three dimensions.

2.3 Editing of three dimensional solids

Sectioning and Slicing of solids, hiding, shading and rendering.

2.4 Selection of material from library

Enable the material library, editing materials and material library.

UNIT- 3

3.0 Application of above units 10P)

Duration: 15 periods (T:5 +

RECOMMENDED BOOKS

1. Auto cad by George Omura
2. 4MCAD User Guide- IntelliCAD Technology Consortium

SPECIFIC LEARNING OUTCOMES:

UNIT -1

1.0 Organize the information on layers

- 1.1 Explain the need and importance of Layers.
- 1.2 Practice creating new layer, naming the layer and assigning properties like Layer colour, Line type and line weight and setting the current layer
- 1.3 Practice the locking and unlocking of layers
- 1.4 Practice the Freezing and thawing of layers
- 1.5 Practice the layer visibility and layer printing
- 1.6 Practice the loading of additional line types

Use the Blocks, Attributes and External references to manage the Drawing

- 1.7 Define a block
- 1.8 Explain the purpose of a block
- 1.9 Practice the creating a block
- 1.10 Practice the inserting a block
- 1.11 Practice the redefining a block
- 1.12 Practice the exploding a block
- 1.13 Define an Attribute
- 1.14 Practice the editing attribute definitions
- 1.15 Practice the attaching attribute to blocks
- 1.16 Edit attributes attached to blocks
- 1.17 Extract attributes information
- 1.18 Define external reference
- 1.19 Practice the Attaching, Removing, and Reloading of external references
- 1.20 Practice the Binding, Clipping and changing the path of external references

UNIT -2

2.0 Understand the concepts of 3D

- 2.1 View entities in three dimensions
- 2.2 To set a new viewing direction
- 2.3 To dynamically set a view direction

Create three-dimensional entities using different methods

- 2.4 Draw two dimensional entities in three dimensional space.
- 2.5 Convert two dimensional planar entities into three dimensional entities by applying elevation and thickness.
- 2.6 Convert two dimensional planar entities into three dimensional entities by revolving or extruding.
- 2.7 Create three-dimensional faces.
- 2.8 Create rectangular meshes.
- 2.9 Create ruled surface meshes.
- 2.10 Create extruded surface meshes.
- 2.11 Create revolved surface meshes.
- 2.12 Create three dimensional entities such as boxes, Cylinders, Cones, Spheres, wedges, torus, Regions.
- 2.13 Create extruded solids.
- 2.14 Create revolved solids.
- 2.15 Create composite solids.
- 2.16 Create intersect solids.

Editing in three dimensions

- 2.17 Rotate in three dimensions
- 2.18 Array in three dimensions (Rectangular and polar)
- 2.19 Mirror in three dimensions
- 2.20 Align in three dimensions

Edit three dimensional solids

- 2.21 Practice Sectioning and Slicing solids

2.22 Practice hiding, shading and rendering

UNIT -3

3.0 Practice applications on above unit

Exercise	Key components
Layers	• Importance of layers • Creation of new layers and controlling properties of layers
Working with blocks	• Create, insert and explode a block • Attach attribute to blocks • Edit and extract attributes attached to blocks
View entities in three dimensions	• Set a new viewing direction • Set dynamically view direction
Create three-dimensional entities	• Create three-dimensional faces • Create rectangular meshes, ruled surface meshes, extruded surface meshes, revolved surface meshes • Create three dimensional entities such as boxes, Cylinders.
Edit in three dimensions	• Rotate in three dimensions • Array in three dimensions (Rectangular and polar) • Mirror in three dimensions • Align in three dimensions
Edit three dimensional solids	• Practice Sectioning and Slicing solids • Practice hiding, shading and rendering
Practice the selection of material from library	• Enable material library • Edit materials and material library

Course Outcome		Cognizant Level	Linked PO	Teaching Hours
CO1	Significance of Layers. Create and assign properties to layers and modify layers	U/A	1,2,3,4,7	6
CO2	Importance and advantages of blocks. Use of standard blocks and user defined blocks	U/A	1,2,3,4,6,7	9
CO3	Need of solid modeling and various methods of solid modeling with different surfaces	U/A	1,2,3,4,7	3
CO4	Create 3D drawings	U/A	1,3,4,6,7	6
CO5	Practice 3D object modifying skills	U/A	1,3,4,6,7	6
CO6	Practice rendering and selection of material	A	1,2,3,4,6,7	15

CO-PO MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	3	-	-	3
CO2	3	1	2	2	-	1	3
CO3	3	2	2	3	-	-	2
CO4	3	-	2	3	-	1	2
CO5	3	-	2	3	-	1	2
CO6	3	2	3	3	-	2	2

MID SEM-I EXAM

S N	Unit name	R,U (Q No's)	A (Q No's)	Remarks
1	Unit-1	1,2,3,4	5,6	

MID SEM-2 EXAM

S N	Unit name	R,U (Q No's)	A (Q No's)	Remarks
1	Unit-2	1,2,3,4	5,6	

SEE

S N	Unit name	Questions to be set for SEE		Remarks
		R,U (Q No's)	A (Q No's)	
1	Unit-1	1,2		
2	Unit-2	3,4		
3	Unit-3		5,6	

ME-207- Advanced AutoCAD Lab
MODEL PAPER FOR MID -I (CIE)

TIME: 2hr

Marks: 20M

PART-A

NOTE: Answer all questions

4 X 2 =

8marks

1. Create four layers, name the layers and assign different properties like line color, line type, line weight to different layers.
2. Write the procedure to create a block.
3. What is meant by attribute.
4. What do you mean by layer and what are the advantages of it.

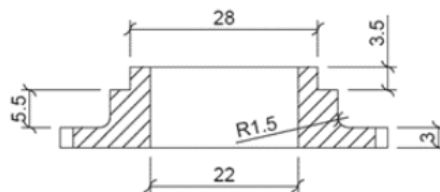
PART-B

NOTE: Answer any one questions

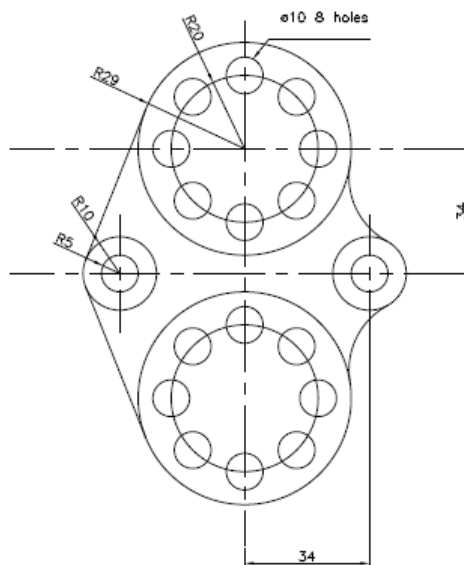
1 X 2 =

12marks

5. Draw the following using Layers. Use different layers to different line types, text, dimension and main figure.



6. Draw the following using Layers. Use different layers to different line types, text, dimension and main figure.



ME-207- Advanced AutoCAD Lab
MODEL PAPER FOR MID -II (CIE)

TIME: 2hr

Marks: 20M

PART-A

NOTE: Answer all questions

4 X 2 =

8marks

1. Draw rectangle of 100x60 and extrude to a depth of 25mm.
2. Draw a cylinder of dia 50mm and height 100mm.
3. List various Boolean operations
4. Draw a cube of 100mm side and make a hole of 25mm.

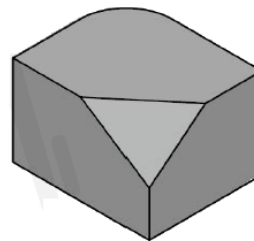
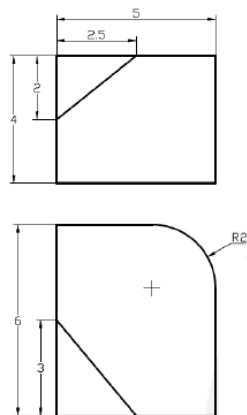
PART-B

NOTE: Answer any one questions

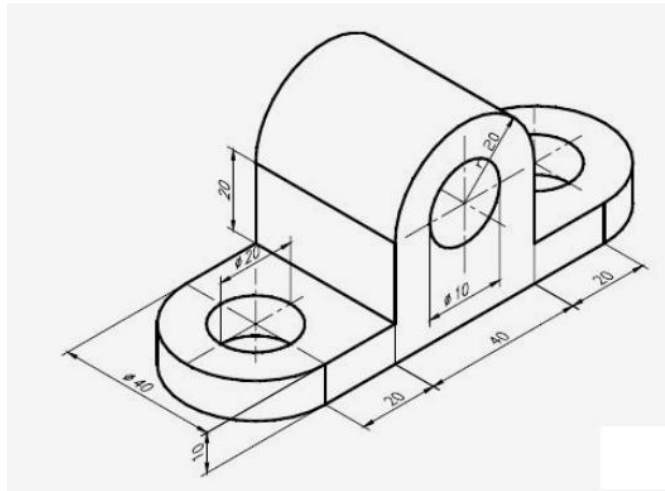
1 X 2 =

12marks

5. Draw the following 3D figure using any CAD software as per the given dimension.



6. Draw the following using any CAD software and add dimensioning.



ME-207- Advanced AutoCAD Lab
MODEL PAPER FOR SEE

TIME: 3hr

Marks: 40M

PART-A

NOTE: Answer all questions
16marks.

4 X 4 =

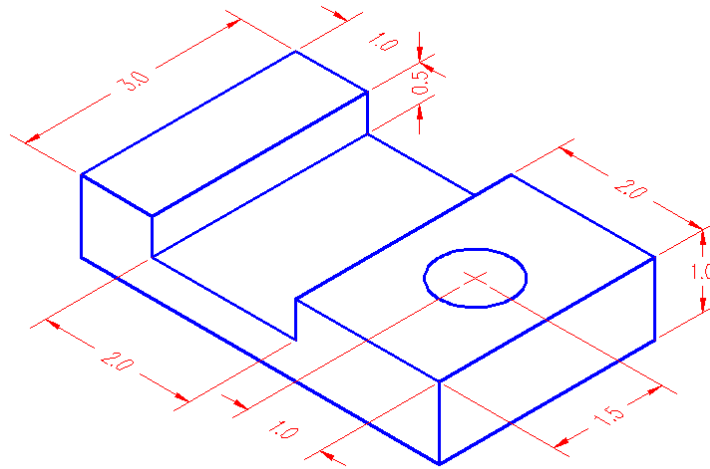
1. Write the procedure to create and insert a block.
2. Create four layers, name the layers and assign different properties like line color, line type, line weight to different layers.
3. Draw a 3D cone of base 30mm and height 50mm
4. Draw to 2 boxes of 50x30x20 and 30x50x20 mm and union them

PART-B

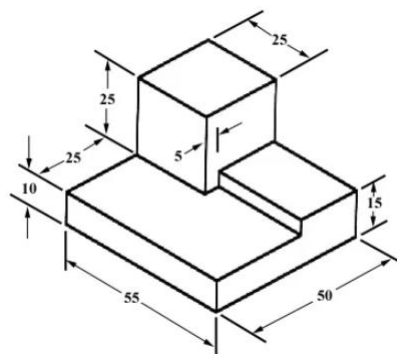
NOTE: Answer any one questions

1 X 24 = 24marks

5. (a) Draw the following 3D object CAD software. 20+4 marks
(b) List the commands in sequence and also write the procedure



6. (a) Draw the following 3D object CAD software. 20+4 marks
(b) List the commands in sequence and also write the procedure



ME-208-ADVANCED WORKSHOP LAB

Course Title	Advanced Workshop Lab	Course Code	ME-208
Semester	II	Course Group	Core
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practice	Total Contact Periods	45Pds
CIE	60 Marks	SEE	40 Marks

Pre requisites: This course requires the basic skills of Handling Domestic tools and the knowledge of Basic Mathematics at Secondary school level

COURSE OUTCOMES

CO1	Ability to Identify, select and use various marking, measuring, and holding, striking and cutting tools & equipments in fitting and sheet metal shops.
CO2	Ability to Operate, control different machines and equipments in Fitting Shop.
CO3	Ability to Design and model assemblies by filing in the fitting shop.
CO4	Ability to Design and model different prototypes in the forging shop.
CO5	Ability to prepare sand for moulds and making the moulds ready for casting operation.
CO6	Design and model different prototypes and utility articles in the sheet metal shop such as hollow cylinder, funnel.

COURSE CONTENT

FITTING SHOP

1. Marking, cutting, drilling, Chamfering and tapping on a M.S. Flat 12 mm thick.
2. Assembling of two pieces, Matching by filing (L/V Shape)

FORGING SHOP

1. Preparation of chisel from round rod.
2. Preparation of ring and hook from M.S. round.
3. Preparation of a hexagonal Head using upsetting operation.

SHEET METAL WORK

1. Preparation of hollow cylinder
2. Preparation of mug.
3. Preparation of funnel

FOUNDRY PRACTICE

Preparation of sand Mould and cutting of Gate, Runner and Riser

1.1 With single piece pattern

1.2 With Split pattern

1.3 With Connecting rod

1.4 Flange coupling

REFERENCE BOOKS

1. Manufacturing Technology (Vol I) by P N Rao (McGraw Hill)
2. Principles of Foundry Technology by P L Jain (McGraw Hill)

Competencies and Key competencies to be achieved by the student

Title of the Job	Competencies	Key Competencies
Fitting shop		
• Tapping and Dieing on a MS flat of 2 mm thick	Check the raw material for size - Identify appropriate tap and die - Secure the tap in the wrench - Tap the hole - Hold the bar in bench vice - Fix the die in die stock - Cut external threads using a Die - Check the fit for accuracy	• Secure the tap in the wrench • Tap the hole • Fix the die in die stock • Cut external threads using a Die
• Assembling of two pieces, matching by filing	- Cut the pieces to size using hack saw - File surface of flat for trueness - Mark the surfaces as per dimensions - Dot punch the marked lines - Cut with hack saw as per marked lines - Smoot the surfaces with file - Assemble the two pieces	• Identify appropriate file • File the specimen • Assemble two pieces
Title of the Job	Competencies	Key Competencies
Forging shop		

Preparation of a Chisel from round rod	- Identify the holding and striking tools - Heat the specimen to the appropriate temperature - Remove the specimen and hold it on the anvil - Hammer the specimen to the required shape	- Heat the specimen to the appropriate temperature - Hammer the specimen to the required shape
Preparation of a ring and hook from M.S round	- Identify the holding and striking tools - Heat the specimen to the appropriate temperature - Remove the specimen and hold it on the anvil - Hammer the specimen to the required shape	- Heat the specimen to the appropriate temperature - Hammer the specimen to the required shape
Preparation of a hexagonal bolt and nut	- Identify the holding and striking tools - Heat the specimen to the appropriate temperature - Remove the specimen and hold it on the anvil - Upset one end by using upset tool - Hammer the specimen to the required shape	- Heat the specimen to the appropriate temperature - Hammer the specimen to the required shape

Title of the Job	Competencies	Key Competency
Sheet metal Work		
Sheet metal Work Preparation of hallow cylinder	- Draw the development of the object to be made - Place the pattern on the sheet - Mark the dimensions using scribe - Shear the required piece from the stock using straight snips - Mark the lines on the sheet to form bends - Strengthen the sides of sheet by singe hem on top &	- Identify the marking and cutting tools - Drawing development of objects - Cut the sheet - Inter lock the sides and apply pressure using mallet to make a strong joint

	bottom side using hatchet stake - Form the flat sheet into cylindrical shape by cylindrical stake and apply pressure using mallet - Prepare single hem on to longitudinal sides in opposite directions - Inter lock the sides and apply pressure to make a strong joint	
Preparation of mug	- Draw the development of the object to be made. - Cut the circles of a given diameter using a straight snips. - Mark the allowance for turning the edge of a circular drill - known the edge of the circular disc to 90° using half moon stake - planish the turned edge of circular disc using a square edge stake and a tinman's anvil stake - turn the edge of a cylinder to form a flange without damaging the edges using a copper smith stake - make single seam (paned down joint) using hand tools - make double seam (knocked up joint) using hand tools.	- Identify the marking and cutting tools - Drawing development of objects - Cut the sheet - Inter lock the sides and apply pressure using mallet to make a strong joint
Preparation of funnel	- Draw the development of upper conical part - Place the pattern on the sheet and cut to required size - Hem the upper side of the sheet - Flange out the bottom side of the sheet	- Draw the development of upper and bottom conical parts - Place the pattern on the sheet and cut to required size

	- Fold the edges of the joining sides - form the sheet into conical shape using appropriate stake and mallet - Repeat the similar operation for making the bottom part - Seam the top conical part and bottom conical part to obtain required funnel	• form the sheet into conical shape using appropriate stake and mallet • Seam the top conical part and bottom conical part to obtain required funnel
Title of the Job	Competencies	Key Competencies
Foundry Practice		
Moulding and Casting of solid bearing	- Select the suitable sand and its mix for the mould - Place the pattern in correct position - Ram the sand properly - Provide vent holes - Remove the pattern slowly - Cut gates and runners - Pour sufficient quantity of molten metal into the mould cavity	• Identify the Hand moulding tools • Know the applications of different types of sands • Know the importance of Pattern Allowances. • Cut gates and runners • Pour sufficient quantity of molten metal
Moulding and Casting of split bearing	- Select the suitable sand and its mix for the mould - Place the pattern in correct position - Ram the sand properly - Provide vent holes - Remove the pattern slowly - Cut gates and runners - Pour sufficient quantity of molten metal into the mould cavity	• Identify the Hand moulding tools • Know the applications of different types of sands • Know the importance of Pattern Allowances. • Cut gates and runners • Pour sufficient quantity of molten metal
Moulding and Casting of Connecting rod	- Select the suitable sand and its mix for the mould - Place the pattern in correct position - Ram the sand properly - Provide vent holes	• Identify the Hand moulding tools • Know the applications of different types of sands • Know the importance

	- Remove the pattern slowly - Cut gates and runners - Pour sufficient quantity of molten metal into the mould cavity	of Pattern Allowances. • Cut gates and runners • Pour sufficient quantity of molten metal
Moulding and Casting of Flange coupling	- Select the suitable sand and its mix for the mould - Place the pattern in correct position - Ram the sand properly - Provide vent holes - Remove the pattern slowly - Cut gates and runners - Pour sufficient quantity of molten metal into the mould cavity	• Identify the Hand moulding tools • Know the applications of different types of sands • Know the importance of Pattern Allowances. • Cut gates and runners • Pour sufficient quantity of molten metal

Course Outcome		CL	Linked PO
CO1	Ability to Identify, select and use various marking, measuring, and holding, striking and cutting tools & equipments in wood working and sheet metal shops.	R/U/A	1,2,3 ,7
CO2	Ability to Operate, control different machines and equipments in Fitting Shops.	R/U/A	1,2,3 ,7
CO3	Ability to Design and model assemblies by filing in the fitting shop.	R/U/A	1,2,3 ,7
CO4	Ability to Design and model different prototypes in the forging shop.	R/U/A	1,2,3 ,7
CO5	Ability to Design and model different prototypes in the carpentry trade such as Mortise and Tenon joint, and House hold articles.	R/U/A	1,2,3 ,7
CO6	Design and model different prototypes and utility articles in the sheet metal shop such as elbow, funnel.	R/U/A	1,2,3 ,7

CO-PO Attainment Matrix:

CO	PO						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
C01	3	2	2	-	-	-	2
C02	3	2	3	-	-	-	2
C03	3	2	3	-	-	-	1
C04	3	2	3	-	-	-	1
C05	3	2	3	-	-	-	1
C06	3	2	3	-	-	-	1

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed

ME-208 - ADVANCED WORKSHOP LAB
MID SEM-I (CIE) EXAM

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Prepare internal thread using tap set and prepare external thread using die set on round bar as per the given figure.
2. Prepare a male female assembly as per the given figure on MS Flat with fitting operations.
3. Prepare chisel from round rod as per the given figure.
4. Prepare ring and hook from round rod as per the given figure.
5. Prepare hexagonal headed bolt using upsetting as per the given figure.
6. Prepare a hollow cylinder from the given sheet as per the given figure.
7. Prepare a mug from the given sheet as per the given figure.
8. Prepare a funnel from the given sheet as per the given figure.
9. Prepare mould for given pattern solid bearing.
10. Prepare mould for given pattern split bearing.
11. Prepare mould for given pattern connecting rod.
12. Prepare mould for given pattern flange coupling.

Note:

1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice
2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

ME-208 - ADVANCED WORKSHOP LAB
MID SEM-II (CIE) EXAM

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Prepare internal thread using tap set and prepare external thread using die set on round bar as per the given figure.
2. Prepare a male female assembly as per the given figure on MS Flat with fitting operations.
3. Prepare chisel from round rod as per the given figure.
4. Prepare ring and hook from round rod as per the given figure.
5. Prepare hexagonal headed bolt using upsetting as per the given figure
6. Prepare a hollow cylinder from the given sheet as per the given figure.
7. Prepare a mug from the given sheet as per the given figure.
8. Prepare a funnel from the given sheet as per the given figure.
9. Prepare mould for given pattern solid bearing.
10. Prepare mould for given pattern split bearing.
11. Prepare mould for given pattern connecting rod.
12. Prepare mould for given pattern flange coupling.

Note:

1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice
2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

ME-208 - ADVANCED WORKSHOP LAB
SEMESTER END EXAM (SEE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Prepare internal thread using tap set and prepare external thread using die set on round bar as per the given figure.
2. Prepare a male female assembly as per the given figure on MS Flat with fitting operations.
3. Prepare chisel from round rod as per the given figure.
4. Prepare ring and hook from round rod as per the given figure.
5. Prepare hexagonal headed bolt using upsetting as per the given figure
6. Prepare a hollow cylinder from the given sheet as per the given figure.
7. Prepare a mug from the given sheet as per the given figure.
8. Prepare a funnel from the given sheet as per the given figure.
9. Prepare mould for given pattern solid bearing.
10. Prepare mould for given pattern split bearing.
11. Prepare mould for given pattern connecting rod.
12. Prepare mould for given pattern flange coupling.

Note:

1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice

Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis

SC-209 - Applied Science Lab

Course Title	Applied Science Lab	Course Code	SC-209
Semester	II	Course Group	Practical
Teaching Scheme in Pds/Hrs(L:T:P)	1:0:2	Credits	1.5
Type of course	Tutorial & Practical	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

Physics Lab

Pre requisites: Knowledge of basic concepts of basic High school science and basic mathematics

Course objectives: To provide practical knowledge about the basics of Physics instrumentation and calculations/measurements.

Course outcomes:

Course Outcomes	
CO 1	Understand the properties of convex lens and find the focal length and focal power of convex lens (Separate & Combination)
CO 2	Determine the value of acceleration due to gravity using simple pendulum and verify with $L-T^2$ graph.
CO 3	Determine the velocity of sound in air at room temperature and calculate velocity of sound at 0°C .
CO 4	Determine the refractive index of a solid using travelling microscope.
CO 5	Practice the mapping of magnetic lines of force-locating neutral points and calculate magnetic moment.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO 1	3			-	-	1	1
CO 2	3			-	-	1	1
CO 3	3			-	-	1	1
CO 4	3			-	-	1	1
CO 5	3			-	-	1	1
	3					1	1

Learning outcomes

On successful completion of the course, the student will have ability to:

1. Find the focal length and focal power of convex lens (Separate & Combination)
2. Determine the value of acceleration due to gravity and verify with $L-T^2$ graph.
3. Determine the velocity of sound in air at room temperature and calculate velocity of sound in air at 0°C .
4. Determine refractive index of a solid.
5. Practice the mapping of magnetic lines of force-location of neutral points and calculate magnetic moment.

Course Delivery:

The course will be delivered through lectures, class room interaction, group discussions, graded exercises, demonstration and practice.

Tutorial: 1 Period/Experiment:

1. Introduction to Physics practical and its importance, safety precautions in maintenance of equipment in the laboratory.
2. Maintenance of apparatus and equipment.
3. Follow of Do's and Don'ts.
4. Maintenance of data in manual and record book.
5. Write the procedure of the experiment before the commencement of each experiment.
6. Strictly following of instructions given from time to time by the lecturer-in-charge.
7. Demonstration of each experiment by the lecturer in charge.

Conduction of experiments: 2 periods/Experiment.

Student must perform experiment individually under the supervision of the lecturer-in charge.

EXAMINATION & EXPERIMENTS		
S.NO	EXAMINATION	EXPERIMENTS
1	MIDSEM-I	EXPERIMENT NO 1 & 2
2	MIDSEM-II	EXPERIMENT NO 3 & 4
3	SEMESTER END EXAMINATION	EXPERIMENT NO 1,2,3,4 and 5

Scheme of Valuation of SEE		
S.No	Particulars	Marks
1.	Objective/Aim	01
2.	Apparatus/Equipment	02
3.	Observations	02
4.	Principle including formula	02
5.	Experiment (Tabular form, readings, etc)	05
6.	Calculation and Result	05
7.	Viva Voce	03
	Total	20

References:

1. Basic Applied Physics – R.K. Gaur
2. Laboratory manual for class XI and XII - NCERT

Chemistry Lab

Prerequisite:

Knowledge of basic concepts of Chemistry of Secondary Education.

Course Objectives:

To provide practical knowledge about the basics of volumetric analysis of chemical compounds.

Course Outcomes:

On successful completion of the course, the student will have ability to attain the following COs

Course Outcome	
CO1	Estimate the amount of the molar salt in the given solution
CO2	Determination of acidity of given water samples/solutions.
CO3	Determination of alkalinity of given water samples/solutions.
CO4	Determination of pH of given water samples/solutions.
CO5	Estimate the amount of the chlorides in the given solution.

CO-PO Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	-	1	1	1
CO2	3	-	-	-	2	1	1
CO3	3	-	-	-	2	1	1
CO4	3	-	-	2	2	1	1
CO5	3	-	-	-	2	1	1

Course Delivery:

The course will be delivered through lectures, classroom interaction, group discussion, demonstration and practicals.

Conduction of experiments: Lecture 1 period + Experiment 2 periods.

Student must conduct experiment individually under the supervision of the staff-in-charge.

Lecture and Demonstration: 1 Period

1. Introduction of chemistry practical and its importance, safety precautions in maintenance of cleanliness and orderliness of chemicals in the laboratory.
2. Maintenance of apparatus and equipment.
3. Follow of Do's and Don'ts.
4. Maintenance of data in record book.
5. Write the procedure of the experiment before the commencement of each experiment.
6. Strict following of instructions given from time to time by the staff-in-charge.
7. Demonstration of each experiment by the staff in charge.

Course content

Volumetric Analysis: (22.5 Periods)

Volumetric Analysis by Titrimetric Method:-

Volumetric Analysis - Titration – Standard solutions - Concentration of solutions - Indicators – Self indicator - Acid base indicators - Selection of indicators - Endpoint of titration - Neutralization.

List of experiments:

1. Estimation of Mohr's salt by using 0.02M potassium permanganate solution.
2. Determination of acidity of water sample by using 0.02N NaOH solution.
3. Determination of alkalinity of water sample by using 0.02N H₂SO₄ solution.
4. Find out the pH of the given solution by using pH meter.
5. Estimate the chloride content present in water sample by using 0.0141N AgNO₃ solution.

Specific Learning Outcomes

Upon completion of the course, the student will have ability to

1. Estimate Mohr's salt by using standard potassium permanganate solution.
2. Determine the partial and total acidity of water sample by using 0.02N NaOH solution.
3. Determine the partial and total alkalinity of water sample by using 0.02N H₂SO₄ solution.
4. Find out the pH of the given solution by using pH meter.
5. Estimate the chloride content present in water sample by using 0.0141N AgNO₃ solution.

Reference Books:

1. Vogel's Inorganic Qualitative and Quantitative Analysis.
2. Practical chemistry by O.P. Pande & others.
3. Qualitative and quantitative analysis by Alex.

EXAMINATION & EXPERIMENTS		
S.NO	EXAMINATION	EXPERIMENTS
1	MIDSEM-I	Experiment No 1 & 2
2	MIDSEM-II	Experiment No 3 & 4
3	SEMESTER END EXAMINATION	Experiment No 1,2,3,4 and 5

Scheme of Valuation for SEE		
Sl. No.	Particulars	Marks
1	Identification of apparatus/equipment/chemical compounds/tools/etc.	2
2	Writing Principle and Procedure	5
3	Experiment and Observations	6
4	Calculation and Results	4
5	Viva-voce	3
Total		20

BOARD DIPLOMA EXAMINATION, (C-21)
MIDSEM – I
SECOND SEMESTER EXAMINATION
SC-209APPLIED SCIENCE LAB

TIME: 1 Hour

TOTAL MARKS: 20

- Instructions:** (1) Answer both PART-A AND PART-B on separate answer sheets.
- (2) Each question carries **TEN** marks.

PART-A (PHYSICS LAB)

Perform ONE experiment allotted by the examiner.

1 x 10 = 10

1. Determine the Focal length and focal power of given convex lens using U-V method.
2. Determine the value of acceleration due to gravity at your place sing Simple Pendulum.
3. Determine the value of acceleration due to gravity at your place sing Simple Pendulum by L-T² graph.

PART-B (CHEMISTRY LAB)

Perform ONE experiment allotted by the examiner.

1 x 10 = 10

1. Estimate the amount of Mohr's salt present in the given 500 ml of solution by using 0.02M potassium permanganate solution.
2. Determine the partial acidity of water sample by using 0.02N NaOH solution.
3. Determine the total acidity of water sample by using 0.02N NaOH solution

BOARD DIPLOMA EXAMINATION, (C-21)
MIDSEM – II
SECOND SEMESTER EXAMINATION
SC-209 - APPLIED SCIENCE LAB

TIME: 1 Hour

TOTAL MARKS: 20

Instructions: (1) Answer both PART-A AND PART-B on **separate** answer sheets.

(2) Each question carries **TEN** marks.

PART-A (PHYSICS LAB)

Perform ONE experiment allotted by the examiner.

1 x 10 = 10

1. Determine the velocity of sound in air at room temperature by resonance method.
2. Determine the refractive index of a solid using travelling microscope.

PART-B (CHEMISTRY LAB)

Perform ONE experiment allotted by the examiner.

1 x 10 = 10

1. Determine the partial alkalinity of water sample by using 0.02N H₂SO₄ solution.
2. Determine the total alkalinity of water sample by using 0.02N H₂SO₄ solution
3. Find out the pH of the given solution by using pH meter.

BOARD DIPLOMA EXAMINATION, (C-21)
SEMESTER END EXAMINATION
SECOND SEMESTER EXAMINATION
SC-209 - APPLIED SCIENCE LAB

Time: 2 Hours]

[Total Marks: 40

Instructions: (1) Answer both PART-A AND PART-B on separate answer sheets.

(2) Each question carries **TWENTY** marks.

PART-A (PHYSICS LAB)

Perform ONE experiment allotted by the examiner.

1 x 20 = 20

1. Determine the Focal length and focal power of given convex lense using U-V method.
2. Determine the Focal length and focal power of given convex lense by U-V graph method
3. Determine the value of acceleration due to gravity at your place sing Simple Pendulum.
4. Determine the value of acceleration due to gravity at your place sing Simple Pendulum by L-T² graph.
5. Determine the velocity of sound in air at room temperature by resonance method.
6. Determine the refractive index of a solid using travelling microscope.
7. Draw magnetic lines of force around a bar magnet placed in NN position of earth's magnetic field and locate neutral points.
8. Draw magnetic lines of force around a bar magnet placed in NS position of earth's magnetic field and locate neutral points.

PART-B (CHEMISTRY LAB)

Perform ONE experiment allotted by the examiner.

1 x 20 = 20

1. Estimate the amount of Mohr's salt present in the given one litre of solution by using 0.02M KMnO₄ solution.
2. Determine the partial acidity of water sample by using 0.02 N NaOH solution.
3. Determine the total acidity of water sample by using 0.02 N NaOH solution
4. Determine the partial alkalinity of water sample by using 0.02 N H₂SO₄ solution.
5. Determine the total alkalinity of water sample by using 0.02 N H₂SO₄ solution
6. Estimate the chloride content present in water sample by using 0.0141 N AgNO₃ solution
7. Find out the pH of the given solution by using pH meter.

PROGRAMMING IN C LAB

Course Title	Programming in C Lab	Course Code	CS-210
Semester	II	Course Group	Practical
Teaching Scheme in Periods(L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Hours :	45
CIE	60 Marks	SEE	40 Marks

Pre requisites

Basic knowledge of Computer Operation.

Course Content

Unit Number	Unit Name	Periods
1	Concepts of Algorithm, Flowchart and Program	2
2	Using Variables, Operators, Data-types	4
3	Decision making and Looping statements	10
4	Arrays and String programming	8
5	Concept of Functions.	10
6	Structure, union and Files	11
	Total	45

Course Objectives

1. Use the concepts of algorithm and flowchart for developing programs in C language.
2. Use variables, constants, data types, operators and Input / Output functions in programs.
3. Apply decision making and looping concepts for developing programs in C language
4. Implement the concepts of arrays and structures for a given problem.
5. Illustrate the use of functions in developing modular programming.
6. Creating and managing Files.

Course Outcomes

On successful completion of the course, the students will be able to attain below Course Outcome(CO):

Course Outcome		Experiment Linked	CL	Linked PO	Lab Sessions
CO1	Use the concepts of algorithm and flowchart for developing programs in C language.	1,2,3	U, A	1,2,3,4,7	3
CO2	Use variables, constants, data types, operators and Input / Output functions in programs	4,5,6,7	U, A	1,2,3,4,7	3
CO3	Apply decision making and looping concepts for developing programs in C language	8,9,10,11,12,13, 14,15	U, A	1,2,3,4,7	10
CO4	Implement the concepts of arrays and structures for a given problem	16,17,18,21	U, A	1,2,3,4,7	14
CO5	Illustrate the use of functions in developing modular programming	19,20	U,A	1,2,3,4,7	10
CO6	Creating and managing Files	22	U,A	1,2,3,4,7	5
					45

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

Course-PO Attainment Matrix

Course	Program Outcomes						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
PROGRAMMING IN C LAB	3	3	3	3	-	-	3

References

1. Let Us C -- Yeshwanth Kanetkar BPB Publications
2. Programming in ANSI C -- E. Balaguruswamy Tata McGrawHill
3. Programming with C -- Gottfried Schaum's outline
4. C The complete Reference -- Schildt Tata McGraw Hill

Course Delivery

The course will be delivered through Demonstration and Practices.

List of Exercises:-

1. Exercise on developing algorithms
2. Exercise on drawing flowcharts
3. Exercise on structure of C program
4. Exercise on Keywords, identifiers, constants, variables
5. Exercise on data types and operators in a simple C program
6. Exercise on input and output of characters
7. Exercise on formatted input and output.
8. Exercise on simple if statement
9. Exercise on if else statement
10. Exercise on else if ladder statement
11. Exercise on switch statement
12. Exercise on conditional operator
13. Exercise on while statement
14. Exercise on for statement
15. Exercise on do...while statement
16. Exercise on one dimensional arrays
17. Exercise on two dimensional arrays
18. Exercise on string handling functions.
19. Exercise on Functions
20. Exercise on Recursion
21. Exercise on structures
22. Exercise on Files.

ME-211-SKILL UPGRADATION

Course Title	Skill Upgradation	Course Code	ME-211
Semester	II	Course Group	Core
Teaching Scheme in Hrs(L:T:P)	0:0:8	Credits	2.5
Methodology	Lecture + Practice	Total Contact Hours	120

Advanced English – Skills Upgradation

TASK:

LEVEL 1: Collection of material for learning skills

LEVEL2: Analysis of the material

LEVEL 3: Practice the activities

LEVEL 4: Assessment of the skills acquired

Activity before the activities:

Collect the material useful for learning Listening, Speaking, Reading, Writing (LSRW skills), Grammar and Vocabulary

- 1. Collect newspaper clippings, books, puzzles, pictures, audio and video programmes in English*
- 2. Talk to your classmates, seniors, alumni, teachers, successful people in job interviews and celebrities*
- 3. Visit libraries to gather information on language learning skills*
- 4. Visit useful websites for learning vocabulary and grammar.*

Activities:

1. Collect the prefixes, suffixes and roots and build vocabulary
2. Collect the vocabulary building games and activities. Practice them individually, in pairs and groups.
3. Learn different kinds of reading a text. Practice reading various kinds of reading material.
4. Collect the following reading material:
 - a) Short stories (Read them aloud in the class.)
 - b) Collect interesting / funny articles on science and technology, biographies and travelogues. (Display them on the board.)
5. Practice jigsaw reading
6. Practice dialogues on
 - a) Fixing, rescheduling and cancelling appointments.
 - b) Extending, accepting and declining invitations.

- c) Offering help, opinion and suggestions.
(Dramatize the dialogues)
7. Identify the treasure hidden in the institute by giving directions and instructions to your team members. (Treasure Hunt game)
 8. Collect different kinds of tables, pie charts, graphs, tree diagrams, etc. and interpret them using primary and secondary analysis.
 9. Prepare a tree diagram on your family for three to four generations.
 10. Identify and correct the errors in the given reading material.
 11. Collect the resumes of celebrities or successful people in the job interviews and analyze them.
 12. Listen to the audio clip and make notes.
 13. Edit the rough copy of a project report.
 14. Visit the vegetable market / a hospital / a sports complex / bus station and write a report.
 15. Create an email id and write e-mails to your local leaders describing the problems in your village.

Note: The above activities are indicative. The teacher may assign any other activity relevant to the skills introduced in the semester.

COURSE OUTCOMES

CO NO	At the end of the course the students will have the ability to
201.1	Learn vocabulary and use them in professional and social interactions.
201.2	Comprehend the main idea and minute details related to engineering courses.
201.3	Communicate effectively in English in terms of basic sciences, mathematics and engineering fundamentals.
201.4	Learn English grammar to speak and write flawlessly so as to interpret the data.
201.5	Learn the mechanics of writing to make the technical writing practical and meaningful.
201.6	Make notes, write resumes, prepare cover letters, write technical emails and draft reports.

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
201.1	-	-	-	-	3		3	5,7
201.2	-	-	-	-	3	2	3	5,6,7
201.3	-	-	-	-	3	3	3	5,6,7
201.4	-	-	-	-	2	2	3	5,6,7
201.5	-	-	-	-	2	2	3	5,6,7
201.6		-	--	--	2		3	5,7

Method of evaluation of the student activities (Rubrics)

Model Rubric:

Sl. No	Sub activity	Performance			
		Excellent	Good	Satisfactory	Need improvement
1	Step-1	Data was collected from more than four sources.	Data was collected from three to four sources.	Data was collected from two sources.	Data was collected only one source.
2	Step-2	All the material and data required for the activity was accurately prepared based on the data collected independently.	Almost all the material and data required for the activity was accurately prepared based on the data collected independently.	The materials and data required for the activity were accurately prepared based on the data collected with the help of teacher.	The material and data required for the activity was inaccurately prepared .
3	Step-3	Procedures were outlined in a step-by-step fashion that could be followed by anyone & performed the activity effectively.	Procedures were outlined in a step-by-step fashion, require explanation & performed the activity effectively.	Procedures that outlined were complete with 1 or 2 gaps and require explanation & performed the activity normally.	Procedures that outlined were not sequential, & performed the activity in a poor way.
4	Step-4	Presented/ explained the information about the activity in logical, interesting sequence with attractive visuals or diagrams.	Presented/ explained the information about the activity in logical sequence with visuals or diagrams.	Presented/ explained the information about the activity in logical sequence with less visuals or diagrams.	Presented/ explained the information about the activity without sequence and visuals or diagrams.
5	Conclusion / Summary	Provided a detailed conclusion/ summary clearly based on the data and activity.	Provided a conclusion / summary clearly based on the data and activity.	Student provided a conclusion/ summary less effectively.	Conclusions / Summary was not relevant.

Note: Separate rubric may be prepared according to the activity.

STUDENT ASSESSMENT RUBRICS

[illegible]

SKILL UPGRADATION IN - ENGINEERING MATHEMATICS

ACTIVITY ASSESSMENT Steps

1. Mathematical concepts
2. Procedure
3. Explanation
4. Working with others
5. Mathematical errors

ACTIVITIES

- 1 Prepare a presentation to describe various types of Straight lines.
- 2 Identify the geometrical shapes in and around your locality and give the details about them.
3. Prepare a comparative study of conic sections and their uses in engineering applications.
3. Prepare a detailed study report on differentiation using different methods.
4. List out and explain the applications of Differentiation.
5. Apply the differentiation in geometrical problems.
6. Apply the differentiation in rate measure problems.
7. Apply the differentiation to problem solving in finding maxima minima.

CO / PO - MAPPING OF ACTIVITIES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	3	2	2	1			1	2	2	3
CO2	3	2	2	1			1	2	2	3
CO3	3	2	2	1			1	2	2	3
CO4	3	2	2	1			1	2	2	3
CO5	3	2	2	1			1	2	2	3
CO6	3	2	2	1			1	2	2	3
CO7	3	2	2	1			1	2	2	3

Rubrics for Activity assessment

CATEGORY	4	3	2	1
Mathematical Concepts	Explanation shows complete understanding of the mathematical concepts used to solve the problem(s).	Explanation shows substantial understanding of the mathematical concepts used to solve the problem(s).	Explanation shows some understanding of the mathematical concepts needed to solve the problem(s).	Explanation shows very limited understanding of the underlying concepts needed to solve the problem(s) OR is not written.
Procedures	Typically, uses an efficient and effective procedure to solve the problem(s).	Typically, uses an effective procedure to solve the problem(s).	Sometimes uses an effective procedure to solve problems, but does not do it consistently.	Rarely uses an effective procedure to solve problems.
Explanation	Explanation is detailed and clear.	Explanation is clear.	Explanation is a little difficult to understand, but includes critical components.	Explanation is difficult to understand and is missing several components OR was not included.
Working with Others	Student was an engaged partner, listening to suggestions of others and working cooperatively throughout lesson.	Student was an engaged partner but had trouble listening to others and/or working cooperatively.	Student cooperated with others, but needed prompting to stay on-task.	Student did not work effectively with others.
Mathematical Errors	90-100% of the steps and solutions have no mathematical errors.	Almost all (85-89%) of the steps and solutions have no mathematical errors.	Most (75-84%) of the steps and solutions have no mathematical errors.	More than 75% of the steps and solutions have mathematical errors.

STUDENT ASSESSMENT by RUBRICS

[illegible]

SKILL UPGRADATION – APPLIED PHYSICS

TASK

LEVEL 1: Concept, Ethical Data, Materials, Source (Library/internet/others)

LEVEL 2: Methodology/procedure

LEVEL 3: Analysis/experiment

LEVEL 4: Interpretation/inference/evaluation.

Activities:-

1. Construct a blowing pipe to detect dangerous gases in mines.
2. Construct model stethoscope with known materials.
3. Conduct awareness program on noise pollution in your college, colony. Prepare a video report.
4. Construct a second's pendulum with simple objects.
5. Prepare a power point presentation on photosensitive materials with detailed specifications.
6. Prepare a report on Lasers where they are practically used.
7. Prepare a power point presentation on application of optical fibers in medical and engineering field.
8. How can you produce electricity with a magnet? – (a) Develop a working model/ prepare a power point presentation with animation/ prepare drawings on a chart.
9. Construct an electric calling bell.
10. Setup a circuit on breadboard to verify Kirchhoff's voltage law.
11. Prepare a power point presentation on Superconductors and their practical applications with motion pictures embedded.
12. Collect various resistors, diodes and LEDs with specifications and compile on a card board.

NOTE: The above activities are indicative. The teacher may assign any other activity relevant to the course based on resources available.

Course Outcomes (CO)		Linked Pos	Activity Hours
CO1	Construction of a blowing pipe to detect dangerous gases in mines	PO1, PO2, PO3, PO4, PO5, PO6	3
CO2	Construction of model stethoscope with known materials	PO1, PO2, PO5, PO7	3
CO3	Conduct of awareness program on noise pollution in the college, colony and preparation of a video report.	PO1, PO2, PO5, PO6, PO7	3
CO4	Construct a second's pendulum with simple objects.	PO1, PO2, PO3, PO4	3
CO5	Preparation of PPT on photosensitive materials with detailed specifications	PO1, PO2	3
CO6	Preparation of report on lasers practically used	PO1, PO2, PO4, PO5, PO7	3
CO7	Preparation of PPT on application of optical fibers in medical and engineering field	PO1, PO2, PO4, PO5, PO6, PO7	3
CO8	Production of electricity with a magnet – working model, PPT with animation and drawings on a chart.	PO1, PO2, PO3, PO4	3
CO9	Construction of an electric calling bell	PO1, PO2, PO3, PO4	3
CO10	Construction of a circuit on breadboard to verify Kirchhoff's voltage law	PO1, PO2, PO3, PO4	3
CO11	Preparation of PPT on Superconductors and their practical applications with motion pictures.	PO1, PO2, PO3, PO4, PO7	3
CO12	Collection of various resistors, diodes and LEDs with specifications and installation on a card board	PO1, PO2	3

Rubrics for Task Assessments

General Scale for scoring student performance in Skill Upgradation

Type of Skill/Score	4	3	2	1
Data/Material Collection	All Data/Material was collected one time independently.	All Data/Material was collected more than one time independently.	All Data/Material was collected several times independently.	All Data/Material was collected several times with assistance.
Methodology/ Procedure	Procedures were outlined in a step-by-step fashion that could be followed by anyone without additional explanations.	Procedures were outlined in a step-by-step fashion that could be followed by anyone without additional explanations. Expert help was needed to accomplish this.	Procedures were outlined in a step-by-step fashion, but had 1 or 2 gaps that require explanation even after expert feedback.	Procedures that were outlined were incomplete or not sequential, even after Expert feedback had been given.
Activity/ Development	Quality of Skill is high.	Skill is mastered to the level of expectation.	Skill is present but with errors and omissions.	Skill needs improvement.
Interpretation/ summary	Student provided a detailed conclusion clearly.	Student provided a somewhat detailed conclusion clearly.	Student provided a conclusion with some reference.	No conclusion was apparent.

NOTE: The above types of skills are indicative. The teacher may change the skills depending on type of activity.

STUDENT ASSESSMENT (RUBRICS)

[illegible]

SC-204 - ENGINEERING CHEMISTRY AND ENVIRONMENTAL STUDIES

Suggested Skill Upgradation Activities

Activity Assessment Steps:

Level-1: Concept, Data collection and summarization, Material etc

Level-2: Prepare Chart, explain the process, perform the experiment etc, and prepare a report etc

Level-3: Oral or power point presentation of the activity.

Level-4: Submission of report.

Activity – 1

Collect the data of the different methods of concentration of ore and present with PPT :

Activity – 2

Study the process of Corrosion of a metal under different conditions:

Activity – 3

Compare the Corrosion of different metals /alloys exposed to the same environmental conditions:

Activity – 4

Compare the Corrosion of metal with different shapes and surfaces under same environmental conditions:

Activity – 5

Study the Prevention of Corrosion of a metal by using different coating materials

Activity – 6

Study of plastics, recycling of plastics and their advantages and disadvantages

Activity – 7

Study of natural rubber and its uses

Activity – 8

Power point presentation on fossil fuels

Activity – 9

Study and suggest the measures to improve your environment related to air pollution

Activity – 10

Study and suggest the measures to improve your environment related to water pollution

Activity – 11

Study and suggest the measures to improve the college environment

Activity – 12

Construct a working model of Galvanic cell and explain its working.

Note: Any other skill upgradation activity related to the course may be taken up.

Mapping of POs to Student activities

S.No	Name of the activity	Linked POs
1	Collect the data of the different methods of concentration of ore and present with PPT	1, 6,7
2	Study the process of Corrosion of a metal under different conditions	1, 6,7
3	Compare the Corrosion of different metals /alloys exposed to the same environmental conditions	1, 6,7
4	Compare the Corrosion of metal with different shapes and surfaces under same environmental conditions	1, 5, 6,7
5	Study the Prevention of Corrosion of a metal by using different coating materials	1, 5, 6,7
6	Study of plastics, recycling of plastics and their advantages and disadvantages	1,5, 6,7
7	Study of natural rubber and its uses	1,5, 6,7
8	Power point presentation on fossil fuels	1,5, 6,7
9	Study and suggest the measures to improve your environment related air pollution	1,5, 6,7
10	Study and suggest the measures to improve your environment related water pollution	1,5, 6,7
11	Study and suggest the measures to improve the college environment	1,5, 6,7
12	Construct a working model of Galvanic cell and explain its working.	1, 6,7

Method of evaluation of the student activities (Rubrics)**Model Rubrics**

S. No	Sub activity	Performance (Score)			
		Excellent (4)	Good (3)	Satisfactory (2)	Need improvement (1)
1	Level-1 (Data and Material collection)	All materials and data required for the activity were accurately prepared based on the data collected independently	Almost all materials and data required for the activity were accurately prepared based on the data collected independently	The materials and data required for the activity were accurately prepared based on the data collected with the help of teacher.	The materials and data required for the activity were inaccurately prepared .
2	Level-2 (Chart, Model, Experiment or Study)	Procedures were outlined in a step-by-step fashion that could be followed by anyone & performed the activity effectively.	Procedures were outlined in a step-by-step fashion, require explanation & performed the activity effectively.	Procedures that outlined were complete with 1 or 2 gaps and require explanation & performed the activity normally	Procedures that outlined were not sequential, & performed the activity in a poor way
3	Level-3 (Oral or Power point presentation)	Presented/ explained the information about the activity in logical, interesting sequence with attractive visuals or diagrams.	Presented/ explained the information about the activity in logical sequence with visuals or diagrams.	Presented/ explained the information about the activity in logical sequence with less visuals or diagrams.	Presented/ explained the information about the activity without sequence and visuals or diagrams.
4	Level-4 (Submission of Report)	Provided a detailed conclusion/ summary clearly based on the data and activity	Provided a conclusion / summary clearly based on the data and activity	Provided conclusion/ summary less effectively	Conclusion /summary was not relevant.

Note: The above rubrics are indicative. Separate rubrics may be prepared according to the activity. Minimum passing score is 2.5.

C21_ Curriculum

DIPLOMA IN MECHANICAL ENGINEERING



OFFERED BY

STATE BOARD OF TECHNICAL EDUCATION & TRAINING,

TELANGANA: HYDERABAD

III SEMESTER

	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			Instruction periods per week			Total Periods per semester	Credits	Continuous internal Evaluation(CIE)			Semester end examination (SEE)		Total Marks	Min marks for passing including CIE
			L	T	P			Mid Sem1	Mid Sem 2	Internal Evaluation	Max marks	Min marks		
1	SC-301	Applied Engineering Mathematics	4	1	0	75	3	20	20	20	40	14	100	35
2	ME-302	Solid Mechanics	4	1	0	75	3	20	20	20	40	14	100	35
3	ME-303	Thermodynamics	4	1	0	75	3	20	20	20	40	14	100	35
4	ME-304	Engineering Materials	4	1	0	75	3	20	20	20	40	14	100	35
5	ME-305	Fluid Mechanics and Hydraulic Machinery	4	1	0	75	3	20	20	20	40	14	100	35
6	ME-306	Machine Drawing	1	0	2	45	1.5	20	20	20	40	20	100	50
7	ME-307	Basic Manufacturing & Fabrication Engineering Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
8	ME-308	Fuels Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
9	ME-309	Material Testing Lab, Fluid Mechanics & Hydraulic Machines Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
10	HU-310	Communication and Life Skills Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
11	ME-311	Skill Upgradation	0	0	8	120	2.5	0	0	Rubrics			--	-
	Activities: student performance is to be assessed through Rubrics													

SC-301 - APPLIED ENGINEERING MATHEMATICS

Course Title	Applied Engineering Mathematics	Course Code	SC-301
SEMESTER	III	Course Group	Foundation
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the knowledge of Basic Engineering Mathematics and Engineering Mathematics at Diploma 1st and 2nd Semester level.

Course Outcomes: COs

At the end of the course, the student will have the ability to:

CO 1	Integrate different kinds of continuous functions
CO 2	Integrate various continuous functions using different methods of integration
CO 3	Find the values of definite integrals using fundamental theorem of integral calculus.
CO 4	Apply definite integrals to determine Areas, Volumes of irregular shapes.
CO 5	Find the Mean and RMS values of various functions and Approximate values of Definite integrals using Trapezoidal and Simpson's 1/3 rd rule
CO 6	Find order and degree of a Differential equation, form the Differential Equation from given primitive by eliminating the arbitrary constants and Solve Simple DEs of 1 st order and 1 st degree.

Course Content:

Unit-I

Duration: 14 Periods (L: 11 – T:3)

Indefinite Integration-I

Integration regarded as anti-derivative – Indefinite integral of standard functions. Properties of indefinite integral. Integration by substitution or change of variable. Integrals of the form $\sin^m \theta$, $\cos^n \theta$. Where m and n are positive integers. Integrals of $\tan x$, $\cot x$, $\sec x$, $\operatorname{cosec} x$ and powers of $\tan x$, $\sec x$ by substitution. Evaluation of integrals which are reducible to the following forms: (Nine standard integrals)

$$\begin{aligned} \text{i)} & \frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2} \\ \text{ii)} & \frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}} \\ \text{iii)} & \sqrt{x^2 + a^2}, \sqrt{a^2 - x^2}, \sqrt{x^2 - a^2} \end{aligned}$$

Unit – II

Duration: 10 Periods (L: 8 – T:2)

Indefinite Integration-II

Integration by decomposition of the integrand into simple rational algebraic functions.
Integration by parts - Bernoulli's rule.

Unit-III

Duration: 10 Periods (L: 8 – T: 2)

Definite Integral and its Properties:

Definite integral fundamental theorem of integral calculus properties of definite integrals, evaluation of simple definite integrals. Definite integral as the limit of a sum.

Unit – IV

Duration: 12 Periods (L: 10 – T: 2)

Applications of Definite Integrals:

Areas under plane curves – Sign of the Area – Area enclosed between two curves. Solid of revolution – Volumes of solids of revolution.

Unit – V

Duration: 10 Periods (L: 8 – T: 2)

Mean , RMS values and Numerical Integration:

Mean values and Root Mean Square values of a function on a given interval. Trapezoidal rule, Simpson's 1/3 rule to evaluate an approximate value of a definite integral.

Unit – VI

Duration: 19 Periods (L: 15 – T: 4)

Differential Equations of First Order:

Definition of a differential equation – order and degree of a differential equation – formation of differential equations – solution of differential equation of first order, first degree : Variables -separable, Homogeneous, Exact, Linear differential equation, Bernoulli's equation.

Reference Books:

1. Integral Calculus Vol. I, by M. Pillai and Shanti Narayan
2. Thomas' Calculus, Pearson Addison –Wesley Publishers
3. Higher Engineering. Mathematics, by B.S. Grewal— Khanna publishers—New Delhi

Suggested E-Learning references

1. www.freebookcentre.net/mathematics/introductory-mathematics-books.html
2. E-books: www.mathebook.net

Suggested Learning Outcomes

At the end of the course, the student will have the ability to:

Unit-I

1.0 Use Indefinite Integration to solve engineering problems

- 1.1 Use the concept of Indefinite integral as an anti-derivative.
- 1.2 Use the indefinite integrals of standard functions and properties of Integrals
 $\int (u + v) dx$ And $\int k u dx$ where k is constant and u, v are functions of x in solving simple problems.
- 1.3 Solve integration problems involving standard functions using the above rules.
- 1.4 Evaluate integrals involving simple functions of the following type by the method of Substitution.
 - (i) $\int f(ax + b) dx$ where $f(x) dx$ is in standard form.
 - (ii) $\int [f(x)]^n f'(x) dx$
 - (iii) $\int f(x)/[f(x)] dx$
 - (iv) $\int f\{g(x)\} g'(x) dx$
- 1.5 Find the Integrals of $\tan x$, $\cot x$, $\sec x$ and $\operatorname{cosec} x$ using the above.
- 1.6 Evaluate the integrals of the form $\int \sin^m \theta \cos^n \theta. d\theta$ where m and n are positive integers.
- 1.7 Evaluate integrals of powers of $\tan x$ and $\sec x$.
- 1.8 Evaluate the Standard Integrals of the functions of the type : (Nine standard integrals)

$$\begin{aligned} \text{i)} & \frac{1}{a^2 + x^2}, \frac{1}{a^2 - x^2}, \frac{1}{x^2 - a^2} \\ \text{ii)} & \frac{1}{\sqrt{a^2 + x^2}}, \frac{1}{\sqrt{a^2 - x^2}}, \frac{1}{\sqrt{x^2 - a^2}} \\ \text{iii)} & \sqrt{x^2 + a^2}, \sqrt{a^2 - x^2}, \sqrt{x^2 - a^2} \end{aligned}$$

- 1.9 Evaluate the integrals of the type :

$$\int \frac{1}{a \pm b \sin \theta} d\theta, \int \frac{1}{a \pm b \cos \theta} d\theta \text{ and } \int \frac{1}{a \cos \theta \pm b \sin \theta \pm c} d\theta.$$

Unit-II

2.0 Use Indefinite Integration to solve engineering problems

- 2.1 Evaluate integrals using decomposition method.
- 2.2 Evaluate integrals using integration by parts with examples.
- 2.3 Apply the Bernoulli's rule for evaluating the integrals of the form $\int u \cdot v \, dx$.
- 2.4 Evaluate the integrals of the form $\int e^x [f(x) + f'(x)] \, dx$.

Unit-III

3.0 Understand definite integral and use it in engineering applications

- 3.1 Use the fundamental theorem of integral calculus in solving problems
- 3.2 Calculate the definite integral over an interval.
- 3.3 Apply various properties of definite integrals in engineering problems.
- 3.4 Evaluate simple problems on definite integrals using the above properties.
- 3.5 Find definite integral as a limit of sum by considering an area.

Unit –IV

4.0 Understand definite integral and use it in Engineering applications

- 4.1 Find the Areas under plane curves and area enclosed between two curves using Integration.
- 4.2 Obtain the Volumes of solids of revolution and solve problems.

Unit –V

5.0 Understand Mean, RMS values and Numerical Methods

- 5.1 Obtain the Mean value and Root Mean Square (RMS) value of the functions in any given Interval.
- 5.2 Apply the Trapezoidal rule, Simpson's 1/3 rules for approximation of definite integrals and solve some problems.

Unit –VI

6.0 Solve Differential Equations in engineering problems.

- 6.1 Identify a Differential equation and find its order and degree
- 6.2 Form a differential equation by eliminating arbitrary constants.
- 6.3 Solve the first order first degree differential equations by the following methods:
 - (i) Variables Separable.
 - (ii) Homogeneous Equations.
 - (iii) Exact Differential Equations
 - (iv) Linear Differential equation of the form $\frac{dy}{dx} + Py = Q$,
Where P and Q are functions of x or constants.
 - (v) Bernoulli's Equation (Reducible to linear form.)
- 6.4 Solve simple problems leading to engineering applications by using above methods.

Suggested Student Activities

- 1. Student visits Library to refer Standard Books on Mathematics and collect related material
- 2. Quiz
- 3. Group discussion

4. Surprise tests
5. Seminars
6. Home Assignments
7. Mathematics for preparing competitive exams and solving old question papers on arithmetical ability.

CO / PO - MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapped POs
CO1	3	2					3	1, 2 ,7
CO2	3	2					3	1, 2 ,7
CO3	3	2					3	1, 2 ,7
CO4	3	2					3	1, 2 ,7
CO5	3	2					3	1, 2 ,7
CO6	3	2					3	1, 2 ,7

	MID SEM-I EXAM								
S.No	Unit Name	R	U	A	Remarks				
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)					
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)					
Total Questions		4	4	4					
MID SEM –II EXAM									
S.No	Unit Name	R	U	A	Remarks				
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)					
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)					
Total Questions		4	4	4					
	Semester End Examination								
Sl No	Unit No.	Questions to be set for SEE				Remarks			
		R		U	A				
1	I	4	1	9(a)	13(a)				
2	II								
3	III		2	10(a)	14(a)				
4	IV								
5	V		3	5, 6	9(b)		13(b)		
					11(a)		15(a)		
					11(b)		15(b)		
6	VI				7,8	10(b)			14(b)
		12(a)				16(a)			
		12(b)				16(b)			
Total Questions		8		8	8				
Legend:		Remembering (R)	1 Mark						
		Understanding (U)	3 Marks						
		Application (A)	5 Marks						

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM –I, III SEMESTER
SC-301- APPLIED ENGINEERING MATHEMATICS

TIME: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions 04 X 01 = 04
2 Each question carries **ONE** mark

1. Integrate $(e^x - \sin x + x^4)$ with respect to x
2. Find $\int \frac{dx}{5x+7}$
3. Write Bernoulli's rule of integration
4. Find $\int x \log x \, dx$

PART-B

Instructions: 1. Answer **ALL** questions 02 X 03 = 06
2. Each question carries **THREE** marks

5 a) Evaluate $\int \frac{x^5}{1+x^{12}} dx$.

OR

5 b) Evaluate $\int \frac{dx}{(x^2+16)}$

6 a) Evaluate $\int x \sin x \, dx$

OR

6 b) Evaluate $\int \frac{3x+2}{(x-1)(2x+3)} dx$.

PART- C

Instructions: 1. Answer **ALL** questions 02 X 05 = 10
2. Each question carries **FIVE** marks

7 a) Evaluate $\int \sqrt{x^2 + 2x + 5} \, dx$

OR

7 b) Evaluate: $\int \cos x \cos 2x \, dx$.

8 a) Find $\int x \tan^{-1} x \, dx$.

OR

8 b) Find $\int x^4 \cos 2x \, dx$.

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM –II, III SEMESTER
SC-301-APPLIED ENGINEERING MATHEMATICS

TIME: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions:

1. Answer **ALL** questions
- 2 Each question carries **ONE** mark

04 X 01 = 04

1. Find $\int_0^1 (x^4 + 1) dx$
2. Evaluate : $\int_0^\pi \sin 3x dx$
3. Evaluate : $\int_0^1 \frac{1}{1+x^2} dx$
4. Write the formula to find area bounded by the curve $y = f(x)$, x-axis, between the limits $x=a$ and $x=b$

PART-B

Instructions:

1. Answer **ALL** questions
2. Each question carries **THREE** marks

02 X 03 = 06

5 a) Evaluate: $\int_0^{\frac{\pi}{2}} \sqrt{1 - \sin 2x} dx$

OR

5 b) Evaluate: $\int_0^{\frac{\pi}{2}} \sin^2 x dx$

- 6 a) Find the area bounded by the line $2x + y = 8$, x-axis and the lines $x = 2$ and $x = 4$.

OR

- 6 b) Find the Volume of the Solid generated by revolving the part of the Circle

$x^2 + y^2 = 36$ From $x = 0$ to $x = 4$ about x – axis.

PART C

Instructions:

1. Answer **ALL** questions
2. Each question carries **FIVE** marks

02 X 05 = 10

7 a) Evaluate: $\int_0^{\frac{\pi}{2}} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}} dx$

Or

7 b) Evaluate: $\int_0^{\frac{\pi}{2}} \log \cos x dx$

- 8 a) Find the area enclosed between the Parabolas $y = 3x - x^2$ and $y = x^2 - x$.

Or

- 8 b) Find the Volume of the Solid generated by the revolution of the area bounded by the

Ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$, about x- axis.

BOARD DIPLOMA EXAMINATION (C-21)
III SEMESTER END EXAMINATION
SC-301-APPLIED ENGINEERING MATHEMATICS

Time: 2 hours

[Total Marks: 40]

PART-A

Instructions:

1. Answer **ALL** questions

08 X 01 = 08

2 Each question carries **ONE** mark

1. Find $\int (x^8 - \frac{5}{x}) dx$
2. Evaluate $\int_0^1 (x^2 + 1) dx$
3. Write the formula to find mean value of $y = f(x)$, in the interval (a, b)
4. Find the Order and Degree of the Differential Equation $x \frac{dy}{dx} = \sqrt{1 + \left(\frac{dy}{dx}\right)^2}$.
5. Write Trapezoidal Rule to find the approximate value of $\int_a^b f(x) dx$.
6. Write the formula to find RMS value of $y = f(x)$ over the range $x=a$ and $x = b$.
7. Solve $\frac{dy}{dx} = e^{4x+y}$
8. Write the condition for exactness of the differential equation $M(x, y)dx + N(x,y)dy = 0$

PART-B

Instructions:

1. Answer **ALL** questions

04 X 03 = 12

2. Each question carries **THREE** marks

9.

- a) Evaluate: $\int_0^{\frac{\pi}{2}} \sqrt{1 - \sin 2x} dx$

OR

- b) Find the approximate value of $\int_0^6 \frac{dx}{1+x}$ by taking $n = 6$ using Trapezoidal rule.

10.

- a) Find the area bounded by the Parabola $y = x^2 - 2x + 1$ and x -axis.

OR

- b) Form the Differential Equation from $y = Ae^x + Be^{3x}$ where A, B are arbitrary constants

11.

- a) Find the RMS value of $\sqrt{\log x}$ over the range $x= 1$ and $x= e$

OR

- b) Calculate approximate value of $\int_0^4 \frac{dx}{1+x}$ by taking $n = 4$ using Simpson's 1/3 rule

12.

- a) Solve: $x \frac{dy}{dx} + 2y = \log x$.

OR

- b) Solve: $x(1 - y^2)dx + y(1 - x^2)dy = 0$

PART C

Instructions:

1. Answer **ALL** questions
2. Each question carries **FIVE** marks

04 X 05 = 20

13.

a) Evaluate: $\int \frac{1}{x^2 + 8x + 25} dx$

OR

b) Find the RMS value of $y = \sqrt{8 - 4x^2}$ between $x = 0$ and $x = 2$

14.

a) Find the volume of solid generated by revolving the Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ about Major axis

OR

b) Solve: $\frac{dy}{dx} = \sin(x + y)$

15.

a) A curve is drawn to passing through the points given by the following table:

x	1	1.5	2	2.5	3	3.5	4
y	3	3.4	3.7	3.8	2.7	2.6	2.1

Calculate the approximate area bounded by the curve, x-axis and the lines $x = 1$ and $x = 4$ using Simpson's 1/3 rule

OR

b) Evaluate: $\int_0^1 \sqrt{1 - x^2} dx$ approximately by taking $n = 4$ using Simpson's 1/3 rd Rule.

16.

a) Solve: $(y^2 - xy)dx = x^2 dy$.

OR

b) Solve: $\frac{dy}{dx} + y \cos x = y^3 \sin 2x$.

ME-302 SOLID MECHANICS

Course Title	Solid Mechanics	Course Code	ME-302
SEMESTER	III	Course Group	Core
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre-Requisites:

Basic knowledge of properties of materials and types of loads.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to

CO1	Understand the concept of forces, analyze the force systems and find out the resultant of the force systems
CO2	Compute stress and strain values and find the changes in axial, lateral and volumetric dimensions of bodies of uniform section and of composite section under the influence of normal forces.
CO3	Locate the centre of gravity of various sections and calculate the Moment of Inertia of standards sections.
CO4	Compute shear force and bending moment at any section of beam and draw the S.F. & B.M diagrams for point loads and UDL.
CO5	Calculate bending stresses, safe load, safe span, dimensions of cross section and deflections of the given beam
CO6	Estimation of shear stress and angle of deflection when a shaft is subjected to torsion and compares the strength of solid and hollow shafts.

BLUE PRINT OF MARKS FOR SEMESTER END EXAM (SEE)

Units		No of periods	Questions to be set for SEE				Remarks	
			R		U	A		
Part-A	1. Force Systems	12	Q4	Q1		Q9(a)	Q13(a)	
	2. Simple Stresses & Strains	13						
Part-B	3. Geometric Properties of Sections	12		Q2		Q10(a)	Q14(a)	
	4. Shear Force & Bending Moment	13						
Part-C	5. Theory of Simple Bending & Deflection of Beams	13		Q3	Q5 Q6	Q9(b) Q11(a) Q11(b)	Q13(b) Q15(a) Q15(b)	
	6. Torsion in Shafts	12				Q7 Q8	Q10(b) Q12(a) Q12(b)	Q14(b) Q16(a) Q16(b)
TOTAL		75	08		08	08		

COURSE CONTENT

1. Force Systems:

Force – definition, types; Force system and its classification; Resolution of a force; Resultant of a coplanar force system - Parallelogram law, Triangle law, Polygon law; Equilibrium of forces, Equilibrant and conditions for equilibrium; Free body diagram; Lami's theorem; Related simple numerical problems on the above topics.

2. Simple Stresses and Strains:

Stress, Strain and their nature; Mechanical properties of common engineering materials; Stress – Strain diagram for M.S. and C.I. specimens and Significance of various points on it; Significance of factor of safety; Hooke's Law, Relation between elastic constants (without derivations); Longitudinal and lateral strain, Poisson's ratio; Stress and strain values in bodies of uniform section and of composite section under the influence of normal forces; Related numerical problems on the above topics.

3. Geometric Properties of Sections:

Definition of Centre of Gravity, Centroid; Locating centroid of geometrical plane figures (square, rectangle, triangle, circle, semi-circle, quarter circle); Centroid of composite figures composed of not more than three geometrical figures; Centre of Gravity of simple solids (Cube, cuboid, cone, cylinder, sphere, hemisphere); Centre of Gravity of composite solids composed of not more than two simple solids.

Moment of inertia (M.I.): Definition, M.I. of plane lamina, Radius of gyration, Parallel and Perpendicular axes theorems (without derivations); M.I. of rectangle, square, circle, semi-circle, quarter circle and triangle section (without derivations); M.I. of symmetrical I-section, Channel section and T-section about centroidal axes.

4. Shear Force and Bending Moment:

Types of beams and loads; Definition and explanation of shear force and bending moment; Calculation of shear force and bending moment and drawing the S.F and B.M. diagrams by the analytical method only for the following cases:

- a) Cantilever with point loads,
 - b) Cantilever with uniformly distributed load,
 - c) Simply supported beam with point loads,
 - d) Simply supported beam with UDL,
 - e) Over hanging beam with point loads, at the centre and at free ends,
 - f) Over hanging beam with UDL throughout,
 - g) Combination of point and UDL for the above (not more than two loads);
- Related simple numerical problems; Point of contraflexure.

5. Theory of Simple Bending & Deflection of Beams:

Explanation of terms: Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance, Bending stress, Radius of curvature; Assumptions in theory of simple bending; Bending Equation $M/I = \sigma/y = E/R$ (without derivation); Problems involving calculations of bending stress, modulus of section and moment of resistance; Calculation of safe loads and safe span and dimensions of cross- section; Definition and explanation of deflection as applied to beams; Deflection formulae without proof for cantilever and simply supported beams with point load and UDL only (Standard cases only); Related numerical problems.

6. Torsion in Shafts:

Definition and function of shaft; Define the terms polar moment of inertia, torsional rigidity and torsional stiffness; Calculation of polar M.I. for solid and hollow shafts; Assumptions in simple torsion; Torsion Equation $T/J = \tau/r = G\theta/L$ (without derivation); Problems on design of shaft based on strength and rigidity; Numerical problems related to comparison of strength and weight of solid and hollow shafts.

REFERENCE BOOKS:

1. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
2. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
3. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
4. Punmia B C, Strength of Materials, Laxmi Publications (P) Ltd. New Delhi.
5. Bansal R K, Strength of Materials, Laxmi Publications.

ELECTRONIC RESOURCES:

1. <https://nptel.ac.in/courses/>
2. <https://www.slideshare.net/>
3. https://en.wikipedia.org/wiki/Strength_of_materials
4. <http://ndl.ethernet.edu.et/bitstream/>
5. http://www.engineersedge.com/mechanics_material_menu.shtml/

SUGGESTED STUDENT ACTIVITIES:

1. Record various forces applied by human beings in their daily activities.
2. Identify the applications where parallelogram law of forces, Lami's theorem etc are used and prepare a report.
3. Using internet record various properties of commonly used materials and compare their strengths.
4. How a corrugated roof sheet differs from plain roof sheet? Demonstrate with models.
5. List out the applications of shafts in our daily activity as well as in industries.
6. Collect the pictures of various types of beams which practically exist.

SUGGESTED LEARNING OUTCOMES:

Upon completion of the course the student shall be able to

1. Force Systems:

- 1.1. Define the force, its units and types
- 1.2. Understand various types of force systems
- 1.3. Resolve a force into horizontal and vertical components
- 1.4. Understand the concept of resultant
- 1.5. State parallelogram law and do related numerical problems
- 1.6. State triangle law and polygon law
- 1.7. Know about free body diagrams
- 1.8. State Lami's theorem and do related numerical problems
- 1.9. Understand the concept of equilibrium of forces, equilibrant and conditions for it.
- 1.10. Solve numerical problems on finding out the resultant of a simple coplanar, concurrent force system.

2. Simple Stresses and Strains:

- 2.1. Define the mechanical properties of commonly used engineering materials
- 2.2. Define the term stress, strain and understand various types of stresses and strains
- 2.3. State Hooke's law and define various elastic constants
- 2.4. Draw Stress – Strain diagram for M.S and C.I. specimens and identify salient points on it
- 2.5. State the significance of factor of safety
- 2.6. Define the terms longitudinal & lateral strains and Poisson's ratio
- 2.7. Write down the relation between elastic constants E, N, K, & 1/m
- 2.8. Compute stress and strain values in bodies of uniform sections
- 2.9. Compute stress and strain values in bodies of composite sections

- 2.10. Compute changes in axial, lateral and volumetric dimensions of bodies of uniform sections under the action of normal forces

3. Geometric Properties of Sections:

- 3.1. Define centre of gravity and centroid
- 3.2. Locate centroid of geometrical plane figures such as square, rectangle, triangle, circle, semi-circle, quarter circle
- 3.3. Locate centroid of simple composite figures
- 3.4. Find out the Centre of Gravity of simple solids such as cube, cuboid, cone, cylinder, sphere, hemisphere
- 3.5. Find out the Centre of Gravity of simple composite solids
- 3.6. Define Moment of Inertia (M.I.) of plane lamina
- 3.7. Understand the concept of Radius of gyration
- 3.8. State and understand Parallel and Perpendicular axes theorems (without derivations)
- 3.9. Find out M.I. of laminas such as rectangle, square, circle, semi-circle, quarter circle and triangle section
- 3.10. Find out M.I. of symmetrical I-section, Channel section and T-section about centroidal axes

4. Shear Force and Bending Moment:

- 4.1. List the types of beams and loads
- 4.2. Define and explain the terms shear force, bending moment and point of contraflexure
- 4.3. Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for cantilever with point loads
- 4.4. Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for cantilever with UDL
- 4.5. Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for cantilever with point loads & UDL
- 4.6. Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for simply supported beam with point loads
- 4.7. Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for simply supported beam with UDL
- 4.8. Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for simply supported beam with point loads & UDL
- 4.9. Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for overhanging beam with point loads
- 4.10. Calculate the S.F. and B.M. and drawing the S.F and B.M. diagrams by the analytical method for overhanging beam with UDL

5. Theory of Simple Bending & Deflection of Beams:

- 5.1. Define the terms Neutral layer, Neutral Axis, Modulus of Section, Moment of Resistance, Bending stress and Radius of curvature
- 5.2. Find out section modulus for various sections such as plain & hollow rectangular, square and circular sections,
- 5.3. List out the assumptions made in theory of simple bending
- 5.4. Write the Bending Equation $M/I = \sigma/y = E/R$ (without derivation) and understand the terms involved in it and their units

- 5.5. Solve the numerical problems involving calculations of bending stress, modulus of section and moment of resistance using bending equation
- 5.6. Solve the numerical problems involving calculations of safe loads and safe span and dimensions of cross- section using bending equation
- 5.7. Define and understand the concept of deflection of beams
- 5.8. Write the deflection formulae without proof for cantilever beam with point load and UDL(Standard cases only) and solve related numerical problems
- 5.9. Write the deflection formulae without proof for simply supported beam with point load and UDL (Standard cases only) and solve related numerical problems
- 5.10. Solve numerical problems on deflection of cantilever or simply supported beams subjected to a combination of point load and UDL (Standard cases only)

6. Torsion in Shafts:

- 6.1. Define and state the functions of a shaft
- 6.2. Define the terms polar moment of inertia, torsional rigidity and torsional stiffness
- 6.3. Calculate of polar M.I. for solid and hollow shafts
- 6.4. List out the assumptions made in theory of simple torsion
- 6.5. Write the Torsion Equation $T/J = \tau/r = G\theta/L$ (without derivation) and understand the terms involved in it and their units
- 6.6. Solve numerical problems related to Torsion Equation
- 6.7. Design of solid and hollow shafts based on strength and solve related numerical problems
- 6.8. Design of solid and hollow shafts based on rigidity and solve related numerical problems
- 6.9. Design of solid and hollow shafts based on both strength & rigidity and solve related numerical problems
- 6.10. Solve numerical problems related to comparison of strength and weight of solid and hollow shafts

COURSE OUTCOMES		CL	Linked POs	Teaching Periods
CO1	Understand the concept of forces, analyze the force systems and find out the resultant of the force systems	R, U, A	1, 2, 3, 7	12
CO2	Compute stress and strain values and find the changes in axial, lateral and volumetric dimensions of bodies of uniform section and of composite section under the influence of normal forces.	R, U, A	1, 2, 3, 7	13
CO3	Locate the centre of gravity of various sections and calculate the Moment of Inertia of standards sections.	U, A	1, 2, 3,	12
CO4	Compute shear force and bending moment at any section of beam and draw the S.F. & B.M diagrams for point loads and UDL.	U, A	1, 2, 3, 7	13
CO5	Calculate bending stresses, safe load, safe span, dimensions of cross section and deflections of the given beam	U, A	1, 2, 3	13
CO6	Estimation of shear stress and angle of deflection when a shaft is subjected to torsion and compares the strength of solid and hollow shafts.	R, U, A	1, 2, 3, 7	12
			Total Periods	75

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO ATTAINMENT MATRIX:

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2				1
CO2	3	2	3				1
CO3	3	2	3				
CO4	3	3	3				1
CO5	3	2	3				
CO6	3	3	3				1

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	1. Force Systems	1, 2	5(a) 5(b)	7(a) 7(b)	
2	2. Simple Stresses & Strains	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit Name	R	U	A	Remarks
1	3. Geometric Properties of Sections	1, 2	5(a) 5(b)	7(a) 7(b)	
2	4. Shear Force & Bending Moment	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Legend	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

**MID SEM - I
MODEL PAPER
Solid Mechanics (ME-302)**

Time: 1 Hours

Max. Marks: 20

PART-A

4 X 1 = 4

Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

1. State triangle law of forces.
2. What is meant by resolution of a force?
3. Define lateral strain.
4. List out any two types of stresses.

PART-B

2 X 3 = 6

Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

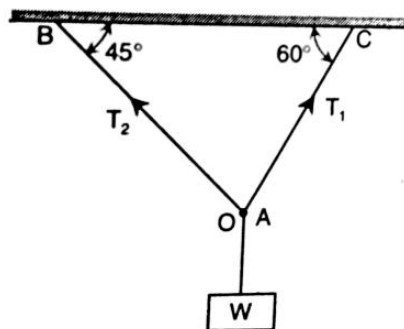
5. (a) Explain the conditions of equilibrium of a coplanar system of forces.
OR
5. (b) Two forces of 100 N and 60 N act at a point. The angle between the lines of action of two forces is 60° . Determine the magnitude and direction of the resultant.
6. (a) List out the three elastic constants and write down the relation between them.
OR
6. (b) Find the diameter of a M.S. rod, carrying a load of 560 kN. If the maximum tensile strength of the rod is 30 N/mm^2 .

PART-C

2 X 5 = 10

Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

7. (a) A weight of 2 kN is supported by two strings as shown in figure given below. Determine the tensions in the string.



OR

7. (b) i) State parallelogram law of forces and write the expression for magnitude and direction of resultant force. (3M)
ii) Write about the free body diagram. (2M)
8. (a) Draw stress-strain diagram for mild steel, show the salient points on it.
OR
8. (b) A tensile load of 15 kN is applied longitudinally on a mild steel bar having a diameter of 10 mm and 350 mm length. Calculate the extension in the bar, the change in diameter and change in volume. Take $E = 2 \times 10^5 \text{ N/mm}^2$ and the Poisson's ratio as 0.25.

**MID SEM - II
MODEL PAPER
Solid Mechanics (ME-302)**

Time: 1 Hours

Max. Marks: 20

PART-A

4 X 1 = 4

Instructions: 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

1. Define the term centroid.
2. Write the moment of inertia about their centroidal axes for a quadrant if its radius is R.
3. Name any two types of loads experienced by a beam for the calculation of shear force and bending moment.
4. What is a point of contraflexure?

PART-B

2 X 3 = 6

Instructions: 1. Answer **ALL** questions.

2. Each question carries **THREE** marks.

5. (a) State parallel axis theorem. Write its equation.

OR

5. (b) A right angle triangle of base 30 mm and height 50 mm is placed in such a way that its base is parallel to horizontal. Find the moment of inertia about (a) horizontal centroidal axis (b) base.

6. (a) Draw SF and BM diagrams for simply supported beam of length 'L' with a point load 'W' at centre.

OR

6. (b) Describe any three types of beams with the help of outline sketch.

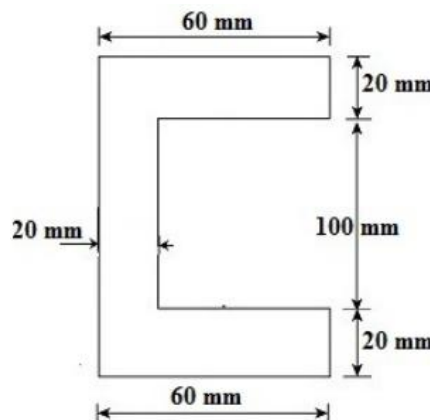
PART-C

2 X 5 = 10

Instructions: 1. Answer **ALL** questions.

2. Each question carries **FIVE** marks.

7. (a) Find the moment of inertia about centroidal X – X axis for the C-section given in the following figure.



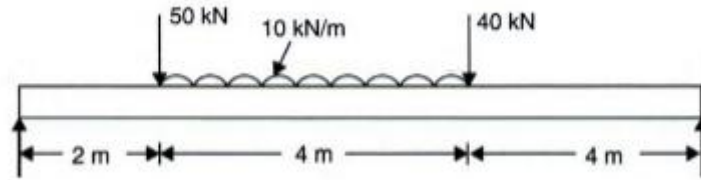
OR

7. (b) Two rectangles of dimension 100 mm X 10 mm form a L section. Find its centroid

8. (a) A cantilever beam of length 2 m carries a uniformly distributed load of 2 kN/m length over the entire span and a point load of 3 kN at the free end. Draw S.F. and B.M. diagrams for the beam.

OR

8. (b) Draw the SF diagram for a simply supported beam of length 10 m carrying a uniformly distributed load and two point loads as shown in the following figure.



BOARD DIPLOMA EXAMINATION, (C-21)
SEE-MODEL PAPER
DME– III SEMESTER EXAMINATION
Solid Mechanics (ME-302)

Time: 2 Hours

Max. Marks: 40

PART-A

8 X 1 = 8

Instructions: 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

1. State Lami's theorem.
2. State Hooke's law
3. Write significance of finding centroid of a body.
4. Name any two types of loads experienced by a beam for the calculation of shear force and bending moment.
5. Define flexural rigidity.
6. Define neutral axis.
7. Write the expression for polar moment of inertia of a solid shaft having a diameter 'D'.
8. Write the equation for the torque to be transmitted by a hollow shaft in terms of its diameters.

PART-B

4 X 3 = 12

Instructions: 1. Answer **ALL** questions.

2. Each question carries **THREE** marks.

9. (a) Two forces of magnitude 30N and 40N each act on a body. The angle between the forces is 20° . Find the magnitude and direction of the resultant.

OR

9. (b) Write any three assumptions made in the theory of simple bending.
10. (a) Two rectangles of dimension 100mmX10mm form a T section. Find its centroid.

OR

10. (b) A solid shaft of 150 mm diameter is used to transmit torque. Find the maximum torque transmitted by the shaft, if the maximum shear stress induced in the shaft is 45N/mm^2 .
11. (a) A steel plate of width 100 mm and 30 mm depth. Find the Moment of Inertia about centroidal axes

OR

11. (b) Write the deflection formulae for cantilever with point load at free end and UDL for entire span.
12. (a) A solid circular shaft transmits 1.5 kN-m torque at 1440 rpm. Find the power transmitted by the shaft.

OR

12. (b) The shear stress of the solid shaft is not to exceed to 40N/mm^2 when the torque transmitted is 20 kN-m. Determine the minimum diameter of the shaft.

PART-C

4 X 5 = 20

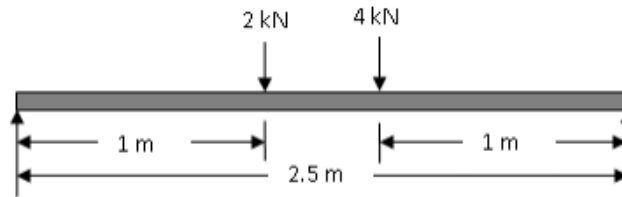
Instructions: 1. Answer **ALL** questions.2. Each question carries **FIVE** marks.

13. (a) A body of weight 200 N is held vertically by means of two strings which make 30° and 60° with horizontal. Find tension in strings.

OR

13. (b) A wooden beam of rectangular section is subjected to a bending moment of 5 kN-m. If the depth of the section is to be twice the breadth and stress in the wood is not to exceed 60 N/mm^2 , find the dimensions of the cross-section of the beam

14. (a) A simply supported beam of span 2.5 m is carrying two point loads as shown in Fig. given below. Draw the shear force and bending moment diagrams for the beam.



OR

14. (b) A hollow shaft is to transmit 300 kW at 900 rpm. If the shear stress is not exceed 50 N/mm^2 , find the external and internal diameter of the shaft. The internal diameter is 0.6 times the external diameter.

15. (a) A cantilever 3 m long and of rectangular section carries a UDL of 20 kN/m over its entire length. If the maximum stress induced is not to exceed 125 N/mm^2 , find the dimensions of the beam. Take depth of section is twice the width.

OR

15. (b) A simply supported beam of span 3 m is carrying a uniformly distributed total load of 6000 N. The beam has a rectangular section 150 mm wide and 300 mm deep. Calculate the maximum deflection. Take $E = 0.1 \times 10^5 \text{ N/mm}^2$

16. (a) Find the power transmitted by a circular shaft of 50 mm diameter at 120 rpm, if the maximum shear stress in the shaft is not to exceed 60 N/mm^2 .

OR

16. (b) A steel wire of 5 mm diameter is bent into a circular shape of 5 m radius. Determine the maximum stress induced in the wire. Take $E = 2 \times 10^5 \text{ N/mm}^2$

ME-303 THERMODYNAMICS

Course Title	Thermodynamics	Course Code	ME-303
SEMESTER	III	Course Group	Core
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

PREREQUISITES: Basic knowledge of Physics

COURSE OUTCOMES: At the end of the course the students will have the ability to

CO1	Explain Laws of thermodynamics and interpret the gas laws.
CO2	Assess various thermodynamic processes and estimate different thermo dynamic properties.
CO3	Classify fuels and describe experimental procedure to determine their Calorific value
CO4	Analyse different air standard cycles and compare them.
CO5	Illustrate working principles of IC Engines.
CO6	Explain different systems used in IC Engines and evaluate the performance of IC Engines.

BLUE PRINT OF MARKS FOR SEE:

Unit No	Unit Name	Periods	Questions to be set for SEE				Remarks	
			R		U	A		
1	Fundamentals of Thermodynamics and perfect gas laws	13	4	1		9(a)	9(b)	
2	Thermodynamic Processes	12						
3	Fuels and Combustion	12		2		10(a)	14(a)	
4	Air Standard Cycles	13						
5	IC Engines – Working Principles	13		3	5 , 6	9(b), 11(a), 11(b)	13(b), 15(a), 15(b)	
6	IC Engines – Systems used and Performance of IC engines	12						7 , 8

Legend: R-Remembering, U-Understanding, A-Applying

COURSE CONTENT

Unit-1

Duration: 13 Periods (L:10-T:3)

Fundamentals of Thermodynamics and perfect gas laws

Introduction- Thermodynamic systems - properties – Zeroth law , First law, First law applied to closed system (NFEE) and Second Law of Thermodynamics-Perfect gas – Boyle's Law, Charles's law, Avogadro's law, Regnault's law, Joule's law - Ideals Gas equation - Relation between specific heats.

Unit-2

Duration: 12 Periods (L:10-T:2)

Thermodynamic processes

Expression for work done and heat supplied (without derivation) for Isochoric, Isobaric, Isothermal, Isentropic, Polytropic processes – Free expansion and Throttling process – Entropy – Expression for entropy (without derivation) for the above thermodynamic processes.

Unit-3

Duration: 12 Periods (L:10-T:2)

Fuels and Combustion

Fuel – Types – Calorific values (Heating value) of fuels – Dulong's formula for calorific value – Bomb calorimeter – Junker's Gas calorimeter – Definition of combustion of fuel – Calculation of minimum air required (on Mass basis) for the complete combustion of fuel having a given composition – products of combustion – Orsat Apparatus for flue gas analysis.

Unit-4

Duration: 13 Periods (L:10-T:3)

Air Standard Cycles

Air standard cycle – Reversible and irreversible process – Explanation and analysis of Carnot cycle, Otto cycle, Diesel cycle – Expression for efficiency of these cycles (without derivation) – Comparison of performance of Otto cycle and Diesel cycle.

Unit-5

Duration: 13 Periods (L:10-T:3)

IC Engines – Working principles

Heat engines – Internal combustion engines and external combustion engines – classification of IC engines – Components of IC engines – Functions of each part and materials used – Principle of working of four stroke petrol engine and four stroke diesel engine – Principle of

working of two stroke petrol engine – Value timing diagram of four stroke petrol engine and four stroke Diesel engine.

Unit-6

Duration: 12 Periods (L:10-T:2)

IC Engines – Systems used and performance of IC engines

Fuel systems – Ignition systems - Cooling systems – Lubrication systems – Evaluation of performance of parameters.

REFERENCE BOOKS

1. Engineering Thermodynamics by P.K. Nag TMH Publishers
2. Thermal Engineering by R.K Rajput
3. Thermodynamics and Heat Engines Vol 1 and Vol 2 by R Yadav
4. IC Engines by Gill and Smith

SUGGESTED LEARNING OUTCOMES:

1.0 Fundamentals of Thermodynamics and perfect gas laws

- 1.1 Define the various terms associated with the thermodynamic system. Explain with examples Open system, closed system and isolated system.
- 1.2 Define the various thermodynamic properties, state, Path, process, Cycle, Temperature, Heat and Work and know sign convention of heat and work.
- 1.3 Define the Specific heats, Internal Energy, Enthalpy, Flow work – Solve problems on properties of thermodynamic systems.
- 1.4 Define Thermal equilibrium – Know the Zeroth law of thermodynamics, First law of Thermodynamics, First law applied to closed system and Second law of Thermodynamics.
- 1.5 Solve problems on First law applied to closed system (Non Flow Energy Equation-NFEE).
- 1.6 Define perfect gas – Know Boyle's law, Charles's law and Characteristic gas equation (without derivation), Universal gas constant.
- 1.7 Solve problems on above gas laws.
- 1.8 Define the relation between specific heats (without derivation) – solve problems
- 1.9 State Avogadro's law, Renault's law and Joule's law.

2.0 Thermodynamic processes

- 2.1 Know expression for work done and heat supplied (without derivation) for Isochoric process.
- 2.2 Know expression for work done and Heat supplied for Isobaric process
- 2.3 Know expression for work done and heat supplied for Isothermal process.
- 2.4 Solve problems on the above processes.
- 2.5 Know expression for work done and heat supplied (without derivation) for Isentropic, process.
- 2.6 Know work done and heat supplied (without derivation)for Polytropic process.

- 2.7 Know the relation between pressure, volume and temperature in Adiabatic (isentropic) process.
- 2.8 Sketch all the above processes during expansion and compression on P-V diagram.
- 2.9 Solve problems on above processes.
- 2.10 Know throttling process and Free expansion process.
- 2.11 Define Entropy and know expression for change in entropy for various thermodynamic processes (without derivation).
- 2.12 Solve problem on change in entropy.

3.0 Fuels and Combustion

- 3.1 Define the term fuel- Classification of fuels –Different solid fuels, stages of formation of coal, advantages and disadvantages of solid fuels.
- 3.2 Different Liquid fuels gaseous fuels- Their advantages and disadvantages.
- 3.3 Define higher calorific value (heating value) and Lower calorific value- Know Calorific value of fuels by using Dulong's formula.
- 3.4 Explain with line diagram the components of Bomb calorimeter narrate the sequence of determination of calorific value and write final formula to find calorific value (problems omitted).
- 3.5 Explain the working principle of Junker's gas calorimeter narrate the sequence of determination of calorific value and write final formula to find calorific value (problems omitted).
- 3.6 Define Combustion of fuel, know the expression for minimum air required (on Mass) for complete combustion of fuel and solve problems.
- 3.7 Know the products of combustion (problem omitted).
- 3.8 Explain with line diagram the working of Orsat's apparatus and narrate the sequential procedure in conducting flue gas analysis by using Orsat's apparatus.

4.0 Air Standard Cycles

- 4.1 Define the term air standard cycle. Know assumptions for air standard cycle.
- 4.2 State the assumptions made in Carnot cycle and study its working with line diagram.
- 4.3 Write the formula for the air standard efficiency of a Carnot cycle (without derivation) and solve simple problems.
- 4.4 State the assumptions made in Otto cycle and study its working with a line diagram.
- 4.5 Write the formula for the air standard efficiency of a Otto cycle (without derivation) and solve simple problems.
- 4.6 State the assumptions made in Diesel cycle and study its working with line diagram.
- 4.7 Write the formula for the air standard efficiency of a Diesel cycle (without derivation) and solve simple problems.
- 4.8 Compare the differences between Otto cycle and Diesel cycle.

5.0 IC Engines – Working principles

- 5.1 Define Heat engine- comparisons of Internal Combustion Engines and External Combustion Engines- classify Internal Combustion Engines.
- 5.2 Explain with line diagram of an IC Engine , name the various parts and briefly explain their functions. Know the various terms associated with IC Engine
- 5.3 Explain the working of four stroke petrol engine (SI) with line diagram.
- 5.4 Explain theoretical indicator diagram, valve timing diagram of four stroke petrol (SI) engine.
- 5.5 Explain the working of four stroke Diesel engine (CI) with line diagram.
- 5.6 Explain theoretical indicator diagram, valve timing diagram of four stroke Diesel (CI) engine.
- 5.7 Explain the working of two stroke petrol engine (SI) with line diagram. Draw the Indicator diagram.
- 5.8 Compare the differences between two stroke engine and four stroke engine
- 5.9 Compare the differences between petrol engine and Diesel engine.

6.0 IC Engines- Systems used and performance analysis of IC engines

- 6.1 Know the functions of the elements of the fuel system in a petrol engine (Fuel tank, Fuel pump, Fuel filter, Air cleaner and carburettor).
- 6.2 Know the functions of various elements of the fuel systems of Diesel engine (Fuel Feed pump, Filter, Fuel Injection pump and Fuel injector).
- 6.3 Explain with line diagram the working of Battery Ignition system.
- 6.4 Explain with line diagram the working of Magneto Ignition system- compare Battery ignition system with Magneto ignition system.
- 6.5 Know the necessity of cooling of IC engine. Study with legible sketch Air cooling system, forced circulation water cooling system and forced circulation liquid coolant system and compare them.
- 6.6 Know the necessity of Lubrication of IC engine and know the parts to be lubricated.
- 6.7 Understand the lubrication system with a line diagram and know the components of lubricating system (Oil pump, Oil strainer pressure relief valve, oil gallery pressure gauge etc).
- 6.8 Define the performance analysis of IC engines like Indicated power, Brake power, Indicated mean effective pressure ,brake mean effective pressure, Friction power, Specific fuel consumption, Mechanical efficiency, Thermal efficiency and know their formulae.
- 6.9 Solve simple problems involving above parameters.

SUGGESTED STUDENT ACTIVITIES:

1. Make a list of different bikes available in market and know their capacities.
2. Make list of different cars available in market and know their capacities.
3. Visit to automobile workshops /service centers and see how an IC engine works

4. Make a note on the solid, liquid fuels available in market and know their calorific values.
5. Collect the data of pressure required in tyres of a two wheeler and four wheeler
6. Collect data of different engine oils used in automobiles.
7. Collect information of different liquid coolants used in automobiles.
8. Study of cutout models of IC engines.
9. Working of bomb calorimeter
<https://www.youtube.com/watch?v=nJOH29SGcCk>
10. Visit to automobile workshop.
11. Working of IC Engine
<https://www.youtube.com/watch?v=O9tfIfwlmz8>
12. Know fuel system
<https://www.youtube.com/watch?v=DCfyUm3I4oI>
13. Know battery ignition system
<https://www.youtube.com/watch?v=OMLSNwQiiKg>
14. Know cooling system in automobile
<https://www.youtube.com/watch?v=V7inC4lOpGs>
15. Know lubrication system
<https://www.youtube.com/watch?v=mmmcj53TNic>

CO-PO MATRIX:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
CO1	3	1	-	1	-	-	-	1,2,4
CO2	3	2	-	1	-	1	-	1,2,4
CO3	1	3	-	-	-	-	-	1,2
CO4	2	2	-	1	-	1	1	1,2,4,6,7
CO5	2	1	-	-	-	1	1	1,2,6,7
CO6	2	1	-	-	-	1	1	1,2,6,7

QUESTION PAPER BLUE PRINT FOR CIE (MID SEM I)

Unit No	Unit Name	Questions to be set for CIE			Remarks
		R	U	A	
1	Fundamentals of Thermodynamics and perfect gas laws	Q No 1 Q No 2	Q No 5(a) Q No 5(b)	Q No 7(a) Q No 7(b)	
2	Thermodynamic processes	Q No 3 Q No 4	Q No 6(a) Q No 6(b)	Q No 8 (a) Q No 8(b)	

QUESTION PAPER BLUE PRINT FOR CIE (MID SEM II)

Unit No	Unit Name	Questions to be set for CIE			Remarks
		R	U	A	
3	Fuels and Combustion	Q No 1	Q No 5(a)	Q No 7(a)	
		Q No 2	Q No 5(b)	Q No 7(b)	
4	Air Standard Cycles	Q No 3	Q No 6(a)	Q No 8 (a)	
		Q No 4	Q No 6(b)	Q No 8(b)	

**BOARD DIPLOMA EXAMINATION
SEMESTER END EXAM MODEL PAPER
THERMODYNAMICS (ME-303)**

TIME :2 Hours

Max. Marks: 40

PART – A

8 X1 = 8

NOTE: 1) Answer **all** questions and each question carries **one** mark.

2) Answers should be brief and straight to the point and shall not exceeding **three** simple sentences

1. Define heat.
2. Define calorific value of solid fuel.
3. State any two functions of lubricants.
4. Define TDC
5. Define clearance volume.
6. State the two functions of connecting rod.
7. State two functions of cooling systems in IC engine
8. State the function of fuel injection.

PART – B

NOTE: Answer **all** questions . Each question carries **three** marks

4X3 =12

9(a) Define specific heat ? List two specific heats for gases.

OR

9(b) Draw ideal indicator diagram for 4-stroke petrol engine.

10(a) A sample of coal has the mass analysis as C= 60 % , H₂=15 % , O₂=15%, N₂=5 % , S= 3% remaining ash. Calculate the minimum air required for complete combustion of 1 kg of coal.

OR

10(b) Why ignition is required in S.I engine.

11(a) State any three differences between S.I engine and C.I engine.

OR

11(b) State any three advantages of IC engine over EC engine.

12(a) Draw the line diagram of petrol engine fuel system .

OR

12(b) During a trial of 4 stroke diesel engine the following observations were recorded.

Area of indicator diagram = 475 mm² , Length of indicator diagram = 62 mm

Spring number = 1.1 bar/mm

Determine indicated mean effective pressure.

PART – C

NOTE: Answer **all** questions . Each question carries **five** marks

4X5 = 20

- 13 (a) A quantity of gas has an initial pressure , volume and temperature of 150 kN/m^2 , 0.14 m^3 and 25° C respectively. It is compressed to a pressure of 1.5 MN/m^2 according to the law $PV^{1.25} = \text{constant}$. Determine (a) Work transfer to the gas (b) heat transfer from the gas and (c) The change of entropy. Take $C_p = 1.041 \text{ kJ/kg K}$, $C_v = 0.743 \text{ kJ/kg K}$.

OR

- 13 (b) Explain working of four stroke petrol engine with a neat sketch.

- 14 (a) Explain the working of Junkers gas calorimeter with a neat sketch.

OR

- 14 (b) Explain the differences between coil ignition and magneto ignition system.

- 15 (a) Explain valve timing diagram for 4 stroke C.I engine.

OR

- 15 (b) Explain construction features of IC engine with line diagram.

- 16 (a) Explain working of simple carburetor with neat sketch..

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OR

- 16 (b) The following results were obtained from a test on a petrol engine.

Indicated power = 30.3 kW , Brake power = 26.05 kW

Brake specific fuel consumption = 0.315 kg/kW.h , calorific value of fuel = 44100 kJ/kg

Calculate (i) Indicated thermal efficiency

(ii) Brake thermal efficiency

(iii) Mechanical efficiency.

BOARD DIPLOMA EXAMINATION
MID SEM-I MODEL PAPER
THERMODYNAMICS (ME-303)

TIME :1 Hours

Max. Marks: 20

PART – A

8 X1 = 8

NOTE: 1) Answer **all** questions and each question carries **one** mark.

2) Answers should be brief and straight to the point and shall not exceeding **three** simple sentences

1. Define state.
2. Define perfect gas.
3. Draw P-V diagram of Isothermal process.
4. Define entropy.

PART – B

NOTE: Answer **all** questions . Each question carries **three** marks

4X3 =12

5. (a) State First law of thermodynamics.

OR

5. (b) State Boyel's law.

6. (a) Represent Adiabatic and Isobaric process on P-V and T-S diagram.

OR

- 6 (b) Write an expression change of entropy for Isochoric process.

PART – C

NOTE: Answer **all** questions . Each question carries **five** marks

4X5 = 20

- 7 (a) Write Second law of thermodynamics (both Kelvin planck and clausius statements)

OR

- 7 (b) 3 kg of an ideal gas is connected in a rigid cylinder 25 kJ of heat is added to the gas, which has an initial temperature of 30° C. Determine (a) Final temperature and (b) change in entropy Assume $R = 0.317 \text{ kJ/kg K}$ and adiabatic index = 1.26

- 8 (a) A thermodynamic system undergoes a cycle composed of a series of three processes for which $Q_1 = + 10 \text{ kJ}$, $Q_2 = + 30 \text{ kJ}$, $Q_3 = - 5 \text{ kJ}$. For the first process $\Delta E = +20 \text{ kJ}$ and for the third process $\Delta E = - 20 \text{ kJ}$. What is the work in the second process and network output of cycle.

OR

- 8 (b) Explain Isothermal and polytropic processes. Write an expression for change of entropy for above processes.

**DME III SEMESTER
MID SEM II EXAMINATION
THERMODYNAMICS (ME-303)
MODEL PAPER**

Time : 1 hr

Total Marks : 20

PART – A

8 X1 = 8

NOTE: 1) Answer **all** questions and each question carries **one** mark.

2) Answers should be brief and straight to the point and shall not exceeding **three** simple sentences

1. Define fuel.
2. Define air standard efficiency.
3. What is combustion
4. State any two assumptions made in analysis of air standard cycle.

PART – B

NOTE: Answer **all** questions . Each question carries **three** marks

4X3 =12

5 (a) Define HVC and LCV.

OR

5 (b) A sample of coal has the following mass analysis C= 60 % , H₂ = 15 % , O₂ =15 % , N₂ = 5 % , S = 3% remaining ash. Calculate the minimum air required for complete combustion of 1 kg of coal.

6. (a) State any three differences between Otto cycle and Diesel cycle.

OR

6 (b) Draw P-V and T-S diagram for Diesel cycle.

PART – C

NOTE: Answer **all** questions . Each question carries **five** marks

4X5 = 20

7. (a) Explain construction and working of Bomb calorimeter.

OR

7 (b) A sample of coal has the following composition by mass carbon 75%, hydrogen 6%, oxygen 8%, nitrogen 2%, sulphur 1.5% and ash 7%. Calculate its higher and lower calorific values per kg of coal.

8 (a) Describe the processes involved in a carnot cycle and draw P-V diagram.

OR

(b) A diesel engine has a compression ratio 14 to 1 , and the heat supply is cut-off at 0.06 stroke. Find the air standard efficiency of the cycle. Assume adiabatic ratio as 1.4

ME-304 ENGINEERING MATERIALS

Course Title	Engineering Materials	Course Code	ME-304
Semester	III	Course Group	Core
Teaching Scheme in Periods (L: T: P)	4:1:0	Credits	3
Methodology	Lectures + Tutorials	Total contact periods	75
CIE	60 marks	SEE	40 marks

PREREQUISITES: Basic knowledge of Physics and Chemistry

COURSE OUTCOMES:

On successful completion of the course the students will be able to

CO1	Understand the properties of engineering materials and know the testing methods to analyse the mechanical properties
CO2	Acquire knowledge on structure of materials.
CO3	Understand the process of producing Iron and steel by various processes.
CO4	Study Iron-Carbon equilibrium diagram and interpret all the microstructures of iron and steel and eutectic, eutectoid and peritectic reactions. Involved
CO5	Describe the various heat treatment processes of steel and their importance.
CO6	Explain composition, application of important Ferrous and Nonferrous metals, their alloys and describe various methods used in powder metallurgy.

BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	No of Periods	Questions to be set for SEE				Remarks	
			R		U	A		
1	Mechanical properties and Testing of engineering materials	12	Q4	Q1		Q9(a)	Q13(a)	
2	Structure of materials	13						
3	Production of Iron and Steel	12		Q 2		Q10(a)	Q14 (a)	
4	Iron -Carbon Equilibrium Diagram	13						
5	Heat treatment of Steel	13		Q 3	Q5 Q6	Q9(b) Q11(a) Q11(b)	Q13(b) Q15(a) Q15(b)	
6	Ferrous, Non Ferrous Metals - their alloys and Powder Metallurgy	12						
TOTAL		75	08		08	08		

Legend	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

COURSE CONTENT

Unit – 1

Duration:12 Periods (L: 10 – T:2)

Mechanical properties and testing of engineering materials

Engineering Materials –Importance and applications of engineering materials, mechanical properties: strength (Tensile strength, Compressive strength and shear strength), stiffness elasticity, plasticity, Ductility, Malleability, Hardness, Toughness, Brittleness, Impact strength, Fatigue, Creep.

Testing of Engineering materials: Destructive tests– Tensile and Compressive test ,shear test, stress- strain curve for different materials – Brinell, Rockwell and Vickers's hardness test –Izod & Charpy impact test. Non-destructive testing: purpose – Different methods (without explanation)

Unit – 2

Duration:13 Periods (L: 10 – T:3)

Structure of materials

Space lattices, Unit cells – BCC, FCC, HCP structures. Crystallization of metal: dendrite growth, grain boundary, grain size and its effect on properties–factors affecting grain size - Recrystallisation

Unit – 3

Duration: 12 Periods (L:10 – T:2)

Production of Iron and Steel

Raw materials used in production of Iron and steel – Production of: Pig Iron by Blast Furnace, Wrought Iron by Puddling furnace, Cast Iron from Cupola, Steel by Bessemer Process, L.D. Process, Open Hearth Process, Electric Arc process and Electrical Induction process.

Unit – 4

Duration: 13 Periods (L: 10 – T:3)

Iron-Carbon Equilibrium Diagram

Phase, equilibrium, Gibb's phase rule, alloy, solid solution: Interstitial, substitutional, chemical compound, mechanical mixture – Cooling curves of pure metals – Allotropic forms of pure iron and critical points – Micro constituents of Iron & Carbon alloy – Iron Carbon equilibrium diagram.

Unit – 5

Duration: 13 Periods (L: 10 – T:3)

Heat Treatment of Steel.

Stages in heat treatment – critical rate of cooling – martensite, bainite, sorbite and troostite- Isothermal transformation (TTT curves) - Austenite decomposition on continuous cooling transformation (CCT) diagram

Heat treatment processes: Annealing – Full Annealing, Sub critical annealing, spheroidise annealing and isothermal annealing. Normalising, Hardening, Tempering – Austempering and Martempering, Surface hardening and Case hardening (only definition).

Unit – 6

Duration: 12 Periods (L: 10 – T:2)

Ferrous, Non-Ferrous metals - their alloys & Powder metallurgy

Ferrous Metals and alloys—cast iron and types – effect of carbon on properties of cast iron—composition, properties and applications of white cast iron, gray cast iron, nodular iron and malleable Iron – Plain carbon steels – effect of carbon on properties. classification of plain carbon steels – Alloy steels: Effect of adding alloying elements chromium, cobalt, manganese, molybdenum, nickel, tungsten, vanadium – composition, properties and application of chromium steel, nickel steel, manganese steel, stainless steel and HSS steel.

Non-Ferrous metals and alloys - composition, properties and application of duralumin, dowe metal, Brass: cartridge brass, admiralty brass, muntz metal, and naval brass. Bronze: gun and bell metal Nickel: constantan, Monel, nichrome and invar. Babbit

Powder metallurgy: Definition and applications – Manufacturing process in powder metallurgy, methods to produce metal powders – methods to compact powders (without explanation) – Pre sintering and sintering (definition) – Advantages, limitations of powder metallurgy.

Note: At the end of every unit Tutorial classes should be held to interact with the students by various methods (slip test, seminar, quiz, virtual labs etc.) to enhance the skill and to create student centric learning.

REFERENCEBOOKS:

1. Introduction to Physical metallurgy by Avner
2. Physical metallurgy by V. Raghavan
3. Material science and engineering by V. Raghavan
4. Material science and metallurgy by Dr. O.P. KHANNA
5. Powder Metallurgy by TTTI, ECH

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1. Mechanical properties and testing of engineering materials.

- 1.1 Know the importance of materials in industry.
- 1.2 Applications of engineering materials.
- 1.3 Classification of engineering materials.
- 1.4 Identify the various factors for selection of engineering materials
- 1.5 Know different mechanical properties like strength (tensile, compressive and shear strengths) stiffness, elasticity, plasticity, ductility, malleability, hardness, toughness, brittleness, impact strength, fatigue, creep.
- 1.6 Draw stress-strain curves for different materials.
- 1.7 Know the various Destructive tests and Non -destructive tests.
- 1.8 Describe tensile test and compression test on mild steel using universal testing machine(UTM)
- 1.9 Describe shear test
- 1.10 Describe Brinell hardness test.
- 1.11 Describe Rockwell hardness test
- 1.12 Describe Vickers hardness test.
- 1.13 Conduct Izod and Charpy impact tests.
- 1.14 State the purpose of different Non -destructive tests used in industry

2. Structure of materials

- 2.1 Understand the terms Space lattices, Unit cells
- 2.2 Draw the structure, calculate effective number of atoms of BCC structure and mention some materials which have the BCC structure
- 2.3 Draw the structure, calculate effective number of atoms of FCC structure mention some materials which have the FCC structure.
- 2.4 Draw the structure, calculate effective number of atoms of HCP structure mention some materials which have the HCP structure.
- 2.5 Explain the process of crystallisation of metals and discuss the process of grain formation, dendritic growth and grain boundaries
- 2.6 Explain factors effecting grain size.
- 2.7 Explain the process of recrystallisation

3. Production of iron and steel

- 3.1 Name the raw materials used in production of Iron and steel
- 3.2 Describe the production of Pig Iron by Blast Furnace.
- 3.3 Describe the production of Wrought Iron by puddling furnace.
- 3.4 Understand the production of Cast Iron from Cupola furnace.
- 3.5 Illustrate the production of steel by Bessemer process.
- 3.6 Describe the production of steel by L.D. Process.
- 3.7 Know the production of steel by Open Hearth process.
- 3.8 Understand the production of steel by Electric Arc process.
- 3.9 Describe the production of steel by Electrical Induction process.

4. Iron -carbon equilibrium diagram.

- 4.1 State Gibbs phase rule and define the terms involved.
- 4.2 Know the importance of alloy and its advantages
- 4.3 Understand solid solution
- 4.4 Discuss Interstitial and substitutional solid solutions
- 4.5 Describe chemical compound, and mechanical mixture.
- 4.6 Sketch Cooling curves of pure metals
- 4.7 Discuss allotropic forms of pure iron and identify the critical points
- 4.8 Explain the following micro constituents of Iron & Carbon alloy: ferrite, austenite, cementite, ledeburite, pearlite, steel, eutectoid steel, hypo eutectoid steel and hyper eutectoid steel.
- 4.9 Sketch Iron- Carbon equilibrium diagram and understand salient points on it.
- 4.10 Describe peritectic, eutectic, eutectoid reactions.

5. Heat treatment of steel.

- 5.1 Importance of heat treatment.
- 5.2 know the stages in heat treatment
- 5.3 Define critical rate of cooling, martensite, bainite, sorbite and troosite
- 5.4 Draw TTT curves (isothermal transformations) and interpret it.
- 5.5 Sketch austenite decomposition on continuous cooling transformation (CCT) diagram.
- 5.6 Explain Annealing heat treatment process
- 5.7 Compare full Annealing, Sub critical annealing, spheroidise annealing and isothermal annealing
- 5.8 Describe Normalising process and its importance
- 5.9 Describe hardening process and its importance
- 5.10 Describe Tempering process and its importance.
- 5.11 Explain the processes Austempering and Martempering
- 5.12 Define Surface hardening and Case hardening.

6. Ferrous metals and alloys & Non ferrous metals and alloys & powder metallurgy.

- 6.1 Discuss the effect of carbon on properties of cast iron
- 6.2 List different types of cast irons
- 6.3 Compare the composition and applications of white cast iron, Gray cast iron, nodular iron and malleable Iron
- 6.4 Classify the plain carbon steels
- 6.5 Discuss the effect of carbon on properties of steel
- 6.6 Describe the effect of adding alloying elements chromium, cobalt, manganese, molybdenum, nickel, tungsten, vanadium to steel
- 6.7 Define ternary, quaternary and complex alloy steel
- 6.8 Explain the composition, properties and application of chromium steel, HSS steel, nickel steel, manganese steel and stainless steel.
- 6.9 List composition, properties and application of duralumin, dow metal
- 6.10 Give composition, properties and application of brass, cartridge brass, admiralty

brass, muntz metal, and naval brass.

- 6.11 Explain the importance of Bronze, gun metal and bell metal
- 6.12 Discuss the composition and application of Nickel alloys: constantan, Monel, Nichrome and invar.
- 6.13 Write composition and application of Babbitt metal
- 6.14 Define Powder metallurgy
- 6.15 Describe the manufacturing process in powder metallurgy.
- 6.16 Write the processes to produce metal powders.
- 6.17 List the methods to compact powders
- 6.18 Define Pre sintering and sintering.
- 6.19 Write advantages and limitations of powder metallurgy.
- 6.20 Applications of powder metallurgy.

SUGGESTED STUDENT ACTIVITIES:

1. Make a list of commonly used materials in daily life like blade, knife, scissors etc and write the material used.
2. Study microstructure of given specimen.
3. Study micro structure of given specimen after it is welded and notice the difference.
4. Visit to a steel plant
5. Compare hardness of commonly available materials and interpret.
6. Make a list of major parts of a two wheeler and know the material used.
7. Visit a heat treatment plant.

SUGGESTED E-RESOURCES:

1. Crystal lattice and unit cell
https://www.youtube.com/watch?v=BjVTdZ_hu8
2. BCC, FCC and HCP crystal structure
<https://www.youtube.com/watch?v=tq7botEnakA>
3. Production of pig iron by blast furnace
<https://www.youtube.com/watch?v=D3ejDgChEhw>
4. Production of Wrought Iron by Puddling furnace
<https://www.youtube.com/watch?v=XJ0GyofGchI>
5. Production of Cast Iron from Cupola
<https://www.youtube.com/watch?v=Cgbpbw5GRK4>
6. Production of Steel by Bessemer Process
https://www.youtube.com/watch?v=uh_RAMqRgrk
7. Production of Steel by Open Hearth Process
<https://www.youtube.com/watch?v=LxH-B1efDnI>
8. Production of Steel by electric arc furnace
<https://www.youtube.com/watch?v=7oSbZgjXlFo>
9. Production of Steel by electrical induction process
<https://www.youtube.com/watch?v=5TLBdBXzMsg>

COURSE OUT COMES		CL	LINKED PO'S	TEACHING PERIODS
CO1	Understand the properties of engineering materials and know the testing methods to analyse the mechanical properties	R, U, A	1,2,3,4	12
CO2	Acquire knowledge on structure of materials.	R, U, A	1,3,4,7	13
CO3	Understand the process of producing Iron and steel by various processes.	R, U, A	1,2,4,5	12
CO4	Study Iron-Carbon equilibrium diagram and interpret all the microstructures of iron and steel and reactions involved.	R, U, A	1,2,4,7	13
CO5	Describe the various heat treatment processes of steel and their importance.	R, U, A	1,2,4,7	13
CO6	Explain composition, application of important Ferrous and Non-ferrous metals, their alloys and describe various methods used in powder metallurgy.	R, U, A	1,2,3,5	12
TOTAL PERIODS				75

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO ATTAINMENT MATRIX

COURSE OUTCOMES	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	3	3	3	-	-	-	1, 2,3,4
CO2	3	2	3	-	-	-	2	1, 3,4,7
CO3	3	3	-	2	2	-	-	1, 2, 4, 5
CO4	3	3	-	2	-	-	2	1,2 4, 7
CO5	3	3	-	3	-	-	1	1,2, 4,7
CO6	3	2	3	-	3	-	-	1,2,3,5

Level-3-highly addressed, Level-2-moderately addressed, Level-1-Lowely addressed

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Mechanical properties and Testing of engineering materials	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Structure of materials	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit Name	R	U	A	Remarks
3	Production of Iron and Steel	1, 2	5(a) 5(b)	7(a) 7(b)	
4	Iron -Carbon Equilibrium Diagram	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Legend	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MODEL PAPER
MID SEM I EXAMINATION
DME III SEMESTER
ENGINEERING MATERIALS

Time: 1 hr

Total Marks: 20

PART – A

Marks: 4 X 1 M = 4 M

*NOTE: 1) Answer **all** questions and each question carries **one** marks.*

*2) Answers should be brief and straight to the point and shall not exceed **three** simple sentences*

1. Define the term strength
2. Define the term creep
3. What is meant by unit cell?
4. Draw the shape of dendrite.

PART – B

Marks : 2 X 3 M= 6 M

*NOTE: 1) Answer **all** questions and each question carries **three** marks*

2) The answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

5 (a) Write the importance of engineering materials in industry.

OR

5 (b) Write any three differences between Izod and Charpy impact test .

6 (a) Describe factors affecting the grain size.

OR

6 (b) Calculate effective numbers of atoms in FCC structure.

PART – C

Marks: 2 X 05 M= 10 M

*NOTE: 1) Answer **all** questions and each question carries **five** marks*

2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

7 (a) Explain the procedure to conduct the tensile test on mild steel by UTM

OR

7(b) Explain about Vickers hardness test

8 (a) Explain BCC structure with the help of sketch.

OR

8 (b) Explain the process of recrystallisation.

MODEL PAPER
MID SEM II EXAMINATION
DME III SEMESTER
ENGINEERING MATERIALS

Time: 1 hr**Total Marks: 20**

PART – A

Marks: 4 X 1 M = 4 M

*NOTE: 1) Answer **all** questions and each question carries **one** marks.*

*2) Answers should be brief and straight to the point and shall not exceed **three** simple sentences*

1. What are the different raw materials for production of iron?
2. Name the type of iron produced by puddling furnace.
3. Define alloy.
4. What is a solid solution?

PART – B

Marks: 2 X 3 M = 6 M

*NOTE: 1) Answer **all** questions and each question carries **three** marks*

2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

- 5 (a) List two types of electric furnaces.

OR

- 5 (b) Write the principle of steel making.

- 6 (a) Define interstitial solid solution and substitutional solid solution.

OR

- 6 (b) Write short note on eutectoid steel.

PART – C

Marks: 2 X 05 M = 10 M

*NOTE: 1) Answer **all** questions and each question carries **five** marks*

2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

- 7(a) Explain about steel production by L-D Process.

OR

- 7(b) Explain production of wrought iron by puddling furnace.

- 8 (a) Discuss allotropic forms of pure iron and identify the critical points.

OR

- 8(b) Explain peritectic, eutectic, and eutectoid reactions in iron carbon equilibrium.

**SEE- MODEL PAPER
BOARD DIPLOMA EXAMINATION
DME III SEMESTER
ENGINEERING MATERIALS**

TIME: 2 Hours

Max. Marks: 40

PART – A

Marks: 8 X 1 M = 8M

NOTE:1) Answer **all questions** and each question carries **one** mark.

2) Answers should be brief and straight to the point and shall not exceeding **three** simple sentences

1. Define the term malleability.
2. What are the by-products of blast furnace?
3. What is meant by non-ferrous metal?
4. Define shear strength.
5. Define the term heat treatment.
6. Name any two annealing processes.
7. What is steel?
8. What is meant by sintering?

PART – B

Answer **all** questions . Each question carries **three** marks

4 x 3 M = 12M

9 (a) Write short notes on a) creep b) fatigue.

OR

9 (b) What are the three stages of heat treatment of steel?

10 (a) Write the function of coke and lime stone in production of iron.

OR

10 (b) Write the composition of High speed steel. And its applications.

11(a) Write about tempering process and its importance.

OR

11 (b) Explain sub critical annealing.

12 (a) Classify plain carbon steels.

OR

12 (b) what are the advantages of powder metallurgy?

PART – C

Answer **all** questions . Each question carries **five** marks

4 x 5 M = 20 M

13 (a) Explain BCC structure with sketch and name the materials which have the BCC structure.

OR

13 (b) Explain normalising process.

14 (a) Explain production of cast iron by cupola furnace.

OR

14 (b) Write short notes on below two methods of manufacture of metal powders

i) Mechanical pulverisation ii) atomisation

15 (a) Explain continuous cooling transformation (CCT) curves.

OR

15 (b) Explain hardening processes.

16 (a) Write composition, properties and application of Babbitt metal.

OR

16 (b) Explain briefly the sequence of operation in producing a part by powder metallurgy.

ME-305 FLUID MECHANICS AND HYDRAULIC MACHINERY

Course Title	Fluid Mechanics and Hydraulic Machinery	Course Code	ME-305
Semester	III	Course Group	Core
Teaching Scheme in Periods (L: T: P)	4:1:0	Credits	3
Methodology	Lectures + Tutorials	Total contact periods	75
CIE	60 marks	SEE	40 marks

PREREQUISITES: Basic knowledge of physics.

COURSE OUTCOMES: At the end of the course the students will be able to

CO1	Selection of suitable fluid for various applications based on fluid properties.
CO2	Applying concept of Bernoulli's equation for flow of liquids
CO3	Estimate frictional losses and design the pipe for flow of liquids through pipes.
CO4	Analyze forces on plates or vanes due to impact of jets
CO5	Describe the working of water turbines and estimate the power developed by turbines
CO6	Describe a hydraulic pump and estimate the power required to operate hydraulic pumps.

BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	No of Periods	Questions to be set for SEE				Remarks	
			R		U	A		
1	Properties of Fluids	12	Q4	Q1		Q9(a)	Q13(a)	
2	Flow of Liquids	12						
3	Flow through pipes	12		Q 2		Q10(a)	Q14 (a)	
4	Impact of jets	13						
5	Water Turbines	13		Q 3		Q9(b) Q11(a) Q11(b)	Q13(b) Q15(a) Q15(b)	
6	Pumps	13						
TOTAL		75	08		08	08		

Legends: R; Remembering, U: Understanding & A: Applying

COURSE CONTENT

UNIT-1

Duration: Periods 12 (L: 09 – T: 03)

Properties of fluids

Definition of fluid, ideal and real fluids, compressible and incompressible fluids -Units used in fluid mechanics. Density, specific weight, specific gravity, viscosity and surface tension, compressibility and capillarity. Intensity of pressure, gauge and absolute pressures. Measurement of pressures by piezometer, U-Tube – manometer – simple problems – Bourdon tube pressure gauge.

UNIT-2

Duration: Periods 12 (L: 10 – T: 02)

Flow of Liquids

Types of Fluid flow- Steady and Unsteady flow, Uniform and Non-Uniform Flow, 1D, 2D & 3D Flow, Rotational and Irrotational flow, Laminar & Turbulent flow- Concept on Reynolds's Number, Discharge, Continuity equation for compressible and incompressible fluids- Simple problems on continuity equation- Pressure, potential and kinetic energy of liquids - Total energy, Bernoulli's equation (no derivation) – assumptions made, Simple problems on Bernoulli's equation, Working principle of Venturi meter, Simple Problems on Venturi meter, Pitot tube – principle – applications.

UNIT-3

Duration: Periods 12 (L: 09 – T: 03)

Flow through pipes

Concept of loss of head in pipes due to friction, Darcy's & Chezy's formula (without proof), Simple problems on Darcy's and Chezy's formulae, Hydraulic gradient line and Total energy line-illustration, Calculation of discharge, velocity, diameter of pipe etc., for pipes connecting two reservoirs (considering frictional losses only), Siphon – principle of working (Numerical problems omitted), Expression for power transmitted through pipes. Expression for transmission efficiency, condition for maximum efficiency (without proof.), Simple problems on power transmission

UNIT-4

Duration: Periods 13 (L: 10 – T: 03)

Impact of jets

Derivation of formulae for the force of jet on Stationary vertical flat plate, stationary inclined flat plate, Stationary curved plate and Simple problems on the above, Derivation of formulae for the force of jet on moving vertical flat plate. Derivation of formulae for the force of jet on series of moving plates fixed on the rim of a wheel, Simple problems on the above, Force of jet striking on a moving curved blade when jet strikes tangentially at one end of the tip - velocity triangles, Work done, power and efficiency in the above cases, Simple problems on the above.

UNIT-5

Duration: Periods 13 (L: 10 – T: 03)

Water turbines

Introduction to water turbines- Hydro-electric power stations line sketch showing layout of hydro-electric power plant with head race, dam, sluice gate, pen stock turbine, generator and tail race, Classification of turbines-impulse and reaction turbines, Brief sub-classification as axial, radial and tangential flow type, Working principle of Pelton wheel-velocity triangles, Simple problems, Working principle of Francis turbine - velocity triangles, Simple problems, Working principle of Kaplan turbine - velocity triangles, Simple, problems, Differences between Pelton wheel and Francis Turbines, Differences between Francis and Kaplan turbines, Governing of methods of Water turbines

UNIT-6

Duration: Periods 13 (L: 10 – T: 03)

Pumps

Pump-Function – Classification, Principle of operation of a reciprocating pump, Constructional details of single acting, double acting pumps. Expression for theoretical power required to drive the pump (without proof)-slip- Simple problems, working principle of centrifugal pump, Installation of centrifugal pump, Priming of centrifugal pump – necessity- Cavitation in centrifugal pump -, Simple problems on work, power and efficiency of Centrifugal pumps, Difference between Reciprocating pump and Centrifugal pump.

SUGGESTED STUDENT ACTIVITIES:

1. Visit nearby Hydroelectric power station and observe dam, penstock, turbines, generators etc.
2. Visit nearby pumping station and identify the pumps used.
3. Quiz
4. Group discussion
5. Surprise test
6. Seminars

SUGGESTED LEARNING OUTCOMES:

Upon the completion of the course the student should be able to

1. Understand the various properties of fluids

- 1.1 Define fluids.
- 1.2 Differentiate between ideal and real fluids
- 1.3 Differentiate between compressible and incompressible fluids
- 1.4 State the various units used in Hydraulics
- 1.5 Define various properties of fluids and state their units
- 1.6 Solve problems on properties of fluids
- 1.7 Define intensity of pressure and their units, differentiate between gauge pressure and absolute pressure.
- 1.8 Solve problems on pressure.
- 1.9 Explain the working principle of manometer Solve simple problems on simple U-tube manometer.
- 1.10 Borden tube pressure gauge

2. Understand the behavior of liquids in motion

- 2.1 Distinguish types of fluid flows and concept on Reynolds's number.
- 2.2 State the various type of energies and the total energy.
- 2.3 Know about the Discharge and velocity of a flowing liquid
- 2.4 Understand the equation of continuity and solve simple problems
- 2.5 State Bernoulli's equation and its application in hydraulics
- 2.6 Solve simple problems on Bernoulli's equation
- 2.7 Explain the working principle Venturi meter and simple problems on Venturi meter.
- 2.8 Explain the working principle pitot tube simple problems pitot tube.

3. Evaluate frictional losses during flow of liquids through pipes

- 3.1 Mention the equation for loss of head due to friction in pipes
- 3.2 State Darcy's and chezy's formulae and simple problems
- 3.3 Explain the hydraulic gradient and total energy line
- 3.4 Calculate the velocity of flow, discharge and diameter of pipes connecting two reservoirs
- 3.5 Explain the function of siphon and give reason for limiting the height of the pipes

3.6 Explain how the power can be transmitted through pipes carrying liquid under pressure.

3.7 Express the condition for maximum H.P. through pipes

3.8 Solve simple problems on power transmission through pipes

4. Analyze forces during the impact of jets

4.1 Derive expression for force of jet on stationary or fixed vertical plate and problems.

4.2 Derive expression for force of jet on stationary or fixed inclined flat plate and problems

4.3 Derive expression for force of jet on stationary or fixed curved plate and problems

4.4 Derive expression for force of jet on moving flat plate and problems.

4.5 Derive expression for the force of jet on a series of plates fixed on the rim of a wheel and problems.

4.6 Derive expression for the force of jet of water on a moving curved vane when jet strikes tangentially at one end of the tip.

4.7 Find the expressions for work done, power and efficiency

4.8 Solve simple problems on moving curved vane when jet strikes tangentially at one end of the tip.

5. Understand the working of water Turbines

5.1 State the importance of water turbines

5.2 Draw the layout of a hydroelectric power station

5.3 Classify the water turbines based on the direction of flow of water & other criteria

5.4 Explain the working of Pelton wheel and simple problems.

5.5 Explain the working of Francis turbine and simple problems.

5.6 Explain the working of and Kaplan turbine and simple problems.

5.7 Difference between Pelton wheel and Francis Turbine

5.8 Difference between Francis and Kaplan turbines

5.9 Describe the governing of water turbines

6. Know the working of pumps

6.1 Explain the function of pump and Classify the pumps

6.2 Mention the constructional details of single acting pump and simple problems

6.3 Mention the constructional details of double acting pumps and simple problems

6.4 Expression for theoretical power required and slip and simple problems.

6.5 Explain the principle of operation of centrifugal pumps

6.6 Mention the constructional and installation of a centrifugal pump

6.7 Derive the expression for work done by the centrifugal pump.

6.8 Define the heads and efficiency of a centrifugal pump

6.9 Solve simple problems on centrifugal pumps

6.10 Appreciate the importance of priming and explain priming methods

6.11 Explain cavitation in centrifugal pump

6.12 Compare the centrifugal pump with a reciprocating pump

REFERENCE BOOKS:

1. Fluid Mechanics and Hydraulic Machines Dr.R.K.Bansal
2. Hydraulic Machines by S.AnanthaSwamy
3. Hydraulic Machines by R.C. Patel
4. Hydraulics ByMalhotra&Malhotra
5. Hydraulics & Hydraulic Machinery by Yeaple
6. Hydraulics and Pneumatics by Reya and Rao.

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
CO1	3	1	1	-	1	-	-	1,2,3,5
CO2	3	2	2	-	-	-	-	1,2,3
CO3	3	3	3	-	-	-	-	1,2,3
CO4	3	3	1	-	-	-	-	1,2,3
CO5	3	3	3	-	2	1	-	1,2,3,5,6
CO6	3	3	2	-	-	1	-	1,2,3,6

QUESTION PAPER BLUE PRINT FOR CIE (MID-I)

Unit No	Unit Name	Questions to be set for CIE (Q No)			Remarks
		R	U	A	
1	Properties of Fluids	1	5(a)	7(a)	
		2	5(b)	7(b)	
2	Flow of Liquids	3	6(a)	8(a)	
		4	6(b)	8(b)	

QUESTION PAPER BLUE PRINT FOR CIE (MID-II)

Unit No	Unit Name	Questions to be set for CIE (Q No)			Remarks
		R	U	A	
3	Flow through pipes	1	5(a)	7(a)	
		2	5(b)	7(b)	
4	Impact of jets	3	6(a)	8(a)	
		4	6(b)	8(b)	

ME-305 FLUID MECHANICS AND HYDRAULIC MACHINERY

MODEL PAPER - MID -I (CIE)

Time: 1 Hour

Max. Marks: 20 M

PART – A

4 X 1 = 4

NOTE: (i) Answer all questions and each question carries one mark.

(ii) Answers should be brief and straight to the point

1. Define ideal fluid.
2. Write the relation between specific weight and density.
3. What is a turbulent flow?
4. What is a pitot tube?

PART – B

2 X 3 = 6

NOTE: (i) Answer all questions and each question carries three marks

(ii) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

5. (a) Calculate the density and specific weight of 1 lt. of petrol with specific gravity 0.7?

OR

5. (b) Convert a vacuum of 90 mm of mercury into absolute pressure in meters of water?
6. (a) What is the difference between steady flow and unsteady flow?

OR

6. (b) Draw a neat sketch of a venturi meter and label its parts.

PART – C

2 X 5 = 10

NOTE: (i) Answer all questions and each question carries five marks

(ii) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

7. (a) Explain the working of Bourdon tube pressure gauge with a neat sketch.

OR

7. (b) A flat plate of area $1.5 \times 106 \text{ mm}^2$ is pulled with a speed of 0.4m/s relative to another plate located at a distance of 0.15mm from it. Find the force and power required to maintain this speed, if the fluid separating them is having viscosity as 1 poise.

8. (a) A pipe has a diameter 15cm at one end, 30cm at the other end. Water is flowing in this pipe with mean velocity of 20m/sec at first end. Find out A) Discharge of water through pipe, B) velocity at the other end

OR

8. (b) A pipe 300 m long has a slope of 1 in 100 and tapers from 1 m diameter at higher end to 0.5 m at the lower end. The quantity of water flowing is 900 lit/ sec. If the pressure at the higher end is 70 kPa, find the pressure at the lower end.

ME-305 FLUID MECHANICS AND HYDRAULIC MACHINERY

MODEL PAPER - MID -II (CIE)

Time: 1 Hour

Max. Marks: 20 M

PART – A

4 X 1 = 4

NOTE: (i) Answer all questions and each question carries one mark.

(ii) Answers should be brief and straight to the point

5. Define Hydraulic mean depth.
6. Define Total energy line?
7. Write an expression for force exerted on flat moving plate.
8. State the condition for maximum efficiency for a series of moving blades struck by a jet of water

PART – B

2 X 3 = 6

NOTE: (i) Answer all questions and each question carries three marks

(ii) The answers should be comprehensive and the criteria for valuation is the content

but not the length of the answer.

5. (a) Water flows through a pipe of 100mm diameter and 60m long with velocity of 2 m/sec. Find the head lost due to friction by using Darcy's formula, $f = 0.005$.

OR

5. (b) State the reason for limiting the height of the pipes for siphon system?

6. (a) A jet of diameter 40mm strikes horizontally on a plate held vertically. What force is required to hold plate for a flow of oil of specific gravity 0.8 with a velocity of 30m/s.

OR

6. (b) Draw the inlet and outlet velocity triangles for a moving curved vane, when a jet enters tangentially at one tip and leaving at the other tip.

PART – C

2 X 5 = 10

NOTE: (i) Answer all questions and each question carries five marks

(ii) The answers should be comprehensive and the criteria for valuation is the content

but not the length of the answer.

7. (a) Two reservoirs are connected by a pipeline consisting of two pipes, one of 15cm dia. and 10m length and the other of 22.5cm diameter and length 20m. If the

difference between water levels in the two reservoirs is 10m. Calculate the discharge, take $f = 0.02$, neglect minor losses.

OR

7. (b) Water is to be supplied from a reservoir to a turbine. The turbine is situated 150m below the reservoir level. The length of penstock is 1500m. Determine the smallest diameter of penstock to produce 500kW of power with a turbine of efficiency 95% take $f = 0.02$.
8. (a) A jet of 78.64cm^2 area, moving with a velocity of 12 m/sec impinges on a series of vanes moving with a velocity of 8 m/sec. Determine (i) Force on the plate(ii) Work done per sec,(iii) Efficiency.

OR

8. (b) A jet of water of diameter 15 cm, strikes a curved plate at its centre with a velocity of 25 m/sec. The curved plate is moving with a velocity of 11 m/sec in the direction of jet. The jet is deflected through an angle of 165° . Assuming the plate smooth, find (i) Force exerted on the plate in the direction of jet, (ii) Power of the jet, and (iii) Efficiency of the jet.

BOARD DIPLOMA EXAMINATIONS
SEMESTER END EXAMINATION (SEE)
MODEL PAPER- ME-305

FLUID MECHANICS AND HYDRAULIC MACHINERY

TIME : 2 Hours

Max. Marks: 40

PART – A

8 X 1 = 8

NOTE : 1) Answer **all** questions and each question carries **one** mark.

2) Answers should be brief and straight to the point and shall not exceeding three simple sentences

9. Write the Continuity equation for Incompressible fluids.
10. Write the Darcy Weisbach formula.
11. State the pump use.
12. Define Surface tension?
13. What is the Cross-sectional area of bucket in Pelton wheel?
14. Define overall efficiency in hydraulic turbine.
15. Define negative slip for the reciprocating pump.
16. What is positive displacement pump?

PART – B

4X 3= 12

NOTE: (i) Answer **all** questions and each question carries **three** marks

(ii) The answers should be comprehensive and the criteria for valuation is the content

but not the length of the answer.

- 9 (a) State Bernoulli's equation and write any two assumptions made in Bernoulli's equation

OR

- 9 (b) Draw the layout of hydroelectric power plant and indicate the main parts.

- 10 (a) Write short notes on syphon system.

OR

- 10 (b) What are the functions of the casing of a centrifugal pump?

11(a) List any three features of Kaplan turbine.

OR

11 (b) State the need of governing in water turbines.

12 (a) What are the advantages of centrifugal pump over reciprocating pump?

OR

12 (b) Why can the suction height of a pump not exceed certain limit?

PART – C

4 X 5 = 20

NOTE: (i) Answer **all** questions and each question carries **five** marks

(ii) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

13 (a) Explain the working of Simple U-tube manometer with a neat sketch.

OR

13 (b) Explain governing of the reaction turbines with line diagram.

14 (a) Water supplied from a reservoir through a 300mm diameter pipe 600m long to a turbine which is situated 108m below the free surface. Discharge through the pipe is 81 lit/sec. Find the head lost and the power transmitted by the pipe? Darcy's friction factor, $f=0.01$.

OR

14 (b) Explain the working of single acting reciprocating pump with a sketch.

15 (a) A Francis turbine working under a head of 130m runs at 400rpm. The diameter of the runner at inlet is 1.5m and the flow area is 0.5m^2 . The guide blade angle is 20° and vane angle at inlet is 60° . i) Determine power developed ii) Hydraulic efficiency. The velocity of whirl at outlet is zero.

OR

15 (b) A Kaplan turbine is required to develop 7000 KW under a head of 4m, speed ratio is 2, flow ratio is 0.7 and the ratio of boss diameter to runner diameter is 0.35. Find the speed of runner assuming 90% overall efficiency.

16 (a) A double acting reciprocating pump delivers oil of specific gravity 0.82 through a height of 8 m from the pump. The suction height is 5 m and the piston speed is 4 m/sec. The diameter of the cylinder is 10 cm. taking the efficiency of the pump as 60%, find the power of the machine driving the pump.

OR

16 (b) Explain the working principle of centrifugal pump with neat sketch?

ME-306 MACHINE DRAWING

Course title	Machine Drawing	Course Code	ME-306
Semester	III	Course group	Core
Teaching scheme in periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecturer + Practice	Total contact periods	45
CIE	60 Marks	SEE	40 Marks

PRE REQUISITES: This course requires the knowledge of Engineering Drawing

COURSE OUTCOMES: On successful completion of the course, the students will be able to

CO1	Understand the machine drawing.
CO2	Understand need and application of different types of fasteners and draw according to specifications, keys and cotter joints welded joints, piping layout and riveted joints as per IS standards.
CO3	Understanding and draw various Welding symbols
CO4	Understand various pipe fittings and layouts
CO5	Proficiency In reading and interpret various drawings of a component and understand the concepts of Assembly drawings

BLUE PRINT OF MARKS FOR SEMESTER END EXAM

Unit No.	Unit Name	Periods	Questions for SEE			Remarks
			R	U	A	
1	Introduction and fastening devices	8		Q.No.1,2		
2	Pipe Layouts and Welding symbols	7		Q.No.3,4		
3	ASSEMBLY-I Assembly drawings of cotter joint, Gib and Cotter joint, Knuckle Joint, Muff coupling, universal coupling, Flange couplings, Screw Jack, Stuffing Box	15			Q.No.5	
4	ASSEMBLY –II Assembly Drawings of Bearings (Foot step Bearing, Plummer block), cross Head, connecting rod, Eccentric, lathe tail stock	15			Q.No.6	
TOTAL		45		4	2	

COURSE CONTENT

1.0 Introduction

Importance of Machine Drawing - Brief revision of 1st and 3rd angle projections -

Understand the concepts of Orthographic projections and Sectional views.

Fastening Devices

Temporary and Permanent fastenings and their areas of application-thread nomenclature, forms of screw thread profiles, metric, B.A., Acme, Knuckle, etc.

Bolts and Nuts: Specification of bolts and nuts, different types of bolted joints (through bolts, studs, screws etc.) in different applications. Purpose of lock nuts and their types

Keys and cotters: Types of keys and cotters: Difference between key and cotter uses.

Rivets and Riveted joints: Types and proportions and specification of rivets: Different types of riveted joints: Lap, butt-single row, double row etc., chain and zigzag riveting – calculation of diameter of rivet: Pitch and arrangement of rivets in row – use – of standard proportions.

Welded joints and types. Pipe Joints

Exercises: 1

1. Thread Nomenclature and forms of screw thread profiles.
2. Exercises in drawing – bolted connections using standard proportions.
3. Drawing of various types of lock nuts & types of keys indicating their proportionate dimensions.
4. Exercise in drawing riveted joints using standard proportions: Single row, double row (chain and zigzag) in lap and butt joints (single & double strap).

2.0 Piping layouts

Classification of pipes and tubes- Components of pipes lay-out.-Screw fitting bend, elbow, tee, lateral Cross-nipple, reducing socket and plug - Unions: Screwed ground and flanged - Valves: Gate valve: angle valve, check valve - Various conventional symbol used for the above components.

Exercise: 2

1. Single line diagram of pipe layout one exercises.
2. Double line diagram of pipe layout one exercise.

Welded fabrication drawings

Different types of weld and their basic symbols including sectional representation as per table of I.S. standards, fillet, square butt, single V-Butt, double V-Butt, single bevel butt, double bevel butt, stud, bead (edge or seal) spot, seam. - Elements of welding symbol and their standard location the symbol as per IS standards reference code arrow head, weld symbol supplementary symbol dimensions of welds, method of welding process, special reference - Significance of arrow & position of arrow head significance of reference line as per I.S. standards with reference to fillet, V-Butt and stud welds.

Supplementary symbols and special instructions: surface of reference line; as per I.S. standards with reference to fillet, V-Butt and stud welds.- Dimensions of welds: length, location and spacing of welds as per I.S., B.I.S., standards with showing dimensions required on a welding - Need of special reference.

Exercise: 3

1. Drawing tables and figs. Referred in the contents above taking from I.S. standards.
2. Dimensioning a given welding drawings as per I.S., SP-46-1988.
3. Preparing working drawing of welding fabrication from given data.

3.0 Assembly Drawings-I

Need and functions of assembly and detailed drawings - Steps in preparing assembly drawings -. - Exercises in preparing assembly drawings of commonly available engineering components.

Exercise: 4

Draw the views / sectional views of

1. Cotter joint
2. Jib and cotter joint assembly
3. Knuckle joint assembly
4. Assembly of muff coupling (solid & split) coupling, Flange couplings
5. Screw jack assembly
6. Stuffing box.

4.0 Assembly Drawings-II

With the knowledge gained by the above exercises the students shall be able to draw exercises on bearings,

1. Protective type flanged coupling
2. Piston of petrol engine
3. Cross head

4. Connecting rod
5. Eccentric
6. flexible coupling
7. Lathe tool post
8. Foot step bearing
9. Plummer block
10. Lathe tail stock

REFERENCE BOOKS:

1. T.S.M & S.S.M in respect of Technical Drawing by TTTI, Madras
2. Machine Drawing by A.C. Parkinson.
3. Machine Drawing by Jones & Jones.
4. Machine Drawing by N.D. Bhatt.

SUGGESTED LEARNING OUTCOMES:

On the completion of the course the student should be able to

1.0 Introduction & Fastening devices

- 1.1 Know and draw Conventional representation of materials and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
- 1.2 Know the standard specifications of Nuts & Bolts
- 1.3 Know the various temporary fastening devices
- 1.4 Know the various permanent fastening devices
- 1.5 Know difference between Temporary and permanent joints
- 1.6 Know the standard representation of Internal and external threads of Bolts & Nuts
- 1.7 Understand the Standard proportions of various threads like V, ACME, Square, Metric , Knuckle etc.,
- 1.8 Know the standard designation and purpose of Locknut, washer, set screws.
- 1.9 Know the Applications of Keys, riveted joints
- 1.10 Understand the Standard proportions of various keys and cotters
- 1.11 Know the difference between Key & Cotter
- 1.12 Know different types of riveted joints and draw according to standard specifications

2.0 Piping Layouts and Welded Joints

- 2.1 Know the conventional symbols of various welded joints
- 2.2 Know the conventional symbols of various pipe joints.
- 2.3 Draw the Single line diagram of pipe layout
- 2.4 Know and draw Double line diagram of pipe layout

3.0 Assembly drawings

- 3.1 Know the need of assembly drawing
- 3.2 Know the functions of assembly drawing like manufacturing and functional requirements
- 3.3 Know the various steps in making assembly drawing like
 - Geometrical mapping

- Dimensional mapping and
 - Functional matching
- 3.4 Study functional requirements of each component and their inter relationship
 - 3.5 Study carefully the views of each component in the detail drawing and decide the relative location of each part for the proper functioning of the machine.
 - 3.6 Decide the mating dimensions between two components which are required to be assembled
 - 3.7 Know the use of bill of material and its designation

Course Outcomes		CL	Linked PO	Teaching Periods
CO1	Understand the machine drawing.	U/A	1,4,7	3
CO2	Understand need and application of different types of fasteners and draw according to specifications, keys and cotter joints welded joints, piping layout and riveted joints as per IS standards.	U/A	1,2,3,4,5,7	6
CO3	Understanding and draw various Welding symbols	U/A	1,4,7	3
CO4	Understand various pipe fittings and layouts	A	1,3,4,5,7	3
CO5	Proficiency In reading and interpret various drawings of a component and understand the concepts of Assembly drawings	U/A	1,2,3,4,7	30

CO-PO MAPPING MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	-	-	1	-	-	2
CO2	3	1	1	2	1	-	3
CO3	3	-	-	2	-	-	2
CO4	3	-	1	2	1	-	2
CO5	3	1	1	2	-	-	2

MID SEM-I EXAM

S.No.	Unit Name	R	U	A	Remarks
1	Unit-1		Q.No. 1,2,3		Answer any four questions
2	Unit-2		Q.No. 4,5,6		

MID SEM-II EXAM

S.No.	Unit Name	R	U	A	Remarks
1	Unit-3			Q.No. 1,2	Answer any one

BOARD DIPLOMA EXAMINATIONS, (C-21)

CIE- MID SEM-I MODEL PAPER

MID –I MODEL PAPER

ME-306 MACHINE DRAWING

Time: 1 hr

Max.Marks:20

Instructions: Answer any **four** questions. Each question carries five marks 4 x 5=20

1. Draw the square thread profiles with proportions.
2. Draw the views of a square headed bolt.
3. Draw a hexagonal headed bolt with nut of 25 mm diameter.
4. Draw a double riveted lap joint connecting two plates of 6mm Thick.
5. Draw the symbols of the following welded joints.
 - a. Concave fillet weld
 - b. Single v-butt weld
 - c. Spot weld
 - d. Seam weld
 - e. Square butt weld
6. Draw the following piping joint symbols(single line)
 - a. T
 - b. Elbow
 - c. Gate valve
 - d. Lateral
 - e. Union

BOARD DIPLOMA EXAMINATIONS, (C-21)

CIE- MID SEM-I MODEL PAPER

MID –II MODEL PAPER

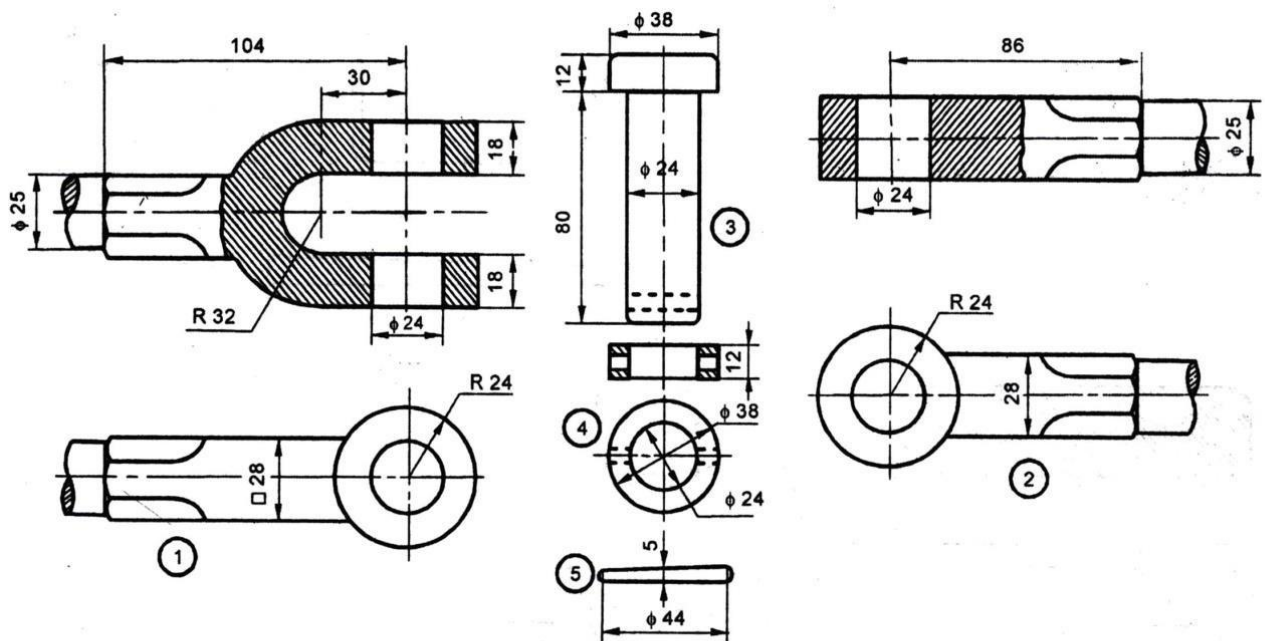
ME-306 MACHINE DRAWING

Time: 1 hr

Max.Marks:20

Instructions: Answer any **one** question. Each question carries twenty marks 1 x 20=20

1. Assemble all the parts of the knuckle joint and draw the sectional front view.

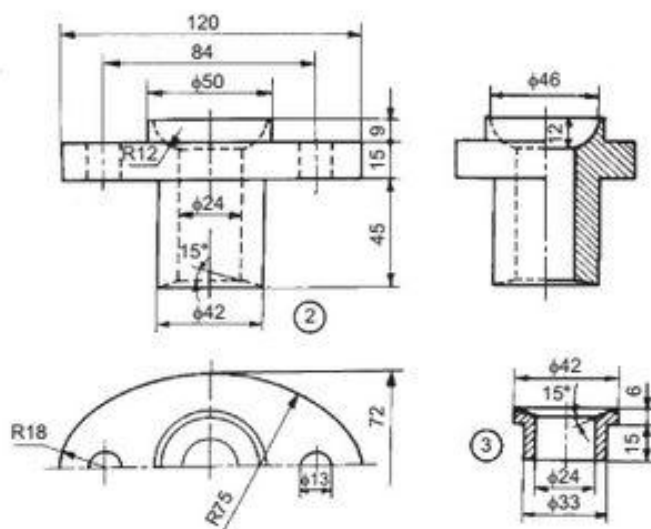
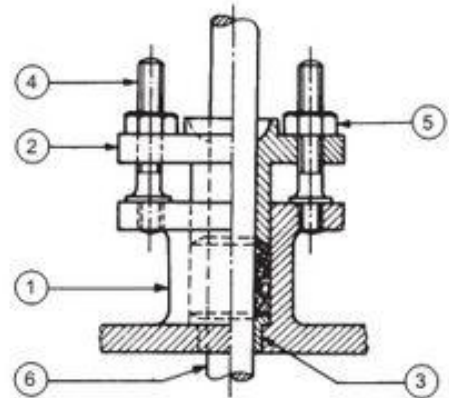
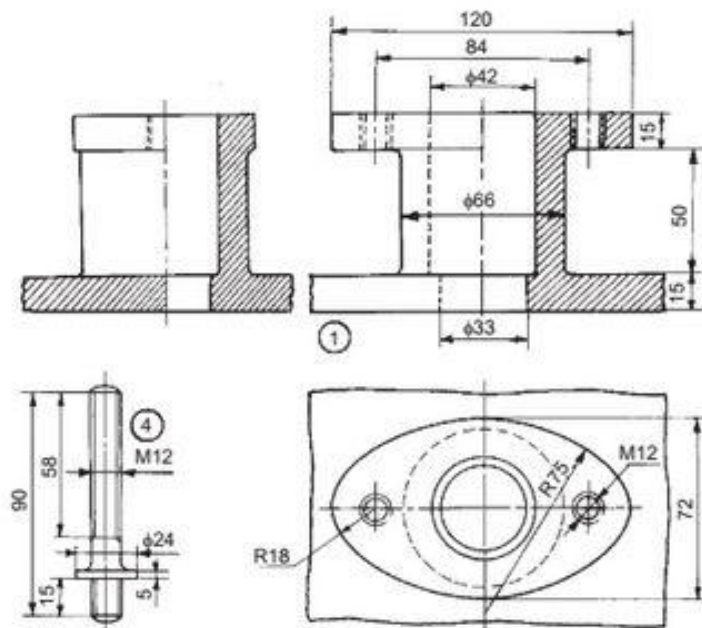


Parts list

No.	Name	Matl	Qty
1	Fork end	F S	1
2	Eye end	F S	1
3	Pin	M S	1
4	Collar	M S	1
5	Taper pin	M S	1

KNUCKLE JOINT

2. Study given part drawing of stuffing box and draw half sectional front view .



Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Gland	Brass	1
3	Bush	Brass	1
4	Stud	MS	2
5	Nut, M12	MS	2

SEMESTER END EXAMINATION MODEL QUESTION PAPER
DME III ME-306 MACHINE DRAWING

Time: 2 hr

Max. Marks: 40

PART-A

3 X 4 = 12

- INSTRUCTIONS:** (1) Answer **ALL** questions
- (2) Each question carries three marks.
 - (3) Answer should be neat & clear with all the necessary dimensions.
 - (4) All dimensions are in 'mm'. Choose suitable scale

1. Draw the following thread profiles with proportions.
 - (a) V threads
 - (b) Square thread
2. Draw the views of a hexagonal headed bolt.
3. Draw a single riveted lap joint connecting two plates of 6mm Thick.
4. Draw the symbols of the following welded joints.
 - (a) Concave fillet weld
 - (b) Double v-butt weld
 - (c) Spot weld
 - (d) Seam Weld
 - (e) Square Butt Weld

PART-B

1 X 28 =

28

- INSTRUCTIONS:** (1) Answer any **ONE** question
- (2) Each question carries three marks.
 - (3) Answer should be neat & clear with all the necessary dimensions.
 - (4) All dimensions are in 'mm'. Choose suitable scale

5. Assemble all the parts of the **knuckle joint** and draw
 - a. Sectional front view
 - b. Top view

ME-307-BASIC MANUFACTURING & FABRICATION ENGINEERING LAB

Course Title	Basic Manufacturing & Fabrication Engineering Lab	Course Code	ME-307
Semester	III	Course Group	Core
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

PRE REQUISITES: This course requires the knowledge in basic manufacturing technology

COURSE CONTENT:

At the end of the course, the student will have the ability to:

CO1	Understand integral parts of lathe and various accessories and attachments used.
CO2	Demonstrate machining skills with appropriate selection of tools and cutting parameters like cutting speed, feed and depth of cut for various machining operations on lathe.
CO3	Ability to perform certain lathe operations like Plain Turning, Step Turning, Taper Turning, Turning Collars, Knurling, Facing.
CO4	Understand different equipments, tools and accessories used in welding.
CO5	Basic knowledge in operating welding equipment and performing some welding operations.
CO6	Demonstrate the knowledge and necessary skills to perform sand preparation for moulds and making the moulds ready for casting operation.

BLUE PRINT OF MARKS FOR SEE

Unit No	Unit name	Periods	Marks for SEE			Total Marks	% Weightage
			Hand ling	Manip ulation	Preci sion		
1.	Hands on practice on Lathe	15	10	15	15	40	100
2.	Hands on practice in welding	15	10	15	15	40	100
3.	Hands on practice in foundry processes	15	10	15	15	40	100
Total		45					

COURSE CONTENT

1 Foundry

Preparation of sand Mould

- 1.1 V – Pulley
- 1.2 Gear pulley
- 1.3 Preparation of Core

2 Machine Shop (Turning)

- 2.1 Facing, Plain Turning and knurling
- 2.2 Facing ,Step Turning and grooving
- 2.3 Facing, Taper Turning
- 2.4 Turning Collars

3. Welding

- 3.1 Layout of Beads
- 3.2 Butt joints.
- 3.3 Lap joints.

NOTE: In foundry section a minimum of one demonstration per batch is to be conducted for casting involving melting, pouring and fettling

Course Outcomes		Linked POs
CO1	Understand integral parts of lathe and various accessories and attachments used.	1,2,3
CO2	Demonstrate machining skills with appropriate selection of tools and cutting parameters like cutting speed, feed and depth of cut for various machining operations on lathe.	1,2,3,7
CO3	Able to perform certain lathe operations like Plain Turning, Step Turning, Taper Turning, Turning Collars, Knurling, Facing.	1,2,3,7
CO4	Understand different equipments, tools and accessories used in welding.	1,2,3,7
CO5	Basic knowledge in operating welding equipment and performing some welding operations.	1,2,3,7
CO6	Demonstrate the knowledge and necessary skills to perform sand preparation for moulds and making the moulds ready for casting operation.	1,2,3,7

CO-PO ATTAINMENT MATRIX

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	-	-	-	
CO2	3	3	3	-	-	-	2
CO3	3	3	3	-	-	-	2
CO4	3	3	3	-	-	-	2
CO5	3	2	3	-	-	-	2
CO6	3	3	3	-	-	-	2

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed

SUGGESTED LEARNING OUTCOMES:

Up on the completion of the course the student shall able to

1. Practice the casting principles and operations in foundry
2. Write the sand moulding procedures in foundry.
3. Prepare a mould sand mix.
4. Identify various tools used in foundry shop.
5. Prepare mould in two boxes, three boxes.
6. Prepare a mould ready for casting with provision for runners, risers and gates
7. Place the cope over the drag without any mismatch
8. Prepare the molten metal and calculate the amount of metal to be poured in the mould
9. Core making and uses
10. Practice the operation of Lathe
11. Perform a plain turning operation on a lathe machine.
12. Select proper tool to perform the job.
13. Centre the job by dial gauge
14. Select the suitable speed for different operations
15. Use various measuring instruments for taking dimensions.
16. Perform step turning operation on lathe.
17. Calculate the taper angle.
18. Practice different taper turning methods on lathe
19. Turn the required tapers by swivelling the compound rest.
20. Produce articles of industrial application such as ring gauges, plug gauges, handle.
21. Tapper turning – Hands on experience in swivelling the compound rest method
22. Practice the joining of metals in Arc Welding, Gas welding, brazing
23. Prepare the edges for welding
24. Select the suitable electrode, voltage and current
25. Handle the Electrode Holder for laying welding beads.
26. Operate the welding transformer and generator.
27. Perform various weld joint operations.

Key Competencies to be achieved by the Student

Title of the Experiment	Key Competency
Moulding and Casting of V – Pulley	- Select the suitable sand and mix it for the mould - Cut gates and runners - Pour sufficient quantity of molten metal
Moulding and Casting of Gear Pulley	- Prepare and place the core - Cut the gates and runners - Pour the sufficient quantity of molten metal
Preparation of core	- Prepare suitable core sand mix - Select wooden mould box - Pour the core sand into the mould box and proper ramming of the sand
Plain turning	- Check the centering of the work piece using dial gauge - Fix the cutting tool at proper inclination - Select the suitable speed, feed and depth of cut for rough and finishing operations - Check the dimensions
Step turning	- Check the centering of the work piece using dial gauge - Fix the cutting tool at proper inclination - Select the suitable speed, feed and depth of cut for rough and finishing operations - Check the dimensions
Taper turning	- Just an introduction of 4 methods. Student is expected to show how they work on machine. - Hands on exposure to swiveling compound rest method
Collar turning	- Check the centering of the work piece using dial gauge - Fix the cutting tool at proper inclination to turn the work piece - Select the suitable speed, feed and depth of cut for rough and finishing operations - Check the dimensions
Knurling	- Check the centering of the work piece using dial gauge - Fix the cutting tool at proper inclination to turn the work piece - Select the suitable speed, feed and depth of cut for rough and finishing operations - Check the dimensions - Fix the knurling tool and selecting the suitable speed and feed

Title of the Experiment	Key Competency
Welding Layout of beads	- Perform Edge preparation - Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc - Check the bead
Lap joint	- Perform Edge preparation - Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc - Check the bead
Butt joint	- Perform Edge preparation - Hold the electrode at suitable angle and distance with respect to the work piece to maintain the arc - Check the bead

State Board of Technical Education, Telangana State

Model Paper

ME-307-BASIC MANUFACTURING & FABRICATION ENGINEERING LAB

Mid Sem-I (CEE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Prepare the plain turning as per the given figure.
2. Prepare the step turning as per the given figure.
3. Prepare the taper turning as per the given figure.
4. Prepare Lap joint as per the given figure.
5. Prepare Butt joint as per the given figure.
6. Prepare mould for given pattern V-Pulley
7. Prepare mould for given pattern Gear Pulley
8. Prepare a core for making hallow section.

- . **Note:** 1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice
2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

State Board of Technical Education, Telangana State

Model Paper

ME-307-BASIC MANUFACTURING & FABRICATION ENGINEERING LAB

Mid Sem-II (CEE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Prepare the plain turning as per the given figure.
2. Prepare the step turning as per the given figure.
3. Prepare the taper turning as per the given figure.
4. Prepare Lap joint as per the given figure.
5. Prepare Butt joint as per the given figure.
6. Prepare mould for given pattern V-Pulley
7. Prepare mould for given pattern Gear Pulley
8. Prepare a core for making hollow section.

- . **Note:** 1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice
2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

State Board of Technical Education, Telangana State

Model Paper

ME-307-BASIC MANUFACTURING & FABRICATION ENGINEERING LAB

(SEE)

Time : 2 Hours

Total Marks : 40 M

Note: Answer any one question.

1. Prepare the plain turning as per the given figure.
2. Prepare the step turning as per the given figure.
3. Prepare the taper turning as per the given figure.
4. Prepare Lap joint as per the given figure.
5. Prepare Butt joint as per the given figure.
6. Prepare mould for given pattern V-Pulley
7. Prepare mould for given pattern Gear Pulley
8. Prepare a core for making hallow section.

Note: 30 marks are to be awarded for the experiment and 10 marks for Viva voice

ME-308 FUELS LAB

Course Title	Fuels Lab	Course Code	ME-308
Semester	III	Course Group	Core
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods	45
CIE	60 Marks	SEE	40 Marks

PREREQUISITES: Basic knowledge of Thermodynamics

COURSE OUTCOMES:

On successful completion of the course, the student will be able to

C01	Determine Flash and Fire point of given sample of fuels and Lubricants by using given Apparatus (Cleveland /Abel's/ Pensky Martens)
C02	Compute Viscosity of given fuel or Lubricating oil using given apparatus (Redwood/Saybolt viscometers)
C03	Measure Calorific value of Solid and liquid fuels by using Bomb calorimeter
C04	Measure Calorific value of gaseous fuels by using Junker's calorimeter
C05	Estimate percentage of carbon residue in given petroleum product
C06	Evaluate the need and importance of calibration of Pressure gauge

BLUE PRINT OF MARKS FOR SEE

S.N	Unit Name	Periods	Marks for SEE			Marks weight age	%Weightage
			Handling	Manipulation	Precision		
1.	Flash and Fire point test using Cleveland Apparatus (open cup test)	3	10	10	20	40	100
2.	Flash and Fire point test using Pensky Martens Apparatus (closed cup test)	3	10	10	20	40	100
3.	Flash and Fire point test using Abels Apparatus (closed cup)	3	10	10	20	40	100
4	Viscosity measurement test	12	15	15	10	40	100
5	Calorific value test using Bomb calorimeter	6	15	15	10	40	100
6	Calorific value test using Junkers gas calorimeter	6	15	15	10	40	100
7	Carbon residue test	6	15	15	10	40	100
8	Valve Timing Diagram	6	10	10	20	40	100
TOTAL		45					

COURSE CONTENT

S.No	Fuels Lab	Number of Periods
1	Flash and Fire point test using Cleveland Apparatus (open cup test)	03
2	Flash and Fire point test using Pensky Martens Apparatus (closed cup test)	03
3	Flash and Fire point test using Abels Apparatus (closed cup test)	03
4	Viscosity measurement test using Redwood/ Saybolt viscometer	12
5	Calorific value test using Bomb calorimeter	06
6	Calorific value test using Junkers gas calorimeter	06
7	Carbon residue test using Conradson's apparatus	06
8	Draw valve timing diagram of 4-stroke engine	06
Total		45

CO-PO ATTAINMENT MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapped POs
CO1	1	3	-	2	1	3	3	1,2,4,5,6,7
CO2	2	3	-	2	1	3	2	1,2,4,5,6,7
CO3	2	3	-	2	1	3	2	1,2,4,5,6,7
CO4	2	3	1	2	1	3	1	1,2,3,4,5,6,7
CO5	2	3	1	1	1	3	3	1,2,3,4,5,6,7
CO6	1	1	2	-	1	3	1	1,2,3,5,6,7

Level 3- Highly addressed Level 2- Moderately addressed Level 1- Lowly addressed,

SUGGESTED LEARNING OUTCOMES

S.No	Exercise	Key competency
1	Flash and Fire point test using Cleveland Apparatus	a. Define flash and fire points b. Know the importance of flash and fire points c. Know the range of flash point measured by the meter d. Identify various parts of the apparatus
2	Flash and Fire point test using Pensky Marten Apparatus	a. Differentiate flash and fire points b. Understand factors affecting the flash point c. Identify various parts of the apparatus
3	Flash and Fire point test using Abels Apparatus	a. Identify various parts of the apparatus b. Know the Range of flash point measured by the meter c. Identify various parts of the apparatus
4	Viscosity measurement test	a. State the importance of Viscosity b. Identify various factors affecting the viscosity c. Know different types of viscometers d. Differentiate between absolute viscosity and kinematic viscosity e. Know the units of viscosity f. Find various parts of Redwood viscometer
5	Calorific value test using Bomb calorimeter	a. Understand the principle of calorimetry b. Know the applications of Junker's calorimeter c. Understand the principle of operation
6	Calorific value test using Junkers gas calorimeter	a. Understand the principle of operation b. Know various components of the calorimeter c. Know the applications of Junker's calorimeter
7	Carbon residue test using Conradson's apparatus	a. What is meant by carbon residue b. Identify various parts and accessories of Conradson's apparatus d. Understand the principle of operation e. Identify the primary components of crude oil f. Understand the importance of the test
8.	Draw valve timing diagram of 4-stroke engine	a. Define VTD b. Measure of angle of suction, compression, expansion & Exhaust c. Measure of angle of overlap

BOARD DIPLOMA EXAMINATIONS (C21)
Model Paper MID SEM - I
DME III SEMESTER EXAMINATION
FUELS LAB

Time: 1 Hours**Max. Marks: 20**

Answer any **one** of the following questions

1. Determine the flash and fire point of given sample using Cleveland apparatus
2. Determine the flash and fire point of given sample using Abels apparatus
3. Determine the flash and fire point of given sample using Pensky marten apparatus
4. Determine Viscosity of given sample of oil using Redwood viscometer
5. Determine Viscosity of given sample of oil using Saybolt viscometer
6. Determine Calorific value of given solid or liquid fuel using Bomb calorimeter.
7. Determine Calorific value of given gaseous fuel using Junkers gas calorimeter.
8. Determine the percentage of Carbon residue using Conradson's apparatus.
9. Draw valve timing diagram of 4- stroke engine.

Note: Mid Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

BOARD DIPLOMA EXAMINATIONS (C21)
Model Paper MID SEM - II
DME III SEMESTER EXAMINATION
FUELS LAB

Time: 1 Hours**Max. Marks: 20**

Answer any **one** of the following questions

1. Determine the flash and fire point of given sample using Cleveland apparatus
2. Determine the flash and fire point of given sample using Abels apparatus
3. Determine the flash and fire point of given sample using Pensky marten apparatus
4. Determine Viscosity of given sample of oil using Redwood viscometer
5. Determine Viscosity of given sample of oil using Saybolt viscometer
6. Determine Calorific value of given solid or liquid fuel using Bomb calorimeter.
7. Determine Calorific value of given gaseous fuel using Junkers gas calorimeter.
8. Determine the percentage of Carbon residue using Conradson's apparatus.
9. Draw valve timing diagram of 4- stroke engine.

Note: Mid Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

BOARD DIPLOMA EXAMINATIONS (C21)
Model Paper (SEE)
DME-III SEMESTER EXAMINATION
FUELS LAB

Time: 2 Hours

Max. Marks: 40

Answer any **one** of the following questions

1. Determine the flash and fire point of given sample using Cleveland apparatus
2. Determine the flash and fire point of given sample using Abels apparatus
3. Determine the flash and fire point of given sample using Pensky marten apparatus
4. Determine Viscosity of given sample of oil using Redwood viscometer
5. Determine Viscosity of given sample of oil using Saybolt viscometer
6. Determine Calorific value of given solid or liquid fuel using Bomb calorimeter.
7. Determine Calorific value of given gaseous fuel using Junkers gas calorimeter.
8. Determine the percentage of Carbon residue using Conradson's apparatus.
9. Draw valve timing diagram of 4- stroke engine.

ME-309-MATERIAL TESTING LAB, FLUID MECHANICS & HYDRAULIC MACHINES LAB

Course Title	Material Testing Lab, Fluid Mechanics & Hydraulic Machines Lab	Course Code	ME-309
Semester	III	Course Group	Core
Teaching Scheme in Periods (L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods	45
CIE	60	SEE	40

A. MATERIAL TESTING LAB

PRE REQUISITES: This course requires the basic knowledge of Strength of materials.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to

Course Outcomes		Linked POs	Teaching Periods
CO1	Analyze the various parameters in tensile testing	1,2,3,4,5	06
CO2	Determine the ultimate strength of wood	1,2,3,4,5	06
CO3	Determine the impact strength	1,2,3,4,5	06
CO4	Calculate the hardness number of the given material	1,2,3,4,5	06
CO5	Conduct torsion test on solid shaft and hollow shaft	1,2,3,4,5	06
CO6	Analyze the micro structure of the metals and alloys	1,2,3,4,5	15

BLUE PRINT OF MARKS FOR SEE

Unit No	Unit name	Periods	Marks for SEE			Marks weight age	% Weightage
			Hand ling	Manip ulation	Prec ision		
1.	Tensile test	3	10	10	20	40	100
2.	Compression test	3	10	10	20	40	100
3.	Impact test	3	10	10	20	40	100
4.	Hardness test	3	10	10	20	40	100
5.	Torsion test	6	10	10	20	40	100
6.	Study of micro structure of metals and alloys	4	15	15	10	40	100

COURSE CONTENT:

1. Analyze the various parameters in UTM machine.
2. Determine the ultimate crushing strength of wood. When the load applied perpendicular to grains and load applied along the grains of the wooden block.
3. Determine the impact strength or toughness of material by conducting an impact test on Izod testing machine.
4. Calculate the hardness number of the specimen on Brinell's hardness testing machine.
5. Calculate modulus of rigidity by conducting torsion test on solid shaft and hollow shaft
6. Analyze the micro structure of the metals and alloys

SUGGESTED LEARNING OUTCOMES:

Up on the completion of the course the student shall able to gain the following competencies

Title of the Experiment	Competencies	Key competency
1. Tensile test	A. Fix specimen in the jaws of the machine B. Fit strain gauge to the specimen C. Apply load gradually on the specimen D. Record load, elongation, diameter without error E. Plot graph stress vs strain F. Locate points of elastic limit, yield stress, ultimate stress on the graph	- Record load, elongation, diameter without error - Plot graph stress vs strain - Locate points of elastic limit, yield stress, ultimate stress on the graph
2. Compression test	A. Place the specimen in the machine properly B. Apply load on the specimen C. Record load	- Apply load on the specimen - Record load
3. Impact test	A. Prepare specimen by making V notch at the required height B. Fix specimen on the machine C. Release load to hit the specimen precautions D. Record load	- Release load to hit the specimen precautions - Record load
4. Hardness test	A. Place the specimen on the machine at correct location B. Identify suitable indenter for the specimen C. Make indent on the specimen properly D. Measure diameter of indentation E. Calculate hardness number	- Make indent on the specimen properly - Measure diameter of indentation
5. Torsion test on mild steel bar	A. Measure diameter and length of mild steel bar. B. Take down the value of torque from the indicating dial for particular value of angle of twist. C. Calculate maximum shear stress and shear modulus.	- Measure the diameter of the MS bar with vernier callipers.
6. Study of micro structure of Metals and alloys	A. Prepare specimen B. Handling microscope to observe micro structure C. Plot microstructure	- Handling microscope to observe micro structure - Plot microstructure

CO-PO MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	3	3	3	1	--	--	1,2,3,4,5
CO2	3	3	3	3	1	--	--	1,2,3,4,5
CO3	3	3	3	3	1	--	--	1,2,3,4,5
CO4	3	3	3	3	1	--	--	1,2,3,4,5
CO5	3	3	3	3	1	--	--	1,2,3,4,5
CO6	3	3	3	3	1	--	--	1,2,3,4,5

**BOARD DIPLOMA EXANIMATIONS
MID-I MODEL QUESTION PAPER
MATERIAL TESTING LAB**

Duration: 1 hour

Max.Marks:10

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Instructions to the Candidate:

- (i) Answer any One of the following Questions.
- (ii) Record the results on a graph sheet if required and conclude your observation of the experiment
- (iii) Draw the diagram for illustration & choose appropriate values when not mentioned in the question

1. Determine the tensile strength of the given material using UTM.
2. Determine the ultimate strength of the given material using UTM.
3. Determine the impact strength or toughness of material by conducting an impact test on izod testing machine.
4. Determine the Brinell's hardness number of a given material using BHM.
5. Determine the Rockwell hardness number of a given material.
6. Draw the micro structures of a) Mild Steel b) Pure iron c) Grey cast iron d) Brass e) Aluminum

Note: Mid Exam should be conducted from the experiments in which student undergone training only, as classes are conducted on rotation basis

BOARD DIPLOMA EXANIMATIONS
MID-II Model Question Paper
MATERIAL TESTING LAB

Duration: 1 hour

Max.Marks:10

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Instructions to the Candidate:

- (i) Answer any One of the following Questions.
- (ii) Record the results on a graph sheet if required and conclude your observation of the experiment
- (iii) Draw the diagram for illustration & choose appropriate values when not mentioned in the question

1. Determine the tensile strength of the given material using UTM.
2. Determine the ultimate strength of the given material using UTM.
3. Determine the impact strength or toughness of material by conducting an impact test on izod testing machine.
4. Determine the Brinell's hardness number of a given material using BHM.
5. Determine the Rockwell hardness number of a given material.
6. Draw the micro structures of a) Mild Steel b) Pure iron c) Grey cast iron d) Brass e) Aluminum

Note: Mid Exam should be conducted from the experiments in which student undergone training only, as classes are conducted on rotation basis

BOARD DIPLOMA EXANIMATIONS
SEE Model Question Paper
MATERIAL TESTING LAB

Duration: 1 hour

Max.Marks:20

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Instructions to the Candidate:

- (i) Answer any One of the following Questions.
- (ii) Record the results on a graph sheet if required and conclude your observation of the experiment
- (iii) Draw the diagram for illustration & choose appropriate values when not mentioned in the question

1. Determine the tensile strength of the given material using UTM.
2. Determine the ultimate strength of the given material using UTM.
3. Determine the impact strength or toughness of material by conducting an impact test on izod testing machine.
4. Determine the Brinell's hardness number of a given material using BHM.
5. Determine the Rockwell hardness number of a given material.
6. Draw the micro structures of a) Mild Steel b) Pure iron c) Grey cast iron d) Brass e) Aluminum

Note: 15 marks for the experiment and 5 marks for viva-voce

B. FLUID MECHANICS & HYDRAULIC MACHINES LAB

PRE REQUISITES: This course requires the basic knowledge of Strength of materials.

COURSE OUTCOMES:

On successful completion of the course, the students will be able to

CO1	Calibrate the venturi meter
CO2	Calculate the friction factor of a given pipe
CO3	Calculate the brake power and efficiency of Pelton turbine
CO4	Calculate the brake power and efficiency of Kaplan turbine.
CO5	Calculate the brake power and efficiency of Francis turbine
CO6	Calculate the efficiency of reciprocating Pump & Centrifugal pump

BLUE PRINT OF MARKS FOR SEE

Unit No	Unit name	Hours/ Periods	Marks for SEE			Marks weight age	%Weightage
			Handl ing	Manip ulation	Precisi on		
1	Venturi meter	3	5	7.5	7.5	20	100
2	Pipe friction	3	5	7.5	7.5	20	100
3	Pelton wheel	3	5	7.5	7.5	20	100
4	Kaplan turbine	3	5	7.5	7.5	20	100
5	Francis turbine	3	5	7.5	7.5	20	100
6	Reciprocating pump	4	5	7.5	7.5	20	100
7	Centrifugal pump	4	5	7.5	7.5	20	100
Total		23					

COURSE CONTENT:

1. Determination of Coefficient of discharge of Venturi meter.
2. Determination of losses in pipes due to friction.
3. Determination of B.P. and efficiency of Pelton wheel.
4. Determination of B.P. and efficiency of Kaplan turbine.
5. Determination of B.P. and efficiency of Francis turbine.
6. Determination of overall efficiency of a reciprocating pump
7. Determination of overall efficiency of the Centrifugal pump

SUGGESTED LEARNING OUTCOMES:

Up on Completion of the Lab the student shall be able to

1.0 Venturi meter

- 1.1 State the practical applications of venturi meter.
- 1.2 Record the manometric head readings from U-tube manometer
- 1.3 Record the time taken for collecting discharge by varying the discharge
- 1.3 Calculate the areas of the pipe and throat of the given venturi meter
- 1.4 Calculate coefficient of discharge of venturi meter.

2.0 Pipe friction

- 2.1 Measure the length of the given pipe
- 2.2 Record the manometric head readings from U-tube manometer
- 2.3 Record the time taken for collecting discharge by varying the discharge
- 2.4 Calculate the loss of head through the pipe
- 2.5 Calculate the friction factor

3.0 Pelton Wheel

- 3.1 Identify the components of Pelton wheel
- 3.2 Start turbine by switching on jet of water slowly
- 3.3 Apply load steadily
- 3.4 Record load, speed
- 3.5 Calculate power and efficiency of turbine

4.0 Kaplan Turbine

- 4.1 Identify the components of Kaplan Turbine
- 4.2 Start turbine by giving input water supply
- 4.3 Apply load steadily
- 4.4 Record load, speed
- 4.5 Calculate power and efficiency of turbine

5.0 Francis Turbine

- 5.1 Identify the components of Francis Turbine
- 5.2 Start turbine by switching on jet of water slowly
- 5.3 Apply load steadily
- 5.4 Record load, speed
- 5.5 Calculate power and efficiency of turbine

6.0 Reciprocating Pump

- 6.1 Identify the components of reciprocating pump
- 6.2 Record the suction and delivery pressures from pressure gauges
- 6.3 Record the time taken for collecting the discharge
- 6.4 Record the energy meter readings and calculate input power
- 6.5 Calculate the output power
- 6.6 Calculate the efficiency

7.0 Centrifugal Pump

- 7.1 Identify the components of centrifugal pump
- 7.2 Record the suction and delivery pressures from pressure gauges
- 7.3 Record the time taken for collecting the discharge
- 7.4 Record the energy meter readings and calculate input power

7.5 Calculate the output power

7.6 Calculate the efficiency

Key competencies to be acquired by students

Exercise	Key competency expected
Calculation of coefficient of discharge of Venturi meter	A. Maintain constant head B. Record readings of U- tube manometer without parallax error C. Record time taken for collection of specific quantity of water D. Calculate discharge and coefficient of discharge of venturi meter E. Repeat experiment for different heads (discharge)
Determination of pipe friction	A. Ensure flow through pipe is full to remove air bubbles B. Record time taken for collection of specific quantity of water in tank C. Calculate pipe friction using formula
Pelton wheel	A. Start turbine by switching on jet of water slowly B. Apply load steadily C. Record load, speed D. Calculate power and efficiency of turbine E. Plot performance curves
Kaplan Turbine	A. Start turbine by switching on water supply B. Apply load steadily C. Record load, speed D. Calculate power and efficiency of turbine E. Repeat experiment by Varying load/speed; Plot performance curves
Reciprocating Pump	A. Maintain steady flow in suction and delivery pipes B. Record suction and delivery pressure gauge readings C. Record time for collection of specific quantity of water, electrical meter reading (input power) D. Calculate indicated power and efficiency E. Vary the head (flow) and repeat experiment
Centrifugal Pump	A. Maintain steady flow in suction and delivery pipes B. Record suction and delivery pressure gauge readings C. Record time for collection of specific quantity of water, electrical meter reading D. Calculate indicated power and efficiency E. Vary the head (flow) and repeat experiment

CO-PO MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	3	3	3	1	--	--	1,2,3,4,5
CO2	3	3	3	3	1	--	--	1,2,3,4,5
CO3	3	3	3	3	1	--	--	1,2,3,4,5
CO4	3	3	3	3	1	--	--	1,2,3,4,5
CO5	3	3	3	3	1	--	--	1,2,3,4,5
CO6	3	3	3	3	1	--	--	1,2,3,4,5

BOARD DIPLOMA EXANIMATIONS
MID-I Model Question Paper
Fluid Mechanics & Hydraulic Machines Lab

Duration: 1 hour

Max.Marks:10

Instructions to the Candidate:

- (i) Answer any One of the following Questions.
- (ii) Record the results on a graph sheet if required and conclude your observation of the experiment
- (iii) Draw the diagram for illustration & choose appropriate values when not mentioned in the question

1. Determine the coefficient of Discharge of Venturi meter.
2. Determine the losses due to fiction in a pipe and find the friction factor.
3. Determine Brake Power and Efficiency of Pelton Turbine
4. Determine Brake Power and Efficiency of Francis Turbine
5. Determine Brake Power and Efficiency of Kaplan Turbine.
6. Calculate the efficiency of Reciprocating Pump.
7. Calculate the efficiency of Centrifugal Pump.

Note: Mid Exam should be conducted from the experiments in which student undergone training only, as classes are conducted on rotation basis

BOARD DIPLOMA EXANIMATIONS
MID-II Model Question Paper
Fluid Mechanics & Hydraulic Machines Lab

Duration: 1 hour

Max.Marks:10

Instructions to the Candidate:

- (i) Answer any One of the following Questions.
- (ii) Record the results on a graph sheet if required and conclude your observation of the experiment
- (iii) Draw the diagram for illustration & choose appropriate values when not mentioned in the question

1. Determine the coefficient of Discharge of Venturi meter.
2. Determine the losses due to fiction in a pipe and find the friction factor.
3. Determine Brake Power and Efficiency of Pelton Turbine
4. Determine Brake Power and Efficiency of Francis Turbine
5. Determine Brake Power and Efficiency of Kaplan Turbine.
6. Calculate the efficiency of Reciprocating Pump.
7. Calculate the efficiency of Centrifugal Pump.

Note: Mid Exam should be conducted from the experiments in which student undergone training only, as classes are conducted on rotation basis

BOARD DIPLOMA EXANIMATIONS
SEE Model Question Paper
Fluid Mechanics & Hydraulic Machines Lab

Duration: 1 hour

Max.Marks:20

Instructions to the Candidate:

- (i) Answer any One of the following Questions.
- (ii) Record the results on a graph sheet if required and conclude your observation of the experiment
- (iii) Draw the diagram for illustration & choose appropriate values when not mentioned in the question

- 1. Determine the coefficient of Discharge of Venturi meter.
- 2. Determine the losses due to fiction in a pipe and find the friction factor.
- 3. Determine Brake Power and Efficiency of Pelton Turbine
- 4. Determine Brake Power and Efficiency of Francis Turbine
- 5. Determine Brake Power and Efficiency of Kaplan Turbine.
- 6. Calculate the efficiency of Reciprocating Pump.
- 7. Calculate the efficiency of Centrifugal Pump.

Note: 15 marks for the experiment and 5 marks for viva-voce

HU-310 - Communication and Life Skills Lab

Course Title	Communication and Life Skills Lab	Course Code	HU-310
Semester	III	Course Group	Practical
Teaching Scheme in Periods- L: T:P	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Hours	45
CIE	60 Marks	SEE	40 Marks

Rationale:

The course is designed to impart listening skills and life skills to the students of diploma which will help them a great deal in personal and professional fronts.

Prerequisites:

The course requires the basic knowledge of vocabulary, grammar, and four language learning skills, viz. Listening, Speaking, Reading and Writing.

Course Contents

I. Listening Skills-I

Duration: 6 (L 2 P 4)

- A paragraph
- A song
- A recipe
- A dialogue

II. Life Skills – I

Duration: 6 (L2 P 4)

1. Introduction to Life Skills

- What are life skills?
- Importance of life skills
- Practicing life skills

2. Attitude

- Features of attitude
- Attitude and behaviour
- Attitude formation
- Positive attitude
- Negative attitude
- Overcoming negative attitude
- Attitude at workplace

3. Adaptability

- Need for adaptability
- Willingness to experiment
- Fear of failure

- Think ahead
- Stay positive
- Open mind
- Curiosity
- Being in present

III. Listening Skills – II

Duration: 9 (L 3 P 6)

- Biography
- Interview
- A Report
- Telephone Conversation

IV. Life Skills – II

Duration: 9 (L 3 P 6)

4. Goal setting

- Importance of setting goals
- What is goal setting
- Short term goals
- Long term goals
- Achieve goals using SMART

5. Motivation

- Why motivation
- Characteristics of motivation
- Extrinsic motivation
- Intrinsic motivation

6. Time Management

- Features of time
- Secrets of time management
- Time wasters
- Prioritisation
- Productive time
- Time Quadrant

V. Life Skills – III

Duration: 6 (L 2 P 4)

7. Creativity

- Flexibility
- Curiosity
- Determination
- Innovative ideas

8. Critical Thinking

- Observation
- Curiosity
- Introspection
- Identify biases
- Critical Analysis

9. Problem Solving and Decision Making

- Define the problem
- Generate Options
- Evaluate and choose an option
- Implement Solution
- Monitoring and seeking feedback

VI. Life Skills – IV

Duration: 9 (L 3 P 6)

10. Leadership Qualities and Teamwork

- Significance of Leadership
- Factors of leadership
- Leadership styles
- Leadership Skills
- Importance of Teamwork
- Characteristics of a good team
- Benefits of teamwork
- Problems of teamwork
- Qualities of team player

11. Stress Management/Managing Emotions

- Components of Emotions
- Stress busters
- Managing Emotions
- Emotions at workplace

12. Core Human Values / Forming Values

- Honesty and integrity
- Work Ethics
- Ego and Respect
- Trust and Truthfulness
- Social Responsibility
- Character formation
- Designing Destiny

Course Outcomes:

	At the end of the course the students will have the ability to:
Listening Skills - I	Identify the main or the central idea. Listen for specific details. Learn the pronunciation.
Listening Skills - II	Listen for drawing inferences. Listen for accuracy. Listen to convey ideas.
Life Skills – I	Know the Life Skills. Practice life skills for a better life. Think positively. Develop positive attitude. Overcome negative attitude. Develop adaptability in any situation.
Life Skills – II	Know the importance of setting goals. Set goals using SMART features. Get inspired to get success. Get personal and professional success. Manage time effectively. Learn various time management techniques. Learn the importance of prioritisation.
Life Skills – III	Learn to be creative. Think innovatively. Know the reasons for a problem. Learn to overcome problems. Learn the various techniques to solve the problems. Learn to make proper decisions on time. Think ‘out of the box’. Think critically.
Life Skills – IV	Develop trust and confidence. To develop healthy and wealthy life. Know how to be a leader. Learn the qualities of a good leader. Learn the qualities of a good team. Learn the advantages and disadvantages of a team. Differentiate between Eu-stress and Distress. Manage stress effectively.

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
310.1	-	-	-	-	3		3	5,7
310.2	-	-	-	-	3	2	3	5,6,7
310.3	-	-	-	-	3	3	3	5,6,7
310.4	-	-	-	-	2	2	3	5,6,7
310.5	-	-	-	-	2	2	3	5,6,7
310.6		-	--	--	2		3	5,7

Suggested Student Activities:

- Listening Comprehension
- Seminars
- Presentations
- Games using Online Dictionaries
- Sharing the information using emails, chats and groups
- Find a solution to the problem
- Making innovative things through recycling
- Creating advertisements
- Five-minute activities on Life Skills
- Watching videos on life skills and making presentations
- Case studies
- Role Plays
- Dialogues

Evaluation Pattern:

I. Continuous Internal Examination:

60 Marks

a. Mid Sem- I	20 marks
Syllabus:	
i. Listening Skills - I	
ii. Life Skills - I	
b. Mid Sem – II	20 Marks
Syllabus:	
i. Listening Skills - II	
ii. Life Skills - II	
c. Internal assessment:	20 marks
i. Seminars:	10 marks
ii. Assignments:	5 marks
iii. Lab record submission:	5 marks

II. Semester End Examination :

40 Marks

a. Listening:	10 Marks
b. Life Skills topics:	15 Marks
c. Viva Voce :	15 Marks

References:

- a. Flint, Chris and Jamie Flockhart *Listening: A2 (Collins English for Life: Skills)* Collins. 2013
- b. Brown, Stephen E. *English in Everyday Life*. McGraw-Hill Education. 2008
- c. Mohanraj, Jayashree. *Let Us Hear Them Speak: Developing Speaking-Listening Skills in English*. Sage. 2015
- d. Susan Earle – Carlin. *Q Skills for Success: Listening and Speaking 5: Student Book with Online Practice*. Oxford University Press. 2013
- e. Kumar, Sanjay and Pushpa Latha. *Communication Skills: A Work Book*. Oxford University Press. 2018
- f. Carnegie, Dale. *The Leader in You*. Simon & Schuster: 1995
- g. Carnegie, Dale. *The Art of Public Speaking*. Prabhat Prakashan. New Delhi. 2013
- h. Kaye, Martin. *Goal Setting (Workbook Included): Goals & Motivation: Introduction To A Complete & Proven Step-By-Step Blueprint For Reaching Your Goals (Goal Setting Master Plan 1)*. Kindle Edition. MK Coaching. 2016.
- i. West, Steven. *Critical Thinking Skills: Practical Strategies for Better Decision making, Problem-Solving and Goal Setting*. Kindle Edition. 2018
- j. Tracy, Brian. *Goals*. Berrett-Koehler Publishers Inc. San Francisco. 2017
- k. Tracy, Brian. *Master your Time Master your Life*. Penguin Random House Inc. New York. 2017
- l. Sean Covey. *The 7 Habits of Highly Effective Teens*. Simon and Schuster, 2011

E-Learning Resources:

- a. <http://www.bbc.co.uk/worldservice/learningenglish/youmeus/learnit/learnitv39.shtml>
- b. https://www.examenglish.com/leveltest/listening_level_test.htm
- c. https://www.oxfordonlineenglish.com/listening?utm_referrer=https%3A%2F%2Fwww.google.co.in%2F
- d. <https://takeielts.britishcouncil.org/prepare-test/free-ielts-practice-tests/listening-practice-test-1>
- e. <https://learnenglish.britishcouncil.org/en/listening>
- f. <https://www.cambridgeenglish.org/learning-english/activities-for-learners/?skill=listening>
- g. <https://www.businessenglishsite.com/business-english-listening.html>

BOARD DIPLOMA EXAMINATION (C-21)
MID SEMESTER EXAMINATION - I
HU-310- COMMUNICATION AND LIFE SKILLS LAB

Time : 1 Hour

Total Marks: 20

Marks

Part – A

10 marks

1. Listening Comprehension:

5 X 2 = 10

(Teacher should give the questions before reading the passage given below)

There are two problems which cause great worry to our educationists – the problem of religious and moral instruction in a land of many faiths and the problem arising out of a large variety of languages.

Taking up the education of children we see that they should be trained to love one another, to be kind and helpful to all, to be tender to the lower animals and to observe and think right. The task of teaching them how to read and write and to count and calculate is important, but it should not make us lose sight of the primary aim of moulding personality in the right way.

For this it is necessary to call into aid, culture, tradition and religion. But in our country, we have in the same school, to look after boys and girls born in different faiths and belonging to families that live diverse ways of life and follow different forms of worship associated with different denominations of religion. It will not do to tread the easy path of evading the difficulty by attending solely to physical culture and intellectual education.

It is not right for us in India to be dissuaded from this by considerations as to overtaking the young mind. What is necessary must be done and it is not in the fact too great a burden.

On the basis of reading the above passage, answer the following questions:

1. Which two problems have our educations to face?
2. What is the primary aim of the education of children?
3. How should the problem of religious and moral instruction be dealt with?
4. Which basic training is the writer talking about?
5. How can we serve the spiritual needs of school children?

PART- B

10 Marks

Instruction: Answer any one of the questions in 150 words.

2. What are the benefits of developing an optimistic sense towards your life?
3. Give an instance from your life when you adapted yourself to a new situation.

BOARD DIPLOMA EXAMINATION (C-21)
MID SEMESTER EXAMINATION - II
HU-310- COMMUNICATION AND LIFE SKILLS LAB

Time : 1 Hour

Total Marks: 20 Marks

Part – A

10 marks

1. Listening Comprehension:

5 X 2 = 10

(Teacher should give the questions before reading the passage given below)

Isaac Newton figured out why objects fall to the ground and why the planets move the way they do. Isaac Newton was born in Lincolnshire, England, in 1643. His father died before he was born but, despite having a difficult childhood, he gained a place at Cambridge University. When the plague broke out he was forced to stay at home and, with so much free time on his hands, Newton started to wonder about what made things fall.

Newton said that he was inspired to think about forces when he saw an apple fall from a tree. He came up with the theory of gravity, an invisible force that pulls all of the objects in the Universe together, and the reason things don't float off into the sky.

In 1685, Newton described his Laws of Motion – a mathematical guide to how an object's movement is affected by speed and mass. Two years later, Newton published his ideas about gravity in a book which contains many of the foundations of modern science.

Newton also invented a new kind of telescope called a reflector. It used a mirror to collect light instead of lenses, and was much more powerful than existing telescopes. He also showed that white light was made up of all the colours of the rainbow.

1. What did Isaac Newton find?
2. Where did Isaac Newton born?
3. Which disease broke out in his childhood?
4. What was the telescope that Isaac Newton invented?
5. From which colour rainbow is made up of?

PART- B

10 Marks

Instruction: Answer any one of the questions in 150 words.

2. What were the short term goals which you set to yourself and how you managed to achieve them in the recent past?
3. Explain -
 - i) how you prioritise your tasks.
 - ii) how you manage your time in the best possible way.

BOARD DIPLOMA EXAMINATION (C-21)
SEMESTER END EXAMINATION
HU-310- COMMUNICATION AND LIFE SKILLS LAB

Time: 3 Hours

Total Marks: 40

Marks

Part – A

10 marks

- 1. Listen to the following passage and answer the questions give below it. 5 X 2 = 10**
(Teacher should give the questions before reading the passage)

Some of us think that writing is only for writers. But writing is for all of us. As Julia Cameron notes in her book *The Right to Write: An Invitation and Initiation into the Writing Life*, “I believe we all come into life as writers.” Writing can be beneficial for all of us, because it can be therapeutic. One of the most powerful parts of therapy is cultivating the ability to observe our thoughts and feelings, said Elizabeth Sullivan, a licensed marriage and family therapist in San Francisco. And that’s what writing helps us do.

“Most of us do not think in complete sentences but in self-interrupted, looping, impressionistic cacophony,” she said. Writing helps us track our spinning thoughts and feelings, which can lead to key insights (e.g., I don’t want to go to that party; I think I’m falling for this person; I’m no longer passionate about my job; I realize how I can solve that problem; I’m really scared about that situation.) Writing is “speaking to another consciousness – ‘the reader’ or another part of the self. We come to know who we really are in the present moment,” she said. Writing also creates a mind-body-spirit connection, she said. “When you use your hands to pen or type something directly from your brain, you are creating a powerful connection between your inner experience and your body’s movement out in the world.” We hold worries, fears and memories in our bodies, Sullivan said. When we use the body in positive ways – such as dancing or writing — we stay in the present moment, we inhabit our bodies, and we can heal ourselves, she said. “Writing is a small movement but it is incredibly powerful when you are writing down what is in your mind.”

Free writing or journaling is simply writing what’s on your mind. It’s letting it all hang out without censoring yourself. According to Sullivan, this could be: “Today I woke up and found the car window smashed and I wondered if the glass replacement guys go out at night and do it.”

“Poetry is a natural medicine; it is like a homeopathic tincture derived from the stuff of life itself—your experience,” writes John Fox in *Poetic Medicine: The Healing Art of Poem-Making*.

Sullivan suggested writing a short letter to a loved one. Imagine this person has written to you and asked you: “How are you doing, really?” Another exercise is to “write to someone with whom you have ‘unfinished business’ without sending it.” The goal is for you to gain a clearer understanding of your own thoughts and feelings about the person, she said.

Answer the following questions:

1. Why does Julia Cameron believe that we all come into life as writers
2. What is the most important therapeutic quality of writing?
3. Whose consciousness does a writer touch through his or her writing?
4. How does Elizabeth Sullivan describe our thinking? Why does she say so?
5. Which word in the passage means ‘a coarse unpleasant noise’?

Part – B

15 marks

2. Seminar Presentations on Life Skills topics:

Part – C

15 marks

3. Viva Voce.

ME-311 SKILL UPGRADATION

Course Title	Skill Upgradation	Course Code	ME-311
Semester	III	Course Group	Core
Teaching Scheme in Hrs(L:T:P)	0:0:8	Credits	2.5
Methodology	Lecture + Practice	Total Contact Hours	120

Applied Engineering Mathematics Model Rubric

Suggested Student Activities:

1. Prepare a presentation to describe various types of integrals.
2. Prepare a detailed study report on integration using different methods.
3. List out and explain the applications of integration.
4. Apply the integration to determine areas, volumes of regular & irregular shapes.
5. List out and explain the practical applications of mean & RMS values.
6. Prepare a presentation to describe various types of differential equations.
7. List out and explain different practical applications of 1st order differential equations

Solid Mechanics Model Rubric

Suggested Student Activities:

1. Record various forces applied by human beings in their daily activities.
2. Identify the applications where parallelogram law of forces, Lami's theorem etc are used and prepare a report.
3. Using internet record various properties of commonly used materials and compare their strengths.
4. How a corrugated roof sheet differs from plain roof sheet? Demonstrate with models.
5. List out the applications of shafts in our daily activity as well as in industries.
6. Collect the pictures of various types of beams which practically exist.

Thermodynamics Model Rubric

Suggested Student Activities:

1. Make a list of different bikes available in market and know their capacities.
2. Make list of different cars available in market and know their capacities.
3. Visit to automobile workshops /service centers and see how an IC engine works
4. Make a note on the solid, liquid fuels available in market and know their calorific values.
5. Collect the data of pressure required in tyres of a two wheeler and four wheeler
6. Collect data of different engine oils used in automobiles.
7. Collect information of different liquid coolants used in automobiles.
8. Study of cut-out models of IC engines.

Engineering Materials Model Rubric

Suggested Student Activities:

1. Make a list of commonly used materials in daily life like blade, knife, scissors etc and write the material used.
2. Study microstructure of given specimen.
3. Study micro structure of given specimen after it is welded and notice the difference.
4. Visit to a steel plant
5. Compare hardness of commonly available materials and interpret.
6. Make a list of major parts of a two wheeler and know the material used.
7. Visit a heat treatment plant

Fluid Mechanics and Hydraulic Machinery Model Rubric

Suggested Student Activities:

1. Visit nearby Hydroelectric power station and observe dam, penstock, turbines, generators etc.
2. Visit nearby pumping station and identify the pumps used
3. Prepare a tabulated summary for types of fluid which is available around you
4. Identify any one hydraulic pump and one prime mover available in market in a group of five students with detail specifications and current price.
5. List out any five pressure measuring devices available in market with its specifications and current market price
6. Prepare a tabulated summary for types of pipes available in market
7. Visit a nearby related industry and prepare a summary of hydro-pneumatic devices used along with their specifications.

C21_ Curriculum

DIPLOMA IN MECHANICAL ENGINEERING



OFFERED BY

STATE BOARD OF TECHNICAL EDUCATION & TRAINING,

TELANGANA: HYDERABAD

IV SEMESTER

	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			Instruction periods per week			Total Periods per semester	Credits	Continuous internal Evaluation(CIE)			Semester end examination (SEE)		Total Marks	Min marks for passing including CIE
			L	T	P			Mid Sem1	Mid Sem 2	Internal Evaluation	Max marks	Min marks		
1	SC-401	Advanced Engineering Mathematics	4	1	0	75	3	20	20	20	40	14	100	35
2	ME-402	Design of Machine Elements	4	1	0	75	3	20	20	20	40	14	100	35
3	ME-403	Heat Power Engineering	4	1	0	75	3	20	20	20	40	14	100	35
4	ME-404	Advanced Manufacturing Technology	4	1	0	75	3	20	20	20	40	14	100	35
5	EE-415	Basic Electrical Engineering	4	1	0	75	3	20	20	20	40	14	100	35
6	ME-406	Production Drawing	1	0	2	45	1.5	20	20	20	40	20	100	50
7	EE-417	Basic Electrical Engineering Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
8	ME-408	Thermal Engineering lab	1	0	2	45	1.5	20	20	20	40	20	100	50
9	ME-409	Solid Modeling Lab												
10	HU-410	Employability Skills Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
11	ME-411	Skill Upgradation	0	0	8	120	2.5	0	0	Rubrics			--	-
	Activities: student performance is to be assessed through Rubrics													

SC-401 - ADVANCED ENGINEERING MATHEMATICS

Course Title	Advanced Engineering Mathematics	Course Code	SC-401
SEMESTER	IV	Course Group	Foundation
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre requisites:

This course requires the knowledge of Engineering Mathematics at Diploma first year level and Applied Engineering Mathematics at Diploma 3rd Semester level.

Course Outcomes:

At the end of the course, the student will have the ability to:

CO 1	Solve simple Homogeneous Linear Differential Equations
CO 2	Solve simple Non-Homogeneous Linear Differential Equations and apply them in solving engineering problems.
CO 3	Express $f(x)$ as a Fourier series in the given interval $(c, c + 2\pi)$
CO 4	Express $f(x)$ as a Fourier Half-Range Cosine series and Sine series in $(0, \pi)$
CO 5	Find Laplace transforms of simple functions.
CO 6	Find Inverse Laplace transforms of simple functions and solve Linear Differential Equations using Laplace Transformations.

Course Contents:

Unit – I

Duration: 07 Periods (L: 5 – T: 2)

Homogeneous Linear Differential equations with constant coefficients

Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

Unit – II

Duration: 16 Periods (L: 13 – T: 3)

Non-Homogeneous Linear Differential equations with constant coefficients

Non-homogenous linear differential equations with constant coefficients of the form $(D)y = X$, where X is in the form $k(a \text{ constant}) e^{ax}$, $\sin(ax)$, $\cos(ax)$, x^n , ($n = 1, 2, 3$) Complimentary Function (CF), Particular Integral (PI) and General Solution (GS).

Unit-III

Duration: 14 Periods (L: 11 – T: 3)

Fourier series

Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c, c+2\pi)$, Euler's formulae, sufficient conditions for existence of Fourier series for a function $f(x)$. Even, Odd functions and Fourier series over the Interval $(0, 2\pi)$ and $(-\pi, \pi)$

Unit – IV

Duration: 08 Periods (L: 7 – T:1)

Fourier Half-range series

Representation of a function $f(x)$ as a Fourier Half-range Sine series and Cosine series over the interval $(0, \pi)$

Unit – V

Duration: 14 Periods (L: 11 – T: 3)

Laplace Transformations:

Definition, sufficient conditions for existence of Laplace Transform, Laplace Transform of elementary functions, linearity property, Change of scale property, First shifting theorem, multiplication by t^n , division by t , Laplace Transform of derivatives and integrals, unit step function, Laplace Transform of second shifting theorem

Unit – VI

Duration: 16 Periods (L: 13 – T: 3)

Inverse Laplace transforms:

Inverse Laplace transforms- shifting theorems and change of scale property, multiplication by s^n and division by s – Inverse Laplace Transform using partial fractions – convolution theorem (no proof) – application of Laplace Transformations to solve ordinary differential equations of second order with initial conditions.

Recommended Books:

1. Higher Engineering Mathematics, B.S. Grewal.
2. Laplace Transforms - Murray R. Spiegel.
3. Ordinary Differential Equations – R. S. Aggarwal.
4. Fourier Series – A.R. Vasishtha and Gupta.

Suggested E-Learning references:

1. www.freebookcentre.net/mathematics/introductory-mathematics-books.html
2. E-books: www.mathebook.net

Suggested Learning Outcomes

At the end of the course, the student will have the ability to:

Unit-I

1.0 Solve Homogeneous linear differential equations with constant coefficients in engineering situations

- 1.1 Solve Differential equations of the type $(aD^2 + bD + c) y = 0$ when the roots of the Auxiliary Equation (A.E) are real & different, real & repeated and complex.
- 1.2 Solve the higher order homogeneous linear differential equations with constant coefficients.

Unit-II

2.0 Solve Non-Homogeneous linear differential equations with constant coefficients in engineering situations

- 2.1 Apply the concept of complementary function, particular Integral to get general solution of a differential equation.
- 2.2 Solve n^{th} order differential equation of the type $f(D) y = X$ where $f(D)$ is a polynomial of second order and X is a function of the form $k, e^{ax}, \sin(ax), \cos(ax), x^n$.
- 2.3 Solve simple problems on the above types of 2.2

Unit-III

3.0 Understand the Fourier series expansion of functions

- 3.1 Know the orthogonality of functions in an interval.
- 3.2 Identify Fourier series of a function in the interval $(C, C+2\pi)$ and use the Euler's Formulae for determining the Fourier coefficients.
- 3.3 Write sufficient conditions for the existence of Fourier series for a function.
- 3.4 Expand Fourier series of simple functions in the range $(0, 2\pi)$ and $(-\pi, \pi)$.
- 3.5 Expand Fourier series for even and odd functions in the interval $(-\pi, \pi)$
- 3.6 Solve simple problems on even and odd functions in the interval $(0, 2\pi)$ and $(-\pi, \pi)$

Unit- IV

4.0 Understand the Half – Range Fourier series expansion of functions

- 4.1 Expand Half – Range Cosine series of a function in the range $(0, \pi)$.
- 4.2 Expand Half – Range Sine series of a function in the range $(0, \pi)$.
- 4.3 Solve simple problems on Half – Range Cosine and Sine series over the interval $(0, \pi)$

Unit-V

5.0 Understand Laplace transforms

- 5.1 Apply the definition of Laplace Transform and find Laplace transform of standard functions
- 5.2 Identify the sufficient conditions for existence of Laplace Transform.
- 5.3 Use the properties of Laplace Transform – Linearity property, First shifting theorem, Change of Scale property in solving simple problems.
- 5.4 Apply formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u)du$ in terms of Laplace transform of $f(t)$ to solve simple problems
- 5.5 Identify unit step function and write the Laplace Transform of unit step function
- 5.6 Apply Second shifting theorem in solving simple problems.

Unit-VI

6.0 Use Laplace transforms and Inverse Laplace transforms to solve differential equation in engineering problems

- 6.1 Define inverse Laplace Transform and write inverse Laplace Transforms of standard functions.
- 6.2 Solve simple problems on Inverse Laplace Transforms.
- 6.3 Write Shifting theorems and Change of scale property of inverse Laplace Transform.
- 6.4 Solve simple problems on 6.2
- 6.5 Write inverse Laplace Transforms corresponding to Laplace Transform of the functions $t^n f(t)$, $\frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u)du$
- 6.6 Solve simple problems on 6.5
- 6.7 Define convolution of two functions and state convolution theorem.
- 6.8 Solve simple problems on Convolution theorem.
- 6.9 Use Laplace and inverse Laplace Transforms to solve simple differential equations of Second order.

Suggested Student Activities:

1. Student visits Library to refer Standard Books on Mathematics and collect related material.
2. Quiz
3. Group discussion
4. Surprise tests

5. Seminars
6. Home Assignments.
7. Mathematics for preparing competitive exams and solving old question papers on Arithmetical ability.

CO-PO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	Mapped POs
CO1	3	2					3	1,2, 7
CO2	3	2					3	1,2, 7
CO3	3	2					3	1,2, 7
CO4	3	2					3	1,2, 7
CO5	3	2					3	1,2, 7
CO6	3	2					3	1,2, 7

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

MID SEM-I EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-I	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-III	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page, 1 page and 2 pages respectively

Unit No	Questions to be set for SEE				
	R		U	A	
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI					
Total Questions	8		8	8	

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM –I, IV SEMESTER
SC-401- ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions: 1. Answer **ALL** questions 04 X 01 = 04

2 Each question carries **ONE** mark

1. Write the General solution of $(aD^2+bD+c)y = 0$, whose roots of auxiliary equation are real and distinct.
2. Find the roots of auxiliary equation of the differential equation $(D^2 + 2D + 1)y = 0$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^{8x}$
4. Find the P.I of $(D^2 - 9)y = \cos 3x$

PART-B

Instructions: 1. Answer **ALL** questions 02 X 03 = 06

2. Each question carries **THREE** marks

5 a) Solve $(D^2 + 4D + 13)y = 0$

OR

5 b) Solve $(D^2 + 16)y = 0$

6 a) Solve $(D^2 + 4D + 4)y = 5 + e^{-2x}$

OR

6 b) Find P.I of $(D^3 + D)y = \sin 2x$

PART- C

Instructions: 1. Answer **ALL** questions 02 X 05 = 10

2. Each question carries **FIVE** marks

7 a) Solve $(D^3 - 2D^2 - 4D + 8)y = 0$

OR

7 b) Solve $(D^3 - 6D^2 + 11D - 6)y = 0$

8 a) Solve $(D^2 + 36)y = \sin^2 x$

OR

8 b) Solve : $(D^2 - 3D + 2)y = x + x^2$

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM –II, IV SEMESTER
SC-401- ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hour

Max. Marks: 20

PART-A

Instructions:

1. Answer **ALL** questions

04 X 01 = 04

2 Each question carries **ONE** mark

1. Define periodic function and give one example
2. Define Fourier series of the function $f(x)$ in the interval $(0, 2\pi)$
3. Write Half-range sine series of $f(x)$ in the interval $(0, \pi)$
4. Find a_0 for $f(x) = e^x$ in $0 < x < \pi$

PART-B

Instructions:

1. Answer **ALL** questions

02 X 03 = 06

2. Each question carries **THREE** marks

5 a) If $f(x) = x^2$ in $(0, 2\pi)$, then find the value of a_n in Fourier series of $f(x)$

OR

5 b) If $f(x) = |x|$ in $(-\pi, \pi)$, then find the value of a_1 in Fourier series of $f(x)$

6 a).Find the value of a_n in half-range Cosine series for the function $f(x) = e^x$ in $(0, \pi)$

OR

6 b) Obtain the Fourier Half – Range Sine series for $f(x) = (\pi - x)$ in the interval $(0, \pi)$

PART- C

Instructions:

1. Answer **ALL** questions

02 X 05 = 10

2. Each question carries **FIVE** marks

7 a) Obtain the Fourier series for $f(x) = x$ in the interval $0 < x < 2\pi$

OR

7 b) Find the Fourier series for $f(x) = (x - x^2)$ in the interval $(-\pi, \pi)$. Hence show that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}$$

8 a) Express $f(x) = \pi x - x^2$ as a half-range Sine series in $(0, \pi)$

OR

8 b) Find the half –range cosine series for the function $f(x) = x^2$ in the interval $(0, \pi)$

BOARD DIPLOMA EXAMINATION, (C-21)
IV SEMESTER END EXAMINATION
SC-401- ADVANCED ENGINEERING MATHEMATICS

Time: 2 hours

[Total Marks: 40]

PART-A

Instructions:

1. Answer **ALL** questions

08 X 01 = 08

2 Each question carries **ONE** mark

1. Find the roots of auxiliary equation of the differential equation $(D^2 + 4D)y = 0$.
2. Define Fourier Series for the function $f(x)$ in the interval $(c, c+2\pi)$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^x$
4. Find $L(e^{2t} + \cos 3t)$
5. Find $L(t + 5\cos t)$
6. State the First Shifting theorem of Laplace Transforms.
7. Find $L^{-1}\left(\frac{1}{s-3} + \frac{s}{s^2+4}\right)$
8. Find $L^{-1}\left(\frac{1}{2s+5}\right)$

PART-B

Instructions:

1. Answer **ALL** questions

04 X 03 = 12

2. Each question carries **THREE** marks

9a) Solve $(D^2 + D + 1)y = 4e^{3x}$

OR

9 b) Find $L(t\cos 3t)$

10 a) Find Half Range Sine Series of $f(x) = x$ in $(0, \pi)$

OR

10 b) Find $L^{-1}\left(\frac{s+1}{s^2+6s-7}\right)$

11 a) If $L\{f(t)\} = \frac{20-4s}{s^2-4s+20}$, find $L\{f(3t)\}$

OR

11 b) Find $\int_0^\infty t \cdot e^{-2t} \sin 3t dt$ using Laplace Transform Technique

12 a) Show that $L^{-1}\left(\frac{1}{s(s^2+a^2)}\right) = \frac{1-\cos at}{a^2}$

OR

12 b) Find $L^{-1}\left(\frac{s}{(s+2)^2+4}\right)$

PART- C

Instructions:

1. Answer **ALL** questions

04 X 05 = 20

2. Each question carries **FIVE** marks

13 a) Solve: $(D^2 + D - 2) y = x + \sin x$

OR

13 b) Find $L[te^t \sin 3t]$

14 a) Expand $f(x) = x^2$ as a Fourier series in the interval $(-\pi, \pi)$

OR

14 b) Find $L^{-1}\left(\frac{s}{(s+1)^2(s^2+1)}\right)$

15 a) Find $L\left(\frac{\sin 3t \cdot \cos t}{t}\right)$

OR

15 b) Evaluate $L\left\{\int_0^t \frac{\sin t}{t} dt\right\}$

16 a) Find $L^{-1}\left(\frac{1}{(s+1)(s+2)}\right)$ using Convolution theorem.

OR

16 b) Solve the differential equation $y'' - 2y' - 8y = \sin t$, when $y(0) = 3$, $y'(0) = 6$ by Laplace Transform method.

ME-402-DESIGN OF MACHINE ELEMENTS

Course Title	Design of Machine Elements	Course Code	ME-402
SEMESTER	IV	Course Group	Core
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Prerequisites: Knowledge of solid mechanics

COURSE OUTCOMES

	At the end of the course the student should be able to
CO1	Understand the concept of design procedure and to estimate the size of screwed fastener for given application.
CO2	Design of shafts to transmit the desired power and compare solid and hollow shafts for their strength and rigidity.
CO3	Design keys and couplings based on different modes of failure
CO4	Estimate the size of belt for a given power transmission and select a suitable gear train to transmit the desired velocity ratio.
CO5	Design sliding contact bearings and select a rolling contact bearing for given application.
CO6	State the applications of cams and construct their profiles.

Blue Print of Marks for SEE:

Unit No	Unit Name	Periods	Questions to be set for SEE (QNo)				
			R		U	A	
1	A) Introduction B)Design of Of Bolts Nuts, Screws	13	4	1		9(a)	13(a)
2	Shafts	12					
3	Keys and Couplings	12		2		10(a)	14(a)
4	Belts and gear drives	13					
5	Bearings	12		3	5,6	9(b),11(a), 11(b)	13(b),15(a), 15(b)
6	Cams	13			7,8	10(b),12(a), 12(b)	14(b),16(a), 16(b)
Total		75	8		8	8	

Legend: R; Remembering, U: Understanding A: Applying
COURSE CONTENT

Duration: 13 Periods (L: 10.0 – T: 3.0)

1.A Introduction

Design philosophy, Factors governing the design of machine element

Design procedure: General sequence of steps in designing a machine element.

Need of standard data for design purpose, use of machine design data, hand books and other data manuals.

1.B Bolts, Nuts & Screws

Thread nomenclature, specifications. Types of screw fasteners, Strength of screwed fasteners and failure due to different reasons Stresses due to initial tightening and external forces, Stress due to combination of forces

Design of a Nut – Hexagonal and square nuts only.

Design and draw an Eye bolt for a given load and using empirical proportions, Applications of eye-bolt and Numerical problems

2. Shafts

Duration: 12 Periods (L: 10.0 – T: 2.0)

Functions, Materials, Types

Standard sizes of shafts as per I.S

Design of diameters for solid and hollow shafts to transmit a given power at given rpm.

a) Based on strength

b) Based on rigidity.

Comparison of solid and hollow shafts, Design of axle, Numerical problems.

3. Keys and Couplings

Duration: 12 Periods (L: 10.0 – T: 2.0)

➤ **Keys**

Function of keys, types of keys, Splines, Specification of splines. Materials of keys and splines. Key failure, Effect of key way on the shaft strength. Design of a rectangular sunk key considering its failure against shear and crushing and using empirical proportions for given diameter of the shaft. Proportions of a spline for a given application using tables.

➤ **Couplings**

Function, types of couplings. Design and draw a muff coupling (solid) and rigid flange coupling for a given torque using empirical formulae.

4. Belt and Gear Drives

Duration: 13 Periods (L: 10.0 – T: 3.0)

Factors to be considered while selecting the type of drive -Belt drive, types of belt drives; belt materials, belt joints- length of open and crossed belts (without proof).

Slip and Creep-Expression for the ratio of belt tensions (without proof), Concept of centrifugal tension – Relation between centrifugal tension and the tension on tight side for transmitting maximum power (derivation omitted) - Permissible stress in the belt per unit width, per unit cross section-Calculation of belt thickness and width for given permissible stress for open and crossed belts.

Gear tooth terminology–Involute and Cycloidal profiles- advantages of involute profile-Gear Material-Simple, compound, reverted & Epi-cyclic gear trains-simple problems on gear terminology- number of teeth for simple, compound and reverted gear trains for a given speed ratio.

5. Bearings

Duration: 12 Periods (L: 10.0 – T: 2.0)

Functions, types of bearings, lubrication types, Journal bearing – terminology, performance - McKee's Equation, Bearing Modulus, power lost in friction and heat generated.

Thrust bearing- Torque equations for flat pivot and flat collar bearings under conditions of uniform pressure and uniform wear(without proof),Power lost in friction.

Rolling contact bearings – advantages and disadvantages-Components of rolling contact bearing, ball and roller bearings-types, applications-Rating life of antifriction bearing, Static load carrying capacity, Basic load rating, equivalent radial load - Load-Life relationship (without derivations),

Market or commercial specifications of ball and roller bearings as per SKF and BIS standards

6. Cams

Duration: 13 Periods (L: 10.0 – T: 3.0)

Functions of cam - Classification of cams and followers – uses. Working principle of plate and cylindrical cams - Nomenclature of cam profile, base-circle, cam angles, trace point - Motion of follower – Uniform velocity, uniform acceleration and retardation and simple harmonic motion – angular displacement of cam or time vs. Displacement of follower diagram only - Construction of cam profile of a plate cam with knife edged, flat & roller follower for all three types of motions stated above - Problems on drawing of cam profiles as stated above for the follower axis passes through the axis of the cam shaft (offset followers not included).

REFERENCES

1. Machine Design – Joseph Edward Shigley.
2. Machine Design – R.S.Khurmi & J.K. Gupta
3. Design of Machine Elements - Pandya and Shah.
4. Design of Machine Elements – V B Bhandari
5. Machine Design Data Handbook by H A Patil

ELECTRONIC RESOURCES

1. <https://nptel.ac.in/courses/>
2. [An Online Mechanical Engineering Resource | The Engineer's Reference](#)
3. <https://www.slideshare.net/>
4. [Machine element - Wikipedia](#)
5. Course: Machine Design (iasri.res.in)

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1.A Introduction

- 1.1. Understand the basic requirements of design.
- 1.2. Describe the phases of design process
- 1.3. List the factors governing the design.
- 1.4. Use of relevant Indian Standard Codes.

1.B Bolts, Nuts & Screws

- 1.5. Explain screw thread nomenclature and specifications of screw threads
- 1.6. List the different threaded fasteners with legible sketches.
- 1.7. Explain the strength of screwed fasteners
- 1.8. List the stresses in bolts
- 1.9. Design the size of bolt for a given load
- 1.10. Design a Hexagonal and a Square Nut
- 1.11. Design the size of eye bolt for a given load.
- 1.12. Draw an eye bolt showing the proportions.

2. Shafts

- 2.1. Define the terms shaft and axle
- 2.2. State the functions of shaft
- 2.3. List the types of shafts
- 2.4. List the standard sizes of shafts as per I.S
- 2.5. Write the formula for power transmitted by the shaft
- 2.6. Design the shaft subjected to only torsion
- 2.7. Design the shaft subjected to only bending load (Design of axle)
- 2.8. Design the shaft subjected to bending and torsion based on Rankine and Guest theories
- 2.9. Design the shaft against the rigidity.
- 2.10. Compare the strength and rigidity of solid and hollow shafts

3. Keys and Couplings

- 3.1. Explain the types and function of keys and splines.
- 3.2. Name the recommended materials used for keys and splines.
- 3.3. Design the keys based on different modes of failure and also based on empirical relations
- 3.4. Write all the proportions of a spline for a given application referring tables.
- 3.5. Write the specifications of parallel, gib-head and taper sunk keys as per B.I.S.
- 3.6. Explain the function of a coupling
- 3.7. Classify the couplings
- 3.8. Design the muff coupling for a shaft of given Torque and using empirical relations.
- 3.9. Design the cast iron flange-coupling (rigid type) for a given torque
- 3.10. Draw the above couplings according to the standard specifications

4. Belt and Gear Drives

- 4.1. List the different power drives.
- 4.2. Compare the flexible drives with the rigid drives
- 4.3. Classify the belt drives
- 4.4. List the belt materials
- 4.5. Define the slip and creep in belts.
- 4.6. Explain the effect of slip and creep on power transmission
- 4.7. Write the expression for the length of open and cross belts
- 4.8. Write the expression for ratio of belt tensions
- 4.9. Write the expression for centrifugal tension in the belt
- 4.10. Explain the effect of centrifugal tension on power transmission
- 4.11. Design the belt cross-sectional dimensions (V-belts are excluded)
- 4.12. Solve the numerical problems related to the above cases.
- 4.13. Explain the nomenclature of spur gear tooth.
- 4.14. Identify various tooth profiles of gear.
- 4.15. Advantages of involute profile
- 4.16. Explain the terminology related to gear drive
- 4.17. List the gear material
- 4.18. List different types of gear trains
- 4.19. List all the advantages and disadvantages of gear drives.
- 4.20. Explain different types of gear trains

4.21. Solve the simple problems related to gear terminology and gear trains.

5. Bearings

- 5.1. State the function of bearing.
- 5.2. Classify the bearings—sliding and rolling contact.
- 5.3. State the advantages and disadvantages of sliding contact bearings
- 5.4. List the types of lubrication.
- 5.5. Explain the construction and working principle of journal bearing
- 5.6. Explain friction in journal bearing and give McKee's equation.
- 5.7. Explain the terms in McKee's equation.
- 5.8. Design a simple journal bearing.
- 5.9. Calculate heat generated and dissipated in journal bearing
- 5.10. Write the expressions for the load and torque carried by thrust and collar bearings under uniform pressure and wear conditions (without proof)
- 5.11. Calculate heat generated and dissipated in collar bearing based on uniform pressure and uniform wear conditions
- 5.12. Solve the numerical problems.
- 5.13. Explain the nomenclature of rolling contact bearing.
- 5.14. Explain the types of ball and roller bearings
- 5.15. List the Advantages and disadvantages of anti-friction bearings
- 5.16. List all the differences between sliding contact and roller bearings
- 5.17. Properties of the bearing material
- 5.18. Define the terms- Rating life, Basic load rating and equivalent radial load
- 5.19. Give the load – life relation for rolling contact bearings (problems omitted)
- 5.20. Specify a bearing

6. Cams

- 6.1. State the function of cam
- 6.2. Classify the cams.
- 6.3. Explain the cam profile.
- 6.4. Define terms related to cam profile.
- 6.5. Draw angular - displacement diagram for lift motion for:
 - a) Uniform velocity.
 - b) S.H.M.
 - c) Uniform acceleration & retardation.
- 6.6. Draw simple cam profiles in above three cases for knife edged, flat and roller followers. (Offset followers are omitted)

SUGGESTED STUDENT ACTIVITIES

1. Student has to identify the machines and inspects the available equipment in the workshops/lab to identify different machine elements.
2. Identify the purpose of Gear trains used in automobiles, machine tools etc.
3. Draw the Involute and Cycloidal Gear tooth profile.
4. Recognise the need of cams and Draw the cam profiles
5. Collect the pictures and recoed videos of various types of machine elements which practically exist in machinery and automobiles.
6. Quiz & Group discussion, Surprise test.
7. Any Case studies- Example- Identifying any new ideas adopted for existing design.

COURSE OUTCOMES		CL	Linked POs	Teaching Periods
CO1	Understand the concept of design procedure and to estimate the size of screwed fastener for given application.	R, U, A	1,2,3,5,7	13
CO2	Design of shafts to transmit the desired power and compare solid and hollow shafts for their strength and rigidity.	R, U, A	1,2,3,7	12
CO3	Design keys and couplings based on different modes of failure	U, A	1,2,3,7	12
CO4	Estimate the size of belt for a given power transmission and select a suitable gear train to transmit the desired velocity ratio.	R, U, A	1,2,3,7	13
CO5	Design sliding contact bearings and select a rolling contact bearing for given application.	R, U, A	1,2,3,7	12
CO6	State the applications of cams and construct their profiles.	U, A	1,2,3,7	13
			Total Periods	75

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	2	2	-	1	-	1	1,2,3,5,7
CO2	2	3	3	-	-	-	1	1,2,3,7
CO3	2	3	3	-	-	-	1	1,2,3,7
CO4	2	3	2	-	-	-	1	1,2,3,7
CO5	2	3	2	-	-	-	1	1,2,3,7
CO6	1	2	2	-	-	-	1	1,2,3,7

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed .

Course Content and Blue Print of Marks for MID - I

SL.NO	UNIT NAME	R	U	A	REMARKS
1	Introduction, Bolts, Nuts, Screws	1,2	5(a) 5(b)	7(a) 7(b)	
2	Shafts	3,4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Course Content and Blue Print of Marks for MID – II

SL.NO	UNIT NAME	R	U	A	REMARKS
1	Keys, Couplings	1,2	5(a) 5(b)	7(a) 7(b)	
2	Belts and gear drives	3,4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Legend	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

C21-MID-I Examination
Model Paper-
ME-402 DESIGN OF MACHINE ELEMENTS

TIME : 1 Hour

Max. Marks: 20

PART – A

Marks: 04 X 1 M = 4M

NOTE: 1) Answer **All** questions and each question carries one mark.

2) Answers should be brief and straight to the point

1. Define Machine design.
2. Define pitch of screw thread.
3. What is the function of shaft.
4. Define Torsional stiffness of a shaft.

PART – B

Answer all questions

2 x 3 M = 6M

5(a). What are the factors to be considered for design of machine element. List out.

OR

5(b) Compute the safe tensile load for a bolt of M36 if the permissible tensile stress is 90 N/mm²

6(a) what are the advantages of Hollow shaft over solid shaft

(OR)

6(b). A hollow steel shaft has 200mm external diameter and 125 mm internal diameter. Shear stress at outer surface is 64 N/mm². Calculate the shear stress at inner surface.

PART – C

Answer all questions

2 x 05 = 10M

7(a). An eye bolt is to be used for lifting a load of 100KN. Design the bolt, If the tensile stress is not to exceed 100 N/mm².

(OR)

7(b). The cylinder head of steam engine is subjected to a pressure of 1 N/mm². It is held in a position by means of 12 bolts. The effective diameter of cylinder is 300mm. A soft copper gasket (k=0.5) is used to make the joint leak proof. Determine the size of bolt so that the stress in bolt does not exceed 100MPa.

8(a) A solid circular shaft is used to transmit a torque of 9.6N-m.. The angle of twist over a length of 2m is 2°. Estimate the required diameter of the shaft and shear stress induced in the material. Take $G = 0.8 \times 10^5$ N/mm².

(OR)

8(b) A hollow shaft has 200mm external diameter and 125 mm internal diameter. Shear stress at outer surface is 64 N/mm². Calculate the shear stress at inner surface.

C21-MID –II Examination
Model Paper
ME-402 DESIGN OF MACHINE ELEMENTS

TIME : 1 Hour

Max. Marks: 20

PART – A

Marks: 04 X1 M = 04M

NOTE : 1) Answer **All** questions and each question carries one mark.
2) Answers should be brief and straight to the point

1. State the effect of keyway on the strength of a shaft.
2. What are splines.
3. Define creep of belt.
4. Define diametral pitch.

PART – B

Answer all questions

2 x 3 M = 06M

5(a) Draw the neat sketch of Gib Head Key with Proportions..
(OR)

5(b) Write the differences between rigid couplings and flexible couplings.

6(a) State the advantages and disadvantages of belt drive over gear drive.
(OR)

6(b) Explain the following terms (a) Circular pitch (b) Pitch circle.

PART – C

Answer all questions

2 x 5 = 10M

7 (a) Design a rectangular sunk key for a shaft of 60mm diameter. The permissible shear stress is 35 N/mm^2 and compression stress is 75 N/mm^2 .
(OR)

7(b) Design a shaft and bolts for cast iron flange coupling to connect two shafts in order to transmit 9 kW at 800 rpm. The permissible shear and crushing stress for shaft and bolt material are 35 N/mm^2 and 60 N/mm^2 .

8 (a) A belt is required to transmit 15 KW from a pulley of 1000mm diameter at 420 rpm. The angle of lap is 160° and coefficient of friction is 0.3. If the safe working stress of belt material is 1.2 N/mm^2 , find the width of belt. Thickness of belt is 10mm.
(OR)

8 (b) Explain about compound gear train with a neat sketch

BOARD DIPLOMA EXAMINATION

C21-End Semester Examination

Model Paper

ME-402 DESIGN OF MACHINE ELEMENTS

TIME : 2 Hrs

Max. Marks: 40

PART – A

Marks: 08 X1 M = 08M

NOTE : 1) Answer **All** questions and each question carries one marks.

2) Answers should be brief and straight to the point and shall not exceed **three** simple sentences

1. Define machine design.
2. State the advantage of a leather as a belt material.
3. Define the term base circle.
4. What is the need for joining of shafts with couplings.
5. What is journal bearing.
6. Write the applications of bearings.
7. State three main parts of a cam mechanism.
8. List out the followers of cam.

PART – B

Answer all questions

4 x 3 M = 12M

9(a) What are the steps involved in design of a machine element.

(OR)

9(b) What is bearing . How are they classified.

10(a) A gear of 48 teeth has pitch circle diameter of 384mm. What is its module and circular pitch.

(OR)

10(b) What is a cam. List out types of cams.

11(a) what are equivalent static load and equivalent dynamic load.

(OR)

11(b) Write the advantages and disadvantages of sliding contact bearings.

12(a) Define the following

(i) Lift or stroke (ii) Dwell

12(b) Write the information required to draw cam profile.

PART-C

4X5=20M

13(a) A solid shaft is subjected simultaneously to a torque of 28 KNm and bending moment of 22KNm. Find the diameter of shaft if the maximum shear stress is 30 N/mm^2 and normal stress is 50 N/mm^2 .

(OR)

13(b) A Flat collar bearing has internal and external diameter of 60 mm and 100 mm respectively and coefficient of friction is 0.05. Assuming the pressure is uniform at 0.14 N/mm^2 . Calculate the power lost in friction at a speed of 5rev/sec.

14(a) The diameter of the pulley on the driving shaft running at 150 rpm is 0.6 m. A counter shaft is to be driven at 375rpm by an open belt drive, having a coefficient of friction 0.3. The distance between the shafts is 2.4m. Determine the width of the belt to transmit 3 KW, If the safe permissible tension is 15N/mm width of belt.

(OR)

14(b)What is displacement diagram. Explain the construction of displacement diagram for a follower moving with SHM.

15(a) A journal bearing 60mm in diameter and 90mm long runs at 450rpm. The oil used for hydrodynamic lubrication has absolute viscosity of 0.016 kg/m.s . If the diametral clearance is 0.1mm, find the safe load on bearing.

(OR)

15(b)A foot step bearing supports a shaft of 120mm diameter, running at 100rpm. The shaft is bored with a shallow hole of 40mm at the end. If the bearing pressure is 0.75 N/mm^2 . Find (a) load to be supported and (b) power lost in friction if coefficient of friction is 0.015. (c) Heat generated.

16(a) A cam is to be designed for a knife edge follower with the following data:

1. Cam lift = 40 mm during 90° of cam rotation with simple harmonic motion.
2. Dwell for the next 30° .
3. During the next 60° of cam rotation, the follower returns to its original position with simple harmonic motion.
4. Dwell during the remaining 180° .

Draw the displacement diagram and profile of the cam when the line of stroke of the follower passes through the axis of the cam shaft.

The radius of the base circle of the cam is 40 mm.

(OR)

16 (b) Draw the profile of a cam to give the following motion to a reciprocating follower with a flat contact of face.

1. Out stroke during 120° of cam rotation
2. Dwell for the next 30° of cam rotation
3. Return stroke during 120° of cam rotation
4. Dwell for the remaining 90° of the cam rotation

The stroke of the follower is 30mm and the minimum radius of the cam is 25 mm. The follower moves with uniform velocity during both out stroke and return stroke. The axis of the follower passes through the axis of the cam shaft.

ME-403-HEAT POWER ENGINEERING

Course Title	Heat Power Engineering	Course Code	ME-403
SEMESTER	IV	Course Group	Core
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Prerequisites

Basic knowledge of Thermodynamics.

Course outcomes

On Successful completion of the course, the student will be able to

CO1 :	Explain construction and working of Air compressors and gas turbines. Understand the working of jet and rocket engines.
CO2 :	Analyze properties of steam and estimate work done, enthalpy, internal energy entropy of steam using steam tables and Mollier chart
CO3 :	Distinguish between water-tube and fire-tube boilers and understand the construction and working of boilers and Boiler mountings & accessories
CO4 :	Explain working and design of steam nozzles for given conditions
CO5 :	Appraise working of steam turbines and distinguish between impulse and reaction turbines. Comprehend compounding and governing of turbines.
CO6	Analyze the construction and working of condensers and cooling towers.

Blue Print of Marks for SEE

Unit no	Unit name	Questions to be set for SEE (Q No)					Remarks
		R		U		A	
1	Air Compressors, Gas Turbines & Jet Propulsion	4	1		9(a)	13(a)	
2	Properties of Steam						
3	Steam Boilers		2		10(a)	14(a)	
4	Steam Nozzles						
5	Steam Turbines		3	5,6	9(b)	13(b)	
				11(b)	15(b)		
6	Steam Condensers		3	7,8	10(b)	14(b)	
						12(a)	
					12(b)	16(b)	
Total questions		8		8		8	

Legend: **R; Remembering, U: Understanding A: Applying**

COURSE CONTENT

UNIT-1

Duration: Periods 14 (L: 11 – T: 03)

Air compressors, Gas Turbines & Jet Propulsion

Functions of air compressor – uses of compressed air – types of air compressors - Single stage reciprocating air compressor its construction and working (with line diagram) using P.V. diagram. Formulae for work done and power required- simple problems on calculation of work done and power required. Multi stage compressors – advantages over single stage compressors. Use of inter cooler – conditions for minimum work in two stage compressor (without proof) Formulae for work done and power required in two stage compressors – simple problems. Gas turbines – Classification – open cycle gas turbines and closed cycle gas turbines – comparison of gas turbine with reciprocating I.C. engines and steam turbines. Applications, advantages and limitations of gas turbines- working of Open cycle constant pressure gas turbine – Closed cycle gas turbine – general lay-out. P.V. and T.S diagram. Principle of jet propulsion. Operation and applications of Ram – jet engine, turbojet engines and rocket engines – fuels used in jet propulsion.

UNIT-2

Duration: Periods 12 (L: 10 – T: 02)

Properties of steam

Formation of steam under constant pressure- dryness fraction and degree of superheat - Determination of enthalpy, entropy and specific volume of wet, dry and superheated steam at a given pressure using steam tables and Mollier chart.

Vapour processes – isochoric, isobaric, isothermal, adiabatic and polytropic -simple problems on enthalpy, entropy and specific volume- internal energy, internal latent heat, of wet, dry and superheated steam using tables.

UNIT-3

Duration: Periods 12 (L: 09 – T: 03)

Steam Boilers

Layout of steam power plant. Function and use of steam boilers – construction - Classification of steam boiler- Comparison of water tube and fire tube boilers - Cochran and Babcock Wilcox Boilers - modern high pressure boilers Lamont and Benson boilers - Boiler mountings - Boiler accessories - Actual evaporation - equivalent evaporation - factor of evaporation - boiler horse power - boiler efficiency - Formula for the above terms without proof - Simple direct problems on the above - draught systems

UNIT-4

Duration: Periods 12 (L: 10 – T: 02)

Steam Nozzles

Function – types- Flow of steam through nozzle - Velocity of steam at the exit of nozzle. Discharge of steam through nozzles - Critical pressure ratio - calculation of cross sectional areas at throat and discharge - Effect of friction in nozzles.

UNIT-5

Duration: Periods 13(L: 11 – T: 02)

Steam Turbines

Steam turbines - Classification - impulse & reaction turbines - working of a simple De-lavel turbine - Velocity diagrams of impulse turbines - Expression for work done, axial thrust, tangential force, blade and diagram efficiency, stage efficiency, nozzle efficiency – Compounding of turbines- velocity, pressure and combined pressure and velocity - Simple problems on single stage impulse turbines- analytical and graphical methods. Working of Parson's Reaction turbine -Bleeding, re-heating - regeneration and re- heating factor (Problems omitted) - Governing of steam turbines and methods.

UNIT-6

Duration: Periods 11 (L: 09– T: 02)

Steam Condensers

Steam condenser-Advantages of incorporating steam condenser in a power plant -Elements of a condensing unit -Classifications – Jet condenser -types of jet condenser -surface condenser -types of surface condenser Mixture of air&steam (Dalton's law of partial pressure),Measurement of vacuum in a condenser , Vacuum efficiency ,Condenser efficiency, - Simple problems on Steam condensers - sources of Air leakage into condenser, effects of Air leakage, Wet-air extraction using Edwards Air pump, Cooling tower-types of cooling towers.

REFERENCE BOOKS

1. Thermodynamics by Yunus Cengel
2. Thermal Engineering by Arora& S. Domkundwar
3. Thermodynamics and Heat Engines by R Yadav
4. Thermal Engineering by R.K Rajput
5. Thermal Engineering by R.S.Khurmi

Suggested student activity

1. Students are advised to visit a nearby industry involving use of boiler and students are advised to conduct energy auditing.
2. Analyze the data by using excel and identify the areas of wastage of energy and suggest suitable methods for improvement of performance.
3. Velocity triangles of turbine may be solved using CAD software.
4. Visit nearest thermal power station and prepare a report consisting of layout – construction and working of various elements.

SUGGESTED LEARNING OUTCOMES

Up on completion of the course the student shall be able to

1. Air compressors, Gas Turbines & Jet Propulsion

- 1.1 State the functions of air compressors.
- 1.2 Enumerate the uses of compressed air.
- 1.3 Name the different types of compressors.
- 1.4 Explain with line diagram the working of a single reciprocating air compressor.
- 1.5 Write the formula for work done and power required by a single stage compressor.
- 1.6 State the advantages of multi- stage compressors over single stage compressor.
- 1.7 Explain the use of inter cooler.
- 1.8 State the conditions for minimum work done in two stage compression.
- 1.9 Solve simple problems on single acting reciprocating air compressors only.
- 1.10 Write the formula for work done and power required in two stage compressor.
- 1.11 Solve simple problems in two stage air compressor.
- 1.12 Classify gas turbines.
- 1.13 Compare Gas turbines with Steam turbines.
- 1.14 Compare gas turbines with reciprocating I.C. engines.
- 1.15 Mention the applications with limitations of gas turbine.
- 1.16 Explain with line diagrams the working of an open cycle constant pressure type gas turbine.
- 1.17 Explain with line diagram the working of a closed cycle type gas turbine.
- 1.18 Represent cycle of operation for the above type on P-V and T-s diagrams.
- 1.19 Explain with line diagram the principles of operation of Ramjet engine and turbo- jet and rocket engines.
- 1.20 Identify the fuels used in jet propulsion.

2. Properties of Steam

- 2.1 Define the various properties and types of steam
- 2.2 Practice the use of steam tables and interpret the data for given pressure &Temp
- 2.3 Compute the enthalpy, specific volume and entropy at given pressure for wet, dry and superheated steam using steam tables.
- 2.4 Identify the various thermodynamic vapour processes isochoric,

isobaric, isothermal, adiabatic and polytrophic.

2.5 Compute the work done, internal energy, enthalpy, specific volume and entropy in each of the above processes under wet, dry and superheated steam condition.

2.6 Represent the above process on T-S and H-S diagrams

3. Steam Boilers.

3.1 State the function and construction of boiler

3.2 List all the uses of boilers.

3.3 Classify steam boilers

3.4 Distinguish between water tube and fire-tube boilers

3.5 Explain the working of Cochran Boiler with a legible sketch

3.6 Explain the working of Babcock Wilcox Boiler with a legible sketch

3.7 Recognize the need of high-pressure modern boilers

3.8 Explain the working principle of Lamont and Benson Boilers with a legible sketch

3.9 List all the boiler mountings

3.10 Explain the function of all the mountings with a legible sketch such as pressure gauge, water level indicator, safety valve and fusible plug.

3.11 List all the boiler accessories.

3.12 Illustrate the function of all the accessories with a legible sketch such as economiser, Super Heater, Steam traps & Separators.

3.13 Explain the terms actual/equivalent evaporation and factor of evaporation.

3.14 Define the boiler Power

3.15 Define the boiler efficiency

3.16 Write the formula for the above

3.17 Compute the equivalent and actual evaporation from given data.

3.18 Solve problems on Boiler Power & efficiency

3.19 Explain draught systems (without problems)

4. Understand the Working of Steam Nozzles

4.1 Explain the Flow of steam through nozzle

4.2 Derive the expression for Velocity of steam at the exit of nozzle in terms of heat drop.

- 4.3 Calculate Velocity of steam at the exit of nozzle by using steam tables or Mollier chart
- 4.4 Write the expression for Discharge of steam through nozzles
- 4.5 Write the formula for Critical pressure ratio (without proof)
- 4.6 Explain the Effect of friction in nozzles
- 4.7 Solve problems of nozzles to calculate cross section area and discharge

5. Steam Turbines

- 5.1 Explain the working principle and construction of a turbine
- 5.2 Classify the Turbines with examples
- 5.3 Differentiate the impulse turbines from reaction turbine
- 5.4 Explain the Principle of working of simple De-Laval turbine with a line diagram
- 5.5 Draw velocity triangles for impulse turbine
- 5.6 List various blade angles
- 5.7 Write formula for tangential force, work done, axial thrust, power and efficiencies.
- 5.8 State the necessity of compounding a turbine
- 5.9 Describe the methods of reducing rotor speeds by velocity, pressure and pressure- velocity compounding with the help of pressure, velocity variation chart
- 5.10 Explain the working principle of Parson's Reaction Turbine with a line diagram
- 5.11 Simple problems on Single Stage Impulse turbines (Velocity triangles and problems on reaction turbine omitted)
- 5.12 Define the terms bleeding & reheating
- 5.13 State the necessity of governing a turbine
- 5.14 Explain the methods of turbine governing

6. Steam Condensers

- 6.1 Define the Steam condenser
- 6.2 State the functions of steam condenser
- 6.3 Classify the condensers
- 6.4 Explain the working principle of Low level counter – Flow and Parallel flow jet Condensers with legible sketch

- 6.5 Explain the working principle of High level Jet condenser with legible sketch
- 6.6 List the Advantages and Disadvantages of High- Level Jet condenser
- 6.7 Explain the working principle of Ejector condenser with legible sketch
- 6.8 Explain the working principle of Shell and Tube Surface condenser with sketch
- 6.9 Distinguish between down flow and central flow surface condenser
- 6.10 Explain the working principle of Evaporative condenser with legible sketch
- 6.11 List Advantages and Disadvantages of Surface condenser
- 6.12 Distinguish between Jet Condenser and Surface Condenser
- 6.13 Write the Formulae for cooling water required, Condenser efficiency, corrected Vacuum, absolute pressure and Vacuum efficiency
- 6.14 Solve Simple problems on Steam condensers to Estimate the Cooling water required, Condenser efficiency and Vacuum efficiency
- 6.15 Define Air Extraction
- 6.16 List the sources of air leakage into condenser.
- 6.17 State the effects of air leakage into condenser.
- 6.18 Explain the working principle of Edwards Air pump.
- 6.19 State the functions of Cooling towers.
- 6.20 Explain the working principle of natural ,forced and induced draught cooling towers.

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	2	1	-	-	-	2	1,2,3,7
CO2	2	1	-	-	-	-	2	1,2,7
CO3	3	2	-	-	1	1	2	1,2,5, 6,7
CO4	3	2	1	-	-	1	3	1,2,3,6,7
CO5	3	2	1	-	-	1	2	1,2,3,6,7
CO6	1	1	1	-	-	-	2	1,2,3,7

Continuous Internal Evaluation (CIE)

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No.of Questions	Marks for each question	Questions to be attemptd	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

Question Paper Blue Print for CIE (MID I)

Unit no	Unit name	Questions to be set for MID-I			Remarks
		R	U	A	
1	Air Compressors, Gas Turbines & Jet Propulsion	1,2	5(a) 5(b)	7(a) 7(b)	
2	Properties of Steam	3,4	6(a) 6(b)	8(a) 8(b)	
Total questions		4	4	4	

Question Paper Blue Print for CIE (MID II)

Unit no	Unit name	Questions to be set for MID-II			Remarks
		R	U	A	
3	Steam Boilers	1,2	5(a) 5(b)	7(a) 7(b)	
4	Steam Nozzles	3,4	6(a) 6(b)	8(a) 8(b)	
Total questions		4	4	4	

State Board of Technical Education, Telangana State
Model Paper
ME-403 -HEAT POWER ENGINEERING

Mid Sem-I (CIE)

Time : 1 Hour

Total Marks : 20 M

PART – A

Marks: 4 X 1M = 4M

*NOTE: 1) Answer **ALL** questions and each question carries **One** mark.
2) Answers should be brief and straight to the point and shall not exceed **three** simple sentences*

1. Define air compressor.
2. Write the classification of gas turbines.
3. Define dryness fraction of steam.
4. Write the formula to find the enthalpy of wet steam.

PART – B

Marks : 2 X 3M= 6 M

*NOTE: 1) Answer **ALL** questions and each question carries **Three** marks
2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.*

- 5.(a) Explain why volumetric efficiency decreases with increase in delivery pressure .
(OR)
- 5.(b) differentiate between open cycle and closed cycle gas turbines.
- 6.(a) Calculate enthalpy, entropy of a steam at 2bar and 130⁰C temperature.
(OR)
- 6.(b) represent a constant entropy process on mollier diagram.

PART – C

Marks : 2 X 5M = 10 M

NOTE :

*1) Answer **ALL** questions and each question carries **Five** marks.
2) The answers should be comprehensive and the criteria for valuation is the content
but not the length of the answer*

- 7.(a) explain the working of a two stage air compressor with the help of P-V diagram.
(OR)
- 7.(b) explain the working of Ramjet with the help of a neat sketch.
- 8.(a) explain in detail the formation of steam under constant pressure.
(OR)
- 8.(b) calculate the change in enthalpy of one kg of steam at 200⁰ C and 3 bar pressure expanded to 0.3 bar pressure isentropically.

State Board of Technical Education, Telangana State
Model Paper
ME-403 -HEAT POWER ENGINEERING
Mid Sem-II (CIE)

Time : 1 Hour

Total Marks : 20

M

PART – A

Marks: 4 X 1M = 4M

*NOTE: 1) Answer **ALL** questions and each question carries **One** mark.
2) Answers should be brief and straight to the point and shall not exceed **three** simple sentences*

1. Mention any two boiler mountings.
2. Define equivalent evaporation.
3. Define nozzle.
4. List out different types of nozzles.

PART – B

Marks : 2 X 3M= 6 M

*NOTE: 1) Answer **ALL** questions and each question carries **Three** marks
2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.*

5. (a) Write any three differences between fire tube and water tube boilers.

(OR)

5. (b) Write any three uses of steam boiler.

6. (a) Compute the critical pressure ratio in a nozzle when the steam is initially dry & saturated.

(OR)

6. (b) Write down the effect of friction in nozzles.

PART – C

Marks : 2 X 5M = 10 M

NOTE :

1. Answer **ALL** questions and each question carries **Five** marks.
2. The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer

7. (a) Explain the working of any water tube boiler with a neat sketch.

(OR)

7. (b) Define draught. Explain various methods of producing draught in steam boilers.

8. (a) Derive the equation for exit velocity of steam passing through a nozzle without friction.

(OR)

- 8 (b) Explain supersaturated flow of steam in nozzle.

State Board of Technical Education, Telangana State SEE -Model Paper
ME-403 -HEAT POWER ENGINEERING

Time : 2 Hour

Total Marks : 40 M

PART-A

08X01=08

Instructions : 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

1. Mention different fuels used in jet propulsion.
2. List out the types of steam nozzles.
3. Define condenser.
4. Define dryness fraction of steam.
5. Write the expression for work done in an impulse turbine.
6. Define stage efficiency.
7. Write the classification of condensers.
8. Define vacuum efficiency w.r.t a condenser.

PART-B

04X03=12

Instructions : 1. Answer **ALL** questions.

2. Each question carries **THREE** marks.

9(a) Write down the advantages of multi stage compression over single stage.

(OR)

9. (b) Write the differences between impulse and reaction turbines.

10 (a) List out the classification of steam boilers.

(OR)

10. (b) Differentiate between surface and jet condensers.

11. (a) Define the terms bleeding & reheating

(OR)

11. (b) Explain the working of a simple De-Laval turbine with a neat sketch.

12. (a) Write a short note on shell and tube surface condensers.

(OR)

12. (b) List out the functions of a condenser.

PART-C

04X5=20

Instructions : 1. Answer **ALL** questions.

2. Each question carries **FIVE** marks.

13.(a) Explain the working of an open cycle constant pressure type gas turbine with the help of a neat sketch.

(OR)

13.(b) Explain different types of governing of steam turbines.

14.(a) Explain the working of Cochran boiler with a neat sketch.

(OR)

14.(b) Distinguish between dry air extraction and wet air extraction.

15.(a) Explain pressure compounding with the help of a neat sketch.

(OR)

15.(b) Numerical example

16.(a) Numerical example

(OR)

16. (b) Explain the working of steam jet air ejector with the help of a neat sketch

ME-404-ADVANCED MANUFACTURING TECHNOLOGY

Course Title	Advanced Manufacturing Technology	Course Code	ME-404
SEMESTER	IV	Course Group	Core
Teaching Scheme in periods (L : T : P)	4:1:0	Credits	3
Methodology	Lecture + Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Prerequisites: Basic knowledge of Manufacturing Processes & Machine

COURSE OUTCOMES

On successful completion of the course, the students will be able to

Course Outcomes	
CO1	Describe the construction and working of a turret lathe machines, Identify the Properties, composition of Cutting Fluids, Coolants & Lubricants to select depending on the application
CO2	Understand about Cores, moulding procedure, special casting methods and casting defects. Classify the advanced welding processes and requirement in various fields of engineering
CO3	Understand the concept of milling machine, types of milling machines, milling cutters
CO4	Illustrate the Working of Grinding Process and apply for engineering applications. Understand various surface finishing processes and apply for various applications
CO5	Explain Modern machining process for different applications.
CO6	Classify Press tools and apply it in various engineering applications & Identify Special tools for Work holding and guiding for different machining processes

COURSE CONTENT

Unit – 1 PRODUCTION LATHES AND CUTTING FLUIDS

PERIODS: 12

Production Lathes and Cutting fluids

Turret lathe: sketch – operation – advantages. Capstan lathe: sketch – operation – advantages. Comparison of engine (centre lathe) – turret – capstan lathe, Semi automatic lathe – features, Automatic lathe – features, Copying lathe – applications. Introduction, Types of cutting fluids. Properties and functions of fluids and coolants. Fluids and coolants required in turning, drilling, shaping, sawing & Broaching, Selection of cutting fluids, methods of application of cutting fluid. Classification of lubricants (solid, liquid, gaseous) Properties and applications of lubricants.

UNIT – 2: ADVANCED CASTING AND WELDING METHODS:

PERIODS: 13

Special Casting Processes: Die casting- Hot chamber -Cold Chamber- Vacuum Die Casting, Permanent Mould (Gravity die) casting -Centrifugal casting - CO₂ process - Investment casting – continuous casting-squeeze casting, electro slag casting, Fettling and finishing, Advantages, Disadvantages and Applications

Casting Defects: Blow holes, Cold shuts and misruns, Hot tears, Mismatch, Shrinkage cavities, Fins or flash, Slag inclusions, Swell, Scabs, Warping- their causes and Remedies

Advanced welding Methods: - Introduction, Classification of advanced welding processes, Advantages and limitations of conventional welding - Working Principles of modern welding methods –Submerged - CO₂ - Atomic Hydrogen - ultrasonic welding - MIG & TIG Welding - Electro slag welding -plasma arc welding.

UNIT – 3 MILLING

PERIODS: 13

Milling :- Purpose – Advantages and Classification -Column and knee type-plain-universal milling machine-vertical milling machine-specification of milling machines principles of operation-work and tool holding devices-arbor-stub arbor spring collet-adapter-milling cutters-cylindrical milling cutter-slitting cutter side milling cutter-angle milling cutter-T-slot milling cutter-woodruff milling cutter-fly cutter-nomenclature of cylindrical milling cutter-milling process conventional milling-climb milling-milling operations-straddle milling-gang milling-vertical milling attachment.

UNIT – 4 GRINDING AND FINISHING PROCESS

PERIODS: 12

Grinding Introduction – principles of Metal Removal by Grinding-need of grinding – construction of grinding wheel - types of abrasives - need of bonding materials – types - binding processes: Vitrified, silicate, shellac, rubber, Bakelite , Factors effecting the selection of grind wheels – size and shape of wheel – effect of grain size ,grit, grade and strength of bond – structure of grain – spacing, Standard marking systems: Meaning of letters & numbers sequence of marking – Grades of letters. Grinding machines – classification: Cylindrical, Surface, Principle of centre less grinding, Advantages & limitations of centre less grinding- Work-holding devices - Dressing and trimming of grind wheels

Other Finishing processes Honing, Lapping, Super finishing, Electroplating–Basic principles – Plating metals – applications, Hot dipping: Galvanizing, Tin coating, Parkerising, Anodizing, Organic coatings: Oil base Paint, Lacquer base, Enamels, Bituminous paints, rubber base coating.

UNIT – 5 MODERN MACHINING PROCESS

PERIODS: 12

Introduction – comparison with traditional machining; Ultrasonic Machining: principle, Description of equipment, applications - Electric Discharge Machining: Principle, Description of equipment, Dielectric fluid, tools (electrodes), Process parameters, Output characteristics, applications - Wire cut EDM: Principle, Description of equipment, Controlling parameters; applications - Abrasive Jet Machining: principle, description of equipment, application - Laser Beam Machining: principle, description of equipment, application - Electro Chemical Machining: description of equipment, application

UNIT – 6 PRESS TOOLS, JIGS & FIXTURES

PERIODS: 13

Press tools :-Introduction - Types of Presses – hand, power, gap, inclinable, adjustable, horn, straight side, pillar presses - Constructional details of a power press-Press size. Press Tools – Punch and die- Die Accessories – Stops, Pilots, strippers, Knock outs, pressure pads.

Press working operations- blanking, piercing and forming, lancing, cutting off and parting, notching, shaving, trimming, embossing, beading and curling, bulging, twisting, coining, swaging, hole flanging or extruding –line sketches and meaning of terms - Types of dies meaning of inverted, progressive, compound and combination dies - Material selection for punch and die.

Jigs & fixtures:- Need and Applications of jigs & fixtures - Basic principles of location - Explain the locating methods and devices. Explanation of basic principles of the clamping - Types of clamps – strap clamps, cam clamps, screw clamps, toggle clamps, hydraulic and pneumatic clamps- Types of jigs - template jig, plate jig, leaf jig, box and handle jig, Indexing jig, Universal jig, vice jigs. Types of fixtures: milling & boring fixtures.

REFERENCE BOOKS

1.	Manufacturing Technology	-	P N Rao (MGH Publishers)
2.	Production Technology	-	R.C.Patel
3.	Production Technology	-	Jain & Gupta
4.	Gear Technology	-	Charrathi
5.	A Text Book of Production Engg.	-	Dora
6.	Tool Design	-	Donaldson

SUGGESTED RESOURCES

1. Grinding process
<https://www.youtube.com/watch?v=Vcfau3bJ8hE>
2. Milling machine operation
<https://www.youtube.com/watch?v=2jc3HkrHh9s>
3. Center less grinding
https://www.youtube.com/watch?v=LfbNFTyGW_c
4. Truing and dressing of a Grinding wheel
<https://www.youtube.com/watch?v=GOR35qroeew>
5. Electroplating
https://www.youtube.com/watch?v=OxhCU_jBiOA
6. *Metal spraying*
<https://www.youtube.com/watch?v=NAeBpF84Q9M>
7. ultrasonic machining process
<https://www.youtube.com/watch?v=5w6szZtOg5w>
8. Wire cut EDM
<https://www.youtube.com/watch?v=yNE0KZTDEsg>
9. *Injection moulding*
<https://www.youtube.com/watch?v=b1U9W4iNDiQ>
10. Compression moulding
<https://www.youtube.com/watch?v=pOGpXZ-UMfo>
11. *Transfer moulding*
<https://www.youtube.com/watch?v=2DUB9DoIoi8>
12. Blow moulding
<https://www.youtube.com/watch?v=8W6P5KU5ONQ>
13. Manual press
<https://www.youtube.com/watch?v=nTshp3STG9M>
14. Hydraulic press
<https://www.youtube.com/watch?v=JxJUPD-Ajnc>
15. Die and types
<https://www.youtube.com/watch?v=qTuPkrfZB00>
16. Jigs and fixtures
<https://www.youtube.com/watch?v=CA3GnfImGmw>

SUGGESTED STUDENT ACTIVITIES

1. Student to inspect the available equipment in the lab to identify different machines, its functioning and application.
2. Quiz
3. Group discussion
4. Surprise test
5. Seminar

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1. PRODUCTION LATHES AND CUTTING FLUIDS

- 1.1 List the various types of production lathes.
- 1.2 Illustrate the working principle, construction and working of turret lathe.
- 1.3 Understand the working principle, construction and working of Capstan lathes.
- 1.4 Know the working principle, construction and working of Automatic and Semi-Automatic Lathes.
- 1.5 Illustrate the working principle, construction and working of copying lathes.
- 1.6 Distinguish between automatic and semi-automatic lathes.
- 1.7 Explain the need of copying lathes.
- 1.8 State the advantages and applications of production lathes.
- 1.9 State the need and properties of cutting fluids and coolants.
- 1.10 Mention the types of fluids.
- 1.11 List the relative merits of the cutting fluids and coolants.
- 1.12 Select the proper cutting fluids and coolants for various machining operations.
- 1.13 Classify the lubricants.
- 1.14 List all the properties of lubricants.

2. ADVANCED CASTING & WELDING METHODS.

- 2.1 Know the Advantages, disadvantages and Applications of die casting
- 2.2 Understand the working of hot chamber and cold chamber die casting,
- 2.3 Describe vacuum die casting
- 2.4 Explain permanent mould casting, centrifugal casting methods
- 2.5 Illustrate CO₂ process, investment casting their advantages and disadvantages
- 2.6 Know continuous casting-squeeze casting, electro slag casting,
- 2.7 Know finishing of casting Fettling
- 2.8 List and explain casting defects, reasons and remedies
- 2.9 List various advanced welding techniques its advantages and applications.
- 2.10 Explain the principle of MIG & TIG and related equipment
- 2.11 Explain the principle of Atomic hydrogen welding and related equipment.
- 2.12 Understand the principle of electron beam welding
- 2.13 Know the mechanism of CO₂ welding
- 2.14 List the various defects in welds.

3. MILLING

- 3.1 List Types of milling machines.
- 3.2 Understand construction and working of column and knee type-plain milling machines
- 3.3 Know the construction and working universal milling machine
- 3.4 Illustrate the construction and working vertical milling machine
- 3.5 Give specification of milling machines
- 3.6 Identify work holding devices and their construction.
- 3.7 Identify tool holding devices and their construction.
- 3.8 Understand various milling cutters
- 3.9 Understand about Various Milling operations like cylindrical, face, End, profile
- 3.10 Understand construction and purpose of Milling cutters like -slitting cutter side milling cutter- angle milling cutter-T-slot milling cutter-woodruff milling cutter-fly cutter-
- 3.11 Understand about conventional milling-climb milling-milling operations-straddle milling-gang milling and vertical milling attachment.

4. GRINDING AND FINISHING OPERATIONS

- 4.1 Understand the principle of metal removal by grinding.
- 4.2 List the different abrasives.
- 4.3 List and understand binding processes in grinding wheel manufacturing
- 4.4 Know the designation of grinding wheel
- 4.5 State the factors for selecting the grinding wheels.
- 4.6 Write the classification of grinding machines.
- 4.7 Understand the working and construction of Cylindrical grinding
- 4.8 Illustrate the working and construction of surface grinding
- 4.9 Understand the working and construction of tool and cutter grinders.
- 4.10 List the different work holding devices.
- 4.11 Understand finishing processes Honing, Lapping, Super finishing
- 4.12 Know the principle of electro-plating with a legible sketch.
- 4.13 Understand the principle of hot dipping processes namely galvanising, tin coating, Parkerizing and anodising.
- 4.14 List and understand the processes of various organic coatings.
- 4.15 State the principles of metal spraying.
- 4.16 Select the appropriate process for surface roughness of a given application

5. Modern machining process

- 5.1 Compare modern machining process with traditional machining
- 5.2 Understand the principle, construction of Ultrasonic Machine and its applications.
- 5.3 Understand the principle of Electric Discharge Machining, Description of equipment
- 5.4 State the necessity of Dielectric fluid.
- 5.5 Identify the function of electrodes and its materials.
- 5.6 Give Process parameters, Output characteristics, of electrodes.
- 5.7 Understand the principle of Wire cut EDM, Description of equipment, Controlling parameters and give applications.

- 5.8 Understand the principle of Abrasive Jet Machining description of equipment, and give application.
- 5.9 Understand the principle of Laser Beam Machining, description of equipment, and give application.
- 5.10 Understand the principle of Electro Chemical Machining, description of equipment, and give application

6. PRESS TOOLS, JIGS & FIXTURES

- 6.1 Understand the Importance of Press Tools
- 6.2 Classify presses based on power and design of frame.
- 6.3 Understand the constructional details of a power press with the help of a legible sketch
- 6.4 State the meaning of Press size.
- 6.5 Know Press Tools – Punch and die.
- 6.6 Describe various press working operations.
- 6.7 Understand different types of dies.
- 6.8 List and explain various die operations
- 6.9 List punch and die materials
- 6.10 List types of jigs and explain their constructional details with the help of legible sketches
- 6.11 State general considerations in design of drill jigs
- 6.12 List different types of fixtures such as milling & boring fixtures and explain their constructional details with the help of legible sketches.
- 6.13 Differentiate between jigs and fixtures.
- 6.14 List the advantages of Jigs and Fixtures
- 6.15 Understand basic principle of location.
- 6.16 Identify different locating methods and devices.
- 6.17 Understand the basic principle of clamping.
- 6.18 Identify different types of clamps and their constructional details with the help of legible sketches

COURSE OUTCOMES		CL	Linked POs	Teaching Periods
CO1	Describe the construction and working of a turret lathe machines, Identify the Properties, composition of Cutting Fluids, Coolants & Lubricants to select depending on the application	R, U, A	1, 4, 7	13
CO2	Understand about Cores, moulding procedure, special casting methods and casting defects. Classify the advanced welding processes and requirement in various fields of engineering	R, U, A	1, 2, 4,5, 7	12
CO3	Understand the concept of milling machine, types of milling machines, milling cutters	U, A	1, 3,4,, 7	12
CO4	Illustrate the Working of Grinding Process and apply for engineering applications. Understand various surface finishing processes and apply for various applications	U, A	1, 3,4,, 7	13
CO5	Explain Modern machining process for different applications.	U, A	1, 2, 4,5,6, 7	12
CO6	Classify Press tools and apply it in various engineering applications & Identify Special tools for Work holding and guiding for different machining processes	R, U, A	1, 2, 3, 7	13
			Total Periods	75

CO-PO Attainment Matrix:

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	-	-	2	-	1	2
CO2	2	3	-	1	1	-	3
CO3	2	-	1	2	-	-	2
CO4	3	-	1	2	-	-	2
CO5	2	3	-	2	1	1	2
CO6	3	1	-	2	-	-	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Production Lathes and Cutting fluids	1, 2	5(a)&(b)	7(a)&7(b)	
2	Advanced Casting and Welding methods	3, 4	6(a)&(b)	8(a)&8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Milling	1, 2	5(a)&(b)	7(a)&7(b)	
2	Grinding & Finishing processes	3, 4	6(a)&(b)	8(a)&8(b)	
Total Questions		4	4	4	

Blue Print of Marks for SEE:

Units		No of periods	Questions to be set for SEE				Remarks	
			R		U	A		
Part-A	Production Lathes and Cutting fluids	12	Q4	Q1		Q9(a)	Q13(a)	
	Advanced Casting and Welding methods	13						
Part-B	Milling	13		Q2		Q10(a)	Q14(a)	
	Grinding & Finishing processes	12						
Part-C	Modern machining process	12		Q3	Q5 Q6	Q9(b) Q11(a) Q11(b)	Q13(b) Q15(a) Q15(b)	
	Press tools, jigs& fixtures	13						
TOTAL		75	08		08	08		

MID SEM - I
MODEL PAPER
ME404 -ADVANCED MANUFACTURING TECHNOLOGY

Time: 1 Hours

Max. Marks: 20

PART-A

4 X 1 = 4

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.
1. What is a turret lathe
 2. What is the purpose of cutting fluids
 3. Define centrifugal casting
 4. What is meant by fettling

PART-B

2 X 3 = 6

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

5. (a) List various production lathes
OR
5. (b) State the advantages and applications of production lathes
6. (a) List various casting defects
OR
6. (b) List the various welding defects

PART-C

2 X 5 = 10

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.
7. (a) Explain Turret lathe
OR
 7. (b) Explain various types of cutting fluids
 8. (a) Explain CO₂ welding
OR
 8. (b) Explain the principle of electro slag welding

MID SEM - II
MODEL PAPER
ME404 -ADVANCED MANUFACTURING TECHNOLOGY

Time: 1 Hours**Max. Marks:** 20**PART-A**

4 X 1 = 4

Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

1. What is gang milling
2. What is a cutter
3. What is grit size
4. What is truing of grinding wheel

PART-B

2 X 3 = 6

Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

5(a) List various Milling cutters

OR

5(b) What is Up milling

6(a) State the factors for selecting the grinding wheels.

OR

6(b) Write the specifications of a grinding wheel

PART-C

2 X 5 = 10

Instructions: 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

7. (a) Explain Knee type milling machine

OR

7.(b) List various milling operations

8 .(a) Explain cylindrical grinding

OR

8.(b) Explain super finishing

BOARD DIPLOMA EXAMINATION, (C-21)
SEE-MODEL PAPER
DME– IV SEMESTER EXAMINATION
ME404 -ADVANCED MANUFACTURING TECHNOLOGY

Time: 2 Hours**Max. Marks:** 40**PART-A**

8 X 1 = 8

Instructions: 1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.

1. What MIG welding
2. What is a abrasive material?
3. What is Parkerizing?
4. Define jig.
5. What is a dielectric fluid
6. Name the material used for electrode in EDM
7. Name any two types of jigs
8. What is a template jig?

PART-B

4 X 3 = 12

Instructions: 1. Answer **ALL** questions.
 2. Each question carries **THREE** marks.

9(a). Compare MIG & TIG?

OR

9(b) Write the advantages of Modern machining process.

10(a). What is down milling?

OR

10(b). Compare jig & fixture.

11. (a) List the functions of a electrode in modern machining process..

OR

11. (b) List various electrode materials.

12(a). Explain progressive die with simple sketch.

OR

12(b). List various press work operations.

PART-C

4 X 5 = 20

Instructions: 1. Answer **ALL** questions.
 2. Each question carries **FIVE** marks.

13 (a). Explain MIG welding.

OR

13 (b). Explain AJM

14 (a). Explain Vertical milling machine.

OR

14 (b) Explain a milling fixture

15 (a) Explain Ultrasonic machining

OR

15 (b) Explain ECM

16 (a) Explain about compound die

OR

16 (b) Explain the construction of box jig

EE-415-BASIC ELECTRICAL ENGINEERING

Course title	Basic Electrical Engineering	Course code	EE-415
Semester	IV	Course group	Core
Teaching scheme in periods (L:T:P)	4:1:0	Credits	3
Methodology	Lecture+ Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Pre-Requisites

Enthusiasm to learn the course, the basic knowledge of Physics and Mathematics and particularly Electrical fundamentals at secondary school level.

CORSE OUTCOMES

On successful completion of the course, the students will be able to

CO1	Understand the concepts of Basic electrical circuits, Electromagnetism and the Induced E.M.F.
CO2	Explain the construction and working of D.C.Machines.
CO3	Summarize the characteristics of A C waveforms, understand the concepts of single and poly phase circuits.
CO4	Explain the construction and working of A.C. Machines.
CO5	Explain the construction and working of Electrical Measuring instruments. Comprehend and follow Electrical Safety procedures and Protection aspects
CO6	Understand and explain the concept of PN junction diode, transistor configuration and types of logic gates.

CONTENTS

UNIT - I Electrical Engineering Fundamentals Duration: 13 Periods (L: 10 - T: 3)

Definitions: Ohm's Law, Laws of resistance work, power, energy with units. Kirchhoff's Laws. Electro – magnetic induction. Dynamically and statically induced e. m. f., Lenz's Law, Fleming's right hand rule, Inductance – self and mutual. Series and parallel circuits & simple problems.

UNIT - II D. C. Machines Duration: 12 Periods (L: 9 - T: 3)

D.C Generator: Principle of operation - Parts of generator - Types of generators - E.M.F equation - Power flow diagram -DC Motors : Principle of operation - Types of motors - Back e. m. f and speed equation - Starters and their necessity - Connection diagram of 3 point starter - Speed control – Field and Armature control - Applications of motors.

UNIT - III A. C. Fundamentals Duration: 12 Periods (L: 9 - T: 3)

Definition – alternating current, voltage amplitude, time period frequency, instantaneous value, Average value, R. M. S. value, form factor - Graphical representation of Alternating quantities - Phase difference - A.C. Circuits - Definition of poly-phase and 3- Ø circuits - Phase difference in 3-Ø - Star and delta connections, definitions of phase values and line values.

UNIT - IV A. C. Machines Duration: 13 Periods (L: 10 - T: 3)

Alternators – principle of working. Constructional features of alternators. Speed and frequency relations. Transformers working principle. Single phase transformers - Voltage ratio, Current ratio, Turns ratio - Welding transformer - 3-Phase Induction Motor - Working principle, Construction - Squirrel cage and Wound Rotor - Single phase Induction Motors - Types and applications of single phase induction motors.

UNIT - V Electrical measuring instruments & Safety procedures Duration: 13 Periods (L: 10 - T: 3)

Construction and principle of operation of PMMC & MI instrument - uses of multimeter- Single phase induction type Energy meter - Electrical safety Procedures - Effects of shock and burns - Remedial procedures to be adopted in case of electrical shocks - Plate earthing - Pipe earthing.

UNIT - VI Basic Electronics Duration: 12 Periods (L: 9 - T: 3)

Semi-conductors-N-type, P-type. Behaviour of PN junction diode. Introduction of PNP, NPN transistors. Transistor configuration – Zener diodes. Truth tables for OR, AND, NOT, NAND and NOR gates

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1.0 Basic Electrical Fundamentals.

- 1.1 Define Voltage
- 1.2 Define Current
- 1.3 Define Ohm's Law.
- 1.4 Define Resistance.
- 1.5 State the Laws of Resistance.
- 1.6 Derive the expression for Resistance.
- 1.7 Define specific resistance
- 1.8 State Work, Power and Energy from electrical and mechanical aspects and understand their units.
- 1.9 Explain Kirchhoff's laws.
- 1.10 Define flux and flux density
- 1.11 State Faraday's laws of Electro Magnetic Induction.
- 1.12 Describe dynamically and statically induced E.M.F.
- 1.13 State Lenz's Law.
- 1.14 State Fleming's Right Hand rule.
- 1.15 Define self and mutual inductance.
- 1.16 Derive the expression for equivalent resistance in D.C Series circuit
- 1.17 Derive the expression for equivalent resistance in D.C Parallel circuit
- 1.18 Simple problems on Series and Parallel circuits

2.0 D C Machines.

- 2.1 Explain working principle of D C Generators.
- 2.2 Know the constructional features of D C Generators and materials used.
- 2.3 List the types of D C Generators.
- 2.4 Write E.M.F equation of D C Generator
- 2.5 Solve substitution problems on emf equation.
- 2.6 Draw the power flow diagram of D C Generator.
- 2.7 List the different losses in DC generator
- 2.8 Explain working principle of D C Motor.
- 2.9 List types of D C motors.
- 2.10 Significance of back e.m.f in D C motor.
- 2.11 Write formula for speed of D C Motor in terms of supply voltage, current and flux.
- 2.12 List the different losses in DC motor
- 2.13 Write necessity of starters for D C motors.
- 2.14 Describe with sketch the connection diagram of a D C 3 point starter.
- 2.15 Explain the speed control of DC motor by a) Armature control, b) Field control method
- 2.16 List the applications of D C motors

3.0 A.C. Fundamentals

- 3.1 Definitions: Alternating current, amplitude, time period, instantaneous value,
- 3.2 Define Average value, R.M.S value form factor, peak factor.
- 3.3 Graphical representation of alternating quantities
- 3.4 Know the concept of Phase and phase difference.

- 3.5 Define Power factor.
- 3.6 Write the formula for AC power.
- 3.7 Write the concept of Poly-phase and 3-phase system.
- 3.8 Comprehend Star and Delta connections.
- 3.9 Write the relation between Line and Phase values.
- 3.10 Solve simple conversion problems on line and phase values.

4.0 A.C. Machines

- 4.1 Explain working principle of alternators.
- 4.2 Constructional features of Alternators.
- 4.3 Know the frequency and speed relation in alternators.
- 4.4 State a transformer.
- 4.5 Explain the working principle of transformer.
- 4.6 Give the ratings of Transformer.
- 4.7 List the types of Transformers
- 4.8 Define Transformation ratio,
- 4.9 Give the relation between Transformation ratio, Voltage and Current ratios.
- 4.10 Describe the operation of a welding Transformer with sketch.
- 4.11 Explain the working Principle of 3-phase induction motor.
- 4.12 Construction of squirrel cage and wound rotors.
- 4.13 List the applications of 3-phase induction motors.
- 4.14 Describe the working principle of Single-phase induction motors.
- 4.15 List the types of 1-phase induction Motors.
- 4.16 Write the Applications of 1-phase induction Motors.

5.0 Electrical Measuring Instruments and Safety Procedures.

- 5.1 Explain the construction and working principle of permanent magnet Moving Coil instruments.
- 5.2 Explain the construction and working principle of Moving Iron instruments.
- 5.3 Compare PMMC and MI instruments
- 5.4 List the uses of multimeter
- 5.5 Explain the construction and working principle of 1-phase induction type energy meters.
- 5.6 State the list of wires and cables used for domestic wiring
- 5.7 List the different types of wiring systems
- 5.8 Explain Surface conduit wiring system
- 5.9 Explain Concealed wiring system.
- 5.10 List the various types of Main Switches
- 5.11 State the specifications of MCB
- 5.12 State the types of MCBs
- 5.13 State the applications of MCCB, ELCB and RCCB.
- 5.14 State the precautions to be taken to avoid electric shock.
- 5.15 Write the Effect of electrical shock.
- 5.16 Write the remedial procedures to be adopted in case of electric shocks.
- 5.17 Know the purpose of earthing of electrical equipment and machinery.
- 5.18 Describe the procedure of i) Pipe earthing and ii) Plate earthing.

6.0 Basic Electronics

- 6.1 Classify materials as conductor, semi-conductor and insulator.
- 6.2 Distinguish between intrinsic and extrinsic semiconductors.
- 6.3 Describe the formation of P type and N type materials.
- 6.4 Write the formation of P.N junction diode.
- 6.5 Explain the working of P.N junction diodes in forward bias and reverse bias.
- 6.6 Draw and explain characteristics of Diode in forward and reverse bias.
- 6.7 Explain the formation of NPN and PNP Transistor.
- 6.8 Draw the symbols of NPN and PNP transistors.
- 6.9 Understand the working of P.N.P and N.P.N transistors.
- 6.10 Draw the different transistor configuration (CB,CC AND CE).
- 6.11 Describe the operation of Zener diode.
- 6.12 Write the truth tables for OR, AND, NAND and NOR logic gates.

- a. **Note : Where ever mentioned, simple formula substitution problems only be solved and no problems in the other specific objectives.**

SUGGESTED STUDENT ACTIVITIES

1. Student visits Library to refer to Manual of Electrical Safety.
2. Student inspects the available equipment in the Lab to identify the components
3. Quiz
4. Group discussions
5. Surprise test

Suggested e-Resources:

1. www.khanacademy.org
2. www.ocw.mit.edu/courses/electrical-engineering
3. www.nptel.ac.in

COURSE-PO ATTAINMENT MATRIX

CO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Linked POs
CO1	2	1	-	1	-	-	1	1,2,4,7
CO2	2	-	-	2	1	-	1	1,4,5,7
CO3	2	1	-	1	-	-	1	1,2,4,7
CO4	2	1	-	2	1	-	1	1,2,4,5,7
CO5	2	-	-	2	2	-	2	1,4,5,7
CO6	2	-	-	1	-	-	1	1,4,7

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed

Internal Evaluation

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

MID SEM-I EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-I	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-III	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page, 1 page and 2 pages respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Unit No	Questions to be set for SEE				
	R		U	A	
I	4	1		9(a)	13(a)
II					
III		2		10(a)	14(a)
IV					
V		3	5, 6	9(b), 11(a), 11(b)	13(b), 15(a), 15(b)
VI					
Total Questions	8		8	8	

BOARD DIPLOMA EXAMINATIONS
Model Question paper
DME IV semester Mid Semester-I Examination

Corse Code:EE-415**Course Name:** Basic Electrical Engineering**Duration:1 hour****Max.Marks:20**

PART – A**Marks: 4 X 1= 4**

Instructions: (1) Answer all questions
(2) Each question carries **one** marks.

1. Define Ohm's Law.
2. Define specific resistance
3. Write the EMF equation of D.C. Generator
4. Write the classifications of D.C. Generators

PART - B**Marks: 2 x 3 = 6**

Instructions: (1) Answer **all** questions.
(2) Each question carries **three** marks.

5.(a) State the Laws of Resistance.

OR

5.(b) State Fleming's Right Hand rule.

6.(a) Write the types of D.C. Generator.

OR

6.(b) Draw the schematic diagram of D.C. Shunt Generator

PART - C**Marks: 2 x****5= 10**

Instructions: (1) Answer **all** questions.
(2) Each question carries **five** marks.

7.(a) State Faraday's laws of Electro Magnetic Induction.

OR

7.(b) Derive the expression for equivalent resistance in D.C Series circuit

.

8.(a) Draw power flow diagram of a D.C. Generator

OR

8.(b) Sketch the connection of welding generator.

BOARD DIPLOMA EXAMINATIONS
Model Question paper
DME IV Semester Mid Semester-II Examination

Corse Code:EE-415**Course Name:** Basic Electrical Engineering**Duration:1 hour****Max.Marks:20**

PART – A

Marks: 4 X 1= 4

Instructions: (1) Answer all questions
(2) Each question carries **one** marks.

1. Write the types of starters for D.C. motors
2. Write the classifications of D.C. motors
3. Define Time Period
4. Define R.M.S Value

PART - B

Marks: 2 x 3 = 6

Instructions: (1) Answer **all** questions.
(2) Each question carries **three** marks.

- 5.(a). Draw the Schematic diagram of D.C. shunt motor.
OR
5.(b). Write the types of speed control of D.C. motors.
- 6.(a). Define Phase and phase difference
OR
6.(b). Draw the Star and Delta connections.

PART - C

Marks: 2 x 5= 10

Instructions: (1) Answer **all** questions.
(2) Each question carries **five** marks.

- 7.(a). List any 4 applications of D.C. motors
OR
7.(b). Explain the speed control of DC motor by Armature control method
- 8.(a). Write the relation between Line and Phase values in Star and Delta connection.
OR
8.(b). Explain phase difference and Phase sequence in 3 phase system.

BOARD DIPLOMA EXAMINATIONS
DIPLOMA IN MECHANICAL ENGINEERING.
SUB CODE: EE-415
Basic Electrical Engineering

SEMESTER END EXAM MODEL PAPER

TIME: 2 HOURS

TOTAL MARKS: 40

PART – A

Marks : 8 X 1= 8

Instructions: (1) Answer all questions
(2) Each question carries **one** mark.

1. Define Flux.
2. State the transformer ratio.
3. List the uses of multimeter
4. Define Amplitude
5. List the various types of Main Switches
6. What is the instrument used to measure Power.
7. Draw the symbol of N.P.N transistor.
8. Write the truth tables for OR gate

PART - B

Marks: 4 × 3= 12

Instructions: (1) Answer all questions.
(2) Each question carries **three** marks.

9.(a). State Faraday's laws of Electro Magnetic Induction.

OR

9.(b). Write the Effect of electrical shock.

10.(a). Write the relation between Line and Phase values in Star and Delta connection.

OR

10.(b). Explain the formation of N-type materials

11.(a). State the precautions to be taken to avoid electric shock.

OR

11.(b). State the list of wires and cables used for domestic wiring

12.(a). Distinguish between intrinsic and extrinsic semiconductors.

OR

12.(b). Explain the operation of Zener diode.

PART – C

Marks: $4 \times 5 = 20$

Instructions: (1) Answer all questions.
(2) Each question carries **five** marks.

13.(a). Draw power flow diagram of a D.C. Generator.

OR

13.(b). Explain the construction and working principle of Moving Iron instruments.

14.(a). Explain the working principle of 1-phase induction Motors.

OR

14.(b). Explain the working of PNP transistor.

15.(a). Describe the procedure of Pipe earthing.

OR

15.(b). Explain Surface conduit wiring system

16.(a). Explain the working of P.N junction diodes in forward.

OR

16.(b). Draw the different transistor configuration.

ME-406-PRODUCTION DRAWING

Course Title	Production drawing	Course Code	ME-406
Semester	IV	Course Group	Practical
Teaching Scheme in Periods (L :T:P)	1:0:2	Credits	1.5
Methodology	Lecture + practice	Total Contact in Periods	45
CIE	60 Marks	SEE	40 Marks

Prerequisites: Basic knowledge of Assembly Drawing.

Course Outcomes

	At the end of the course the students will be able to :
CO1	Understand the difference between machine drawing and production drawing. Understand the need and calculation of limits, fits and tolerances.
CO2	Understand the importance of surface roughness on life of component and its representation indicate surface roughness symbols in drawings, understand standard component specification.
CO3	Understand the Geometrical Tolerances indicated on production drawing and its symbols
CO4	Understand various reprographic methods
CO5	Illustrate production drawings of components, draw process sheet and apply suitable limits and fits.

Course Content and Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions for SEE		
			R	U	A
PART-A					
1	Introduction to production drawing, Limits, fits and tolerances.	06		1	
2	Geometrical Tolerances, Surface finish and standard mechanical component specifications. Reprographic Techniques	09		3	
PART-B					
3	<u>PART DRAWING EXERCISE – I</u> Gib and Cotter joint, Knuckle joint, Muff couplings, flange coupling universal coupling, Eccentric, stuffing box etc.. Process sheet preparation.	15			1
PART-C					
4	<u>PART DRAWING EXERCISE - II</u> Bearings (Foot step Bearing, Plummer block), Cross head, connecting rod, lathe tail stock, Revolving centre, Non-return valve etc.	15			1
	Total	45			

Part B each question carries 28 marks and distributed for

- **Component drawing views..... 20 marks**
- **limits fits and tolerances..... 2 marks**
- **Geometrical tolerances..... 1 mark**
- **Surface finish..... 2 marks**
- **Process sheet 3 marks**

3. Standard components in part-B question need not be drawn.

COURSE CONTENTS

1.0 Understand the idea of production drawing, Limits, Fit and Tolerances and Process sheet preparation

1.1 Introduction to production Drawing

Need of preparing a production drawing, requirements for manufacturing a product like equipment, tools, measuring instruments depending upon processes, accuracy and finish data available in machine drawing – components of a production drawing, fits and tolerances, surface finish, specific processes, material of the component.

a. Limits, fits and tolerances

Concept of limits fits and tolerances – need of limits – standard designation of Hole and Shaft dimensions. Calculation of limits fits by using tolerance charts. Selecting dimensions from BIS standards to obtain clearance, transition and interference fits for a given set of mating parts – computation of fit and tolerance from BIS table. Exercises in computing tolerance.

2.0 Geometrical tolerances to a component, Surface finish and Standard Mechanical component specification

2.1 Need of geometrical tolerances- Types of geometrical tolerances - Tolerance of profile: profile of a line, surface.

Tolerance of orientation or attitude: angularity- perpendicularity- parallelism – flatness, cylindricity, circularity – Tolerance of location: position- concentricity- symmetry, Composite tolerances: radial run-out, axial run-out. Symbols for geometrical tolerances, indication of geometrical tolerances on components.

Exercises on representation of geometrical tolerances on the drawings

2.2 **Surface finish.** Indicate Profile of a surface and important characteristics of a surface, Identify the surface texture symbols. Identify Lay direction, surface roughness achievable from different manufacturing processes, Equivalent surface roughness symbols; Indicate the roughness values or grade number and corresponding symbol as per BIS. Indicate surface roughness on drawings.

- **Exercises** on specifying the surface roughness (average values) for functional surfaces of the following machine tool parts.
- -Shaft rotating in bush bearing,
- -Tailstock sleeve in tailstock body,
- -Keys and keyways
- -Mounting surfaces for antifriction bearings

- -Shaft or bush press fitted into bodies
- -Beds of machine tools, guide-ways
- -Contact surfaces ,example :flanges of pipe fittings
- -Peripheral surfaces of pulleys and grooves for v-belts
- -Surfaces of control elements example: levers ,hand wheels
- -Bases of machines
- -Machine tool tables

2.3 Standard Mechanical component specification.

Standard components (parts) are to be designated as per BIS like - Bolts, Nuts, Locknuts ,Washers, Screws and, Studs – Circlips - Cylindrical and taper pins – Keys – Rivets – Splines - Oil seals-rings - Antifriction bearings:

3.0 Production drawing exercises-I

Prepare the relevant views of the part(s) of a given assembly drawing needed for the purpose of production.

Dimension the views obtained and indicate on it with relevant notes the specific processes.

Compute/ identify the type fit between mating parts from ISI tables as per the function of the component and indicate the limits at appropriate place on the drawing prepared.

Indicate the geometrical tolerances on the component drawing

Mark the surface finish symbols with indications added.

Prepare the process sheet indicating sequence of processes and equipment, tools, measuring instruments required.

Production drawing exercises-I

- Knuckle joint,
- Muff couplings,
- flange coupling
- universal coupling,
- stuffing box
- Eccentric

4.0 Production drawing exercises-II

Prepare the relevant views of the part(s) of a given assembly drawing needed for the purpose of production.

Dimension the views obtained and indicate on it with relevant notes the specific processes.

Compute/ identify the type fit between mating parts from ISI tables as per the function of the component and indicate the limits at appropriate place on the drawing prepared.

Indicate the geometrical tolerances on the component drawing

Mark the surface finish symbols with indications added.

Prepare the process sheet indicating sequence of processes and equipment, tools, measuring instruments required.

Production drawing exercises-II

- Foot step Bearing
- Plummer block
- cross Head,
- connecting rod,
- lathe tail stock ,
- Lathe tool post
- Revolving centre ,

Student Activity

Students/staff members advised to visit nearby local industry and collect actual production drawing, study and practise as exercise.

REFERENCE BOOKS

1. IS 696 – 1972-Code of Practice for General Engg. Drawing & B.I.S Code – SP . 46. IS 696 – 1988
2. Machine Design data hand book – Vol I & II – Dr. K. Lingaiah, (Suma Publishers, Bangalore).
3. IS Code on fits and tolerances.
4. Blur print reading for Mechanical Tradesby B.R.Sachdeva.
5. Machine drawing by R.B. Gupta.
6. Machine Drawing by Siddeswar.
7. Production Drawing by K.Venkat Reddy
8. Machine Drawing by Nagpal

SUGGESTED STUDENT LEARNING OUTCOMES.

On the completion of the course the student should be able to

1.0 Understand the need of production drawing and Interpret dimension to obtain Limits, fit and Tolerance as per BIS standards.

- 1.1 Distinguish the machine drawing from a production drawing.
- 1.2 State the factors that govern the preparation of a production drawing.
- 1.3 Identify the components of a production drawing.
- 1.4 Identify various notations indicated on production drawing like Limits, fits, Tolerances, surface roughness symbols and Geometrical tolerances and its importance
- 1.5 State the need of Limits, allowance and tolerance

- 1.6 Definition of fit, allowance and tolerance.
- 1.7 Identify tolerance zones and tolerance grades
- 1.8 Classify types of fits, Material conditions, System of limits, specification tolerances
- 1.9 Selection of suitable fit for a given mating part.
- 1.10 Compute the fit from tables.
- 1.11 Indicate fits on the drawings.

2.0 Geometrical Tolerances, Surface finish and standard mechanical component specifications and Reprographic Techniques

- 2.1 Need of geometrical tolerances, Types of geometrical tolerances
- 2.2 Guidelines for indication of feature controlled by geometrical tolerances
- 2.3 Guidelines for indication of datum features, datum planes in space, General principles for applying geometrical tolerances on a component
- 2.4 Indicate Profile of a surface and important characteristics of a surface on drawings
- 2.5 Identify the surface texture symbols. Identify Lay direction, surface roughness achievable from different manufacturing processes, Equivalent surface roughness symbols.
- 2.6 Indicate the roughness values or grade number and corresponding symbol as per BIS.
- 2.7 Indicate the sequence of process of production.

3.0 Illustrate the ability to draw the component views in exercise I

4.0 Illustrate the ability to draw the component views in exercise II

Course Content and Blue Print of Marks for Mid sem-I

Unit No	Unit Name	Periods	Questions for SEE		
			R	U	A
PART-A					
1	Introduction to production drawing, Limits, fits and tolerances.	06		Q No.1,2	
2	Geometrical Tolerances, Surface finish and standard mechanical component specifications.	09		Q No.3,4,5 & 6	

Course Content and Blue Print of Marks for Mid sem-II

Unit No	Unit Name	Periods	Questions for SEE		
			R	U	A
PART-B					
3	<u>PART DRAWING EXERCISE – I</u> Gib and Cotter joint, Knuckle joint, Muff couplings, flange coupling universal coupling, Eccentric , stuffing box etc.. Process sheet preparation.	15			Q No. 1 & 2
	Total	15			

Course Outcome		Cognizant Level	Linked PO's
CO1	Understand the difference between machine drawing and production drawing. Understand the need and calculation of limits, fits and tolerances.	R/U	1, 4,7
CO2	Understand the importance of surface roughness on life of component and its representation, indicate surface roughness symbols in drawings, understand standard component specification.	R / U	1, 2, 3, 4, 7
CO3	Understand the Geometrical Tolerances indicated on production drawing and its symbols	R / U	1, 2, 3, 4,6,7
CO4	Understand various reprographic methods	R / U / A	1, 2, 3, 4,7
CO5	Illustrate production drawings of components, draw process sheet and apply suitable limits and fits.	R / U / A	1, 2, 3, 4,5,7

CO-PO Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7
CO1	2	-	-	2	-	-	3
CO2	3	1	1	2	-	-	2
CO3	2	1	2	3	-	1	3
CO4	2	1	1	2	-	-	1
CO5	3	2	3	3	-	2	2

BOARD DIPLOMA EXANIMATIONS
CIE- MID-1Model Paper
ME-406 -PRODUCTION DRAWING

Time: 1 Hours

Max. Marks: 20

PART – A

04 X 05 M = 20M

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **FIVE** marks.
 3. Answer should be neat & clear with all the necessary Dimensions.
 4. All Dimensions are in mm. Choose suitable Scale.
 5. Use of tolerance tables permitted.
1. The dimensions of a shaft and a hole are given
Hole: $35^{+0.022}_{+0.000}$ Shaft: $\phi 35^{+0.031}_{+0.056}$ find out
(a) Hole Tolerance (b) Shaft Tolerance (c) Min Allowance (d) Max allowance
(e) Type of fit
2. The dimensions of a shaft and a hole are given 40Hg7
(a) Hole Tolerance (b) Shaft Tolerance (c) Min Allowance (d) Max allowance
(e) Type of fit
3. Draw the symbols of the following geometrical tolerances:
a) Circularity b) Flatness c) Symmetry d) Misrun e) Parallelism
4. Indicate the roughness values for the following surface roughness grade numbers :
(a) N 10 (b) N 8 (c) N 6 (d) N 4 (e) N 1
5. Write the meaning of the following designations of mechanical components :
(a) Square bolt M10 $\times$ 50 N
(b) Ball bearing 308
(c) Taper key 12 X 8 X 50
(d) Fe 600 W
(e) Splines 5 X 20 X 30
6. Draw the symbols of the following geometrical tolerances:
a) Perpendicularity b) straightness c) concentricity d) angularity e) position

BOARD DIPLOMA EXANIMATIONS

CIE- MID 2 Model Paper- ME-406 -PRODUCTION DRAWING

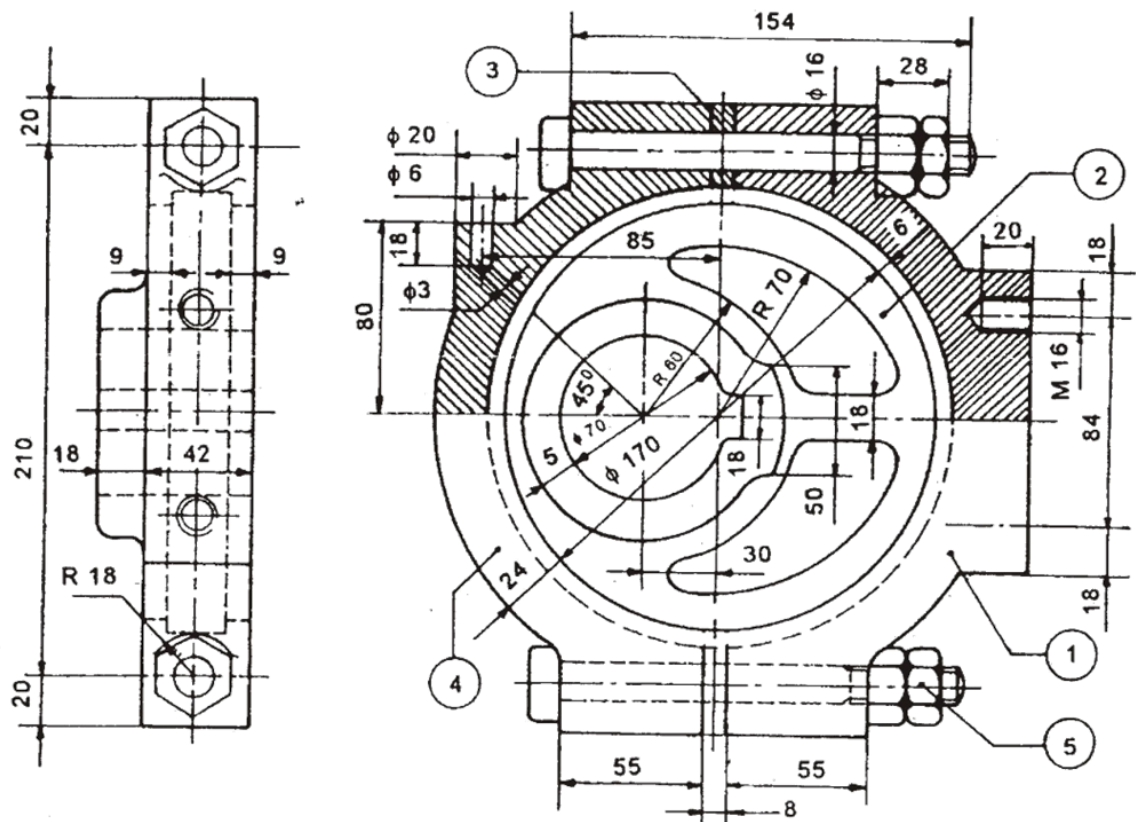
Time: 1 Hours

Max. Marks: 20

- Instructions :**
1. Answer any **ONE** questions.
 2. Each question carries **twenty** marks.
 3. Answer should be neat & clear with all the necessary Dimensions.
 4. All Dimensions are in mm. Choose suitable Scale.
 5. Assume missing data proportionately is any

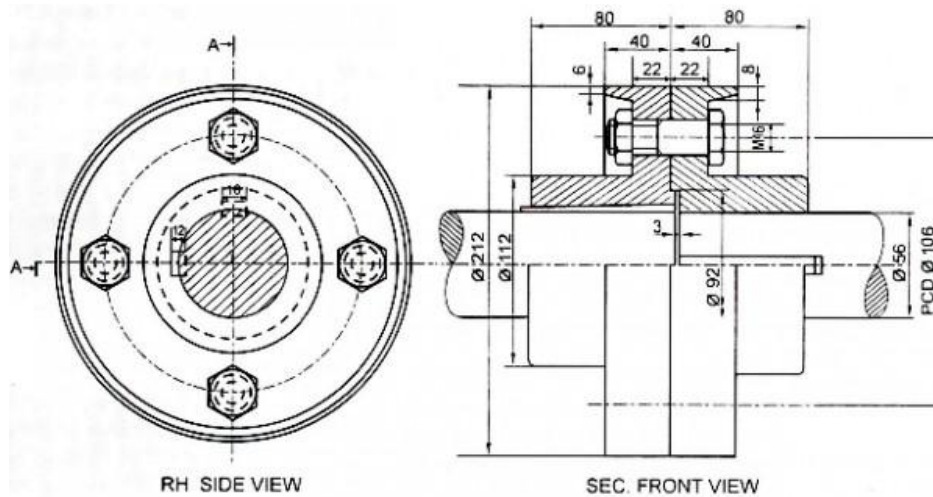
1. Study the given assembly drawing of the eccentric shown in Figure given below:

- (a) Draw the component drawings of all except part 5----14M
- (b) Apply suitable geometric tolerances and fits.-----2M
- (c) Show the surface roughness symbols. -----1M
- (d) Draw the process sheet for bolt -----3M



. Study the given assembly drawing of the protected flange coupling as shown in Figure given below:

- (a) Draw the component drawings of all except part 5----14M
- (b) Apply suitable geometric tolerances and fits.-----2M
- (c) Show the surface roughness symbols. -----1M
- (d) Draw the process sheet for flange -----3M



**BOARD DIPLOMA EXAMINATION
MECHANICAL BRANCH –IV SEMESTER
END EXAMINATION (SEE)
ME-406 -PRODUCTION DRAWING**

Time: 2 Hours

[Total Marks: 40]

PART-A

- Instructions:** 1. Answer all Questions **4X3=12 Marks**
2. Each question carries **Three marks.**
3. Answer should be neat & clear with all the necessary Dimensions
4. All Dimensions are in mm. Choose suitable Scale

1. The dimensions of a hole and shaft are given below :

$+0.039$	$+0.062$
Hole : $30 \begin{smallmatrix} +0.000 \\ +0.039 \end{smallmatrix}$	Shaft : $30 \begin{smallmatrix} +0.041 \\ +0.062 \end{smallmatrix}$

Find (a) maximum allowance, (b) minimum allowance and (c) type of fit.

2. Write the meaning of the following designations of mechanical Components:

(a) Hexagonal Bolt $M20 \times 60$ (b) Bearing 100, 10X26X8 (c) Taper key 12 X 8 X 50v

3. Draw the symbols of the following geometrical tolerances:

- a) Perpendicularity.
- b) Cylindricity
- c) Angularity

4. Write the surface roughness values for the following :

- (a) Hot rolling
- (b) Cylindrical grinding
- (c) Lapping

PART-B

Instructions:

1X28=28 Marks

1. Answer any **one** Question
2. Each question carries 28 marks.
3. Answer should be neat & clear with all the necessary Dimensions
4. All Dimensions are in mm. Choose suitable Scale.

5. For the assembly drawing of Lathe tail stock and draw the component drawings indicating fits, roughness values and tolerances, write the process sheet for barrel

Component drawing views..... 20 marks

- limits fits and tolerances..... 2 marks
- Geometrical tolerances..... 1 mark
- Surface finish..... 2 marks
- Process sheet 3 marks

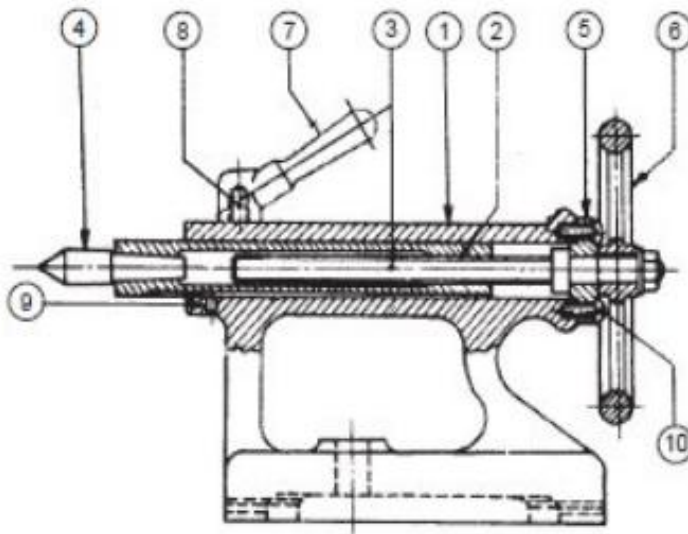


Fig. 18.18A Lathe tail-stock

Parts list

Part No.	Name	Matl	Qty
1	Body	CI	1
2	Barrel	MS	1
3	Spindle with washer & nut	MS	1
4	Centre	CS	1
5	Spindle bearing	CI	1
6	Hand wheel	CI	1
7	Clamping lever	MS	1
8	Stud	MS	1
9	Feather key	MS	1
10	Screw	MS	4

- limits fits and tolerances..... 2 marks
- Geometrical tolerances..... 1 mark
- Surface finish..... 2 marks
- Process sheet 3 marks



EE-417- BASIC ELECTRICAL ENGINEERING LAB

Course Title	Basic Electrical Engineering Lab	Course Code	EE-417
Semester	IV	Course Group	Practical
Teaching Scheme in Periods (L :T:P)	1:0:2	Credits	1.5
Methodology	Lecture + practice	Total Contact in Periods	45
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic skills of Handling Domestic tools, this course also requires the basic knowledge of basic mathematics at secondary school level.

Course Outcomes

On completion of course the student should be able to

CO1	Network Laws & Theorems
CO2	Calibration of meters
CO3	Measurement of Power
CO4	Speed control of D.C.Shunt motors
CO5	Earthing & Safety

Unit No	Unit name	Periods	Questions for SEE	Marks weightage	%of Weightage
			Handling/Manipulation/Precision		
1	Network Laws & Theorems	09	1	40	100
2	Calibration of meters	09	1		
3	Measurement of Power	09	1		
4	Speed control of D.C. Shunt motors	09	1		
5	Earthing & Safety	09	1		
	Total	45	5	40	100
Note: 1. Student can answer any one question out of 5 questions. 2. To pass in practical Exam student should acquire 50% marks in both CIE and SEE separately and CIE & SEE put together.					

Course Outcome (CO)		Cognizant Level	Linked Program Outcomes (PO)	Teaching periods
CO1	Network Laws & Theorems	R/U/A	1,2,3,4,7	5
CO2	Calibration of meters	R/U/A	1,2,3,4,6,7	6
CO3	Measurement of Power	R/U/A	1,2,3,4,6,7	11
CO4	Speed control of D.C. Shunt motors	R/U/A	1,2,3,4,6,7	12
CO5	Earthing & Safety	R/U/A	1,2,3,4,6,7	11
R: Remembering, U: Understanding, A: Applying				

Suggested Learning Outcomes

1.0 Verify Network Laws

1.a Verify Ohm's Law

1.b Verify the limitations of Ohm's law using diode.

2. Verify Kirchoff's current Law

3. Verify Kirchoff's Voltage law

4. Verify Series and Parallel circuits by current and voltage division.

2.0 Calibrate the different meters

2.1 Calibrate Dynamometer type of wattmeter

2.2 Calibrate single phase Energy meter

3.0 Measure Power in DC and AC circuit

3.1 Measure power across a Resistor using voltmeter and ammeter when connected across a DC supply

3.2 Measure power and Power factor in 1 - ϕ inductive circuit by using Wattmeter, Volt meter and Ammeter when connected across an AC supply

4.0 Perform Speed control of DC Shunt Motor

4.1. Armature / Rheostat control method

4.2. Field control method

5.0 Demonstrate domestic wiring circuits Earthing and Safety

5.1. Make a circuit for one lamp controlled by one switch with PVC surface conduit system.

5.2. Make a circuit for two lamps controlled by two switches with PVC surface conduit system.

- 5.3. Make a circuit for one lamp controlled by one switch and provision of 2/3pin socket.
- 5.4. Make a circuit for stair case wiring.
- 5.5. Make a circuit for godown wiring.
- 5.6. Make a circuit for electrical bell connection.
- 5.7. Make a circuit for ceiling fan with regulator
- 5.8. Make a circuit for series connection of lamps
- 5.9. Make a circuit for parallel connection of lamps
- 5.10. Control and practice the wiring for Fluorescent Lamp/LED Lamp
- 5.11.
 - a) Demonstrate Pipe Earthing
 - b) Demonstrate Plate Earthing
- 5.12. Demonstrate measurement of earth resistance using megger
- 5.13. Demonstrate the Procedure of first aid on Electric shock

Safety Precautions

General Safety Precautions to be observed by the student for all Electrical laboratory Practices

1. Every student has to bring insulated tool kit and follow the general safety precautions throughout the lab sessions
2. Whenever handling/using a meter check for 'zero' position of the pointer and adjust for 'zero' position if there is any deviation

CO-PO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	Linked PO
CO1	3	1	-	-	2	2	3	1,2,5,6,7
CO2	3	-	2	3	2	2	3	1,3,4,6,7
CO3	-	1	3	2	2	2	3	2,3,4,5,6,7
CO4	-	3	3	3	2	2	3	2,3,4,5,6,7
CO5	3	2	3	3	2	2	3	1,2,3,4,6,7

Competencies and key competencies to be achieved by the student

S. No	Experiment title	Competencies
I (1a,b, 2,3)	Verification of Network Laws & Theorems	• Draw the relevant circuit diagram • Select proper supply and load. • Select proper meters with proper ranges • Select proper wires to make connections as per circuit diagram • Ensure that all the meters are connected with proper polarity • Perform the experiment by carefully following the experimental procedure and precautions • Observe the readings without any scope for errors and tabulate
II (4,5)	Calibration of meters	• Short M & C terminals of wattmeter • Connect for proper Current range. • Calculate Multiplication factor • Calculate P, Error, %Error • Draw graph between W and % Error
III (6,7)	Measure Power in DC and AC circuit	• Select proper supply and load. • Select proper meters with proper ranges • Short M & C Terminals of wattmeters and connect for proper current coil range • Find out the M.F of Wattmeter • Reverse wattmeter terminals for negative readings (Lead values) • Calculate P, power factor($\cos \phi$)
IV (8,9)	Perform Speed control of DC Shunt Motor	• Draw the relevant circuit diagram • Select the proper DC supply voltage • Choose the proper range of voltmeter, ammeter and rheostat. • Make the connections according to circuit diagram. • Ensure that all the instruments are connected in proper polarity • Keep the Rheostat connected to armature in maximum position in Rheostatic control method • Keep the Rheostat in field in minimum position in Field control method • Observe the speed variation with respect to

V (10)	Demonstrate Earthing	• . Draw Earthing diagram with specifications • Select suitable GI plate, GI wire and funnel with wire mesh • Prepare the earth pit of 1.5 m below the surface of the ground • Place Earth plate in vertical position • Draw GI wire to the GI pipe fastened to GI plate / copper plate with bolts & nuts. • Pour sand, char coal and salt in alternate layers of about 15 cm around the earth pipe. • Test the earth resistance with Megger. • Verify the earth resistance.
(11)	Practice Safety Precautions.	• Practice the various first aid techniques. • Know the safety precautions.

BOARD DIPLOMA EXANIMATIONS, (C21)

MID I

Model Question paper

DME IV semester practical Examination

Corse Code: EE-417

Duration:1 hour

Course Name: Basic Electrical Engineering Lab

Max.Marks:20

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required , and conclude your observation of the experiment

((iii) Draw the diagram for illustration; choose appropriate values when not mentioned in the question

1. Verify Ohm's Law for given resistive circuit.
2. Verify the limitations of Ohm's law by using Diode
2. Verify Kirchoff's current Law
3. Verify Kirchoff's Voltage law
4. Verify in a parallel circuit the total current is equal to sum of Individual currents
($I_{\text{total}} = I_1 + I_2$)
5. Verify in a series circuit the total voltage is equal to sum of the voltage across the

each

Resistor ($V_{\text{total}} = V_1 + V_2$)

- 6 Calibrate Dynamometer type of wattmeter
- 7 Calibrate single phase Energy meter

BOARD DIPLOMA EXANIMATIONS, (C21)

MID II

Model Question paper

DME IV semester practical Examination

Corse Code: EE-417

Duration:1 hour

Course Name: Basic Electrical Engineering Lab

Max.Marks:20

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required , and conclude your observation of the experiment

((iii) Draw the diagram for illustration; choose appropriate values when not mentioned in the question

1. Measure power across a Resistor using voltmeter and ammeter when connected across a DC supply
2. Measure power and Power factor in 1 - ϕ inductive circuit by using Wattmeter, Volt meter and Ammeter when connected across an AC supply
3. Control the speed of a DC Motor by using Armature / Rheostatic control method
4. Control the speed of a DC Motor by using Field control method

BOARD DIPLOMA EXANIMATIONS, (C21)

SEMESTER END EXAM

Model Question paper

DME IV Semester Practical Examination

Corse Code: EE-417

Duration:3 hour

Course Name: Basic Electrical Engineering Lab

Max.Marks:40

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required , and conclude your observation of the experiment

((iii) Draw the diagram for illustration; choose appropriate values when not mentioned in the question

1. Verify Ohm's Law for a restive circuit.
2. Verify the limitations of Ohm's law by using Diode
2. Verify Kirchoff's current Law
3. Verify Kirchoff's Voltage law
- 4 Calibrate given Dynamometer type of wattmeter
- 5 Calibrate given single phase Energy meter
6. Measure the power across a Resistor using voltmeter and ammeter when connected across a DC supply
7. Measure power and Power factor in 1 - ϕ inductive circuit by using Wattmeter, Volt meter and Ammeter when connected across an AC supply
8. Control the speed of a DC Motor by using Armature / Rheostatic control method
- 9.Control the speed of a DC Motor by using Field control method.
- 10.Make a connection for one lamp controlled by one switch
- 11 Make a connection for one lamp controlled by TWO switches (Stair case wiring)
- 12 Make a connection for two lamps controlled by two switches
- 13 Make a connection for ceiling fan with regulator
- 14 Make a connection for tube light (Fluorescent Lamp) with switch control
- 15.Draw and prepare Pipe Earthing
- 16.Draw and prepare Plate Earthing
17. Measure the resistance of given earth pit using megger
18. Write the Procedure of first aid on Electric shock

ME-408-THERMAL ENGINEERING LAB

Course Title	Thermal Engineering Lab	Course Code	ME-408
Semester	IV	Course Group	Core
Teaching Scheme in Periods (L :T:P)	1:0:2	Credits	1.5
Methodology	Lecture + practice	Total Contact in Periods	45
CIE	60 Marks	SEE	40 Marks

Prerequisites: Basic knowledge of Thermodynamics

Course OUTCOMES

On successful completion of the course, the students will be able to

Course Outcomes	
CO1	Evaluate and analyze economic speed of given IC Engine
CO2	Analyze water cooling curves on IC Engine
CO3	Calculate the power developed by multi cylinder engine using Morse Test
CO4	Understand the Performance Characteristics of given IC Engine
CO5	Estimate Heat Balance of Given IC engine
CO6	Understand working principle of Boiler

LIST OF EXPERIMENTS

S.No.	Description	No of Periods
1	Economical Speed test on an I.C engine	6
2	Optimum cooling water flow and optimum cooling water temperature test on an IC engine	6
3	Morse Test on a 4-stroke multi cylinder I.C engine	6
4	Performance test on 2 stroke I.C engine	6
5	Performance test on 4 stroke I.C engine	6
6	Heat Balance Sheet of an I.C engine	9
7	Study of Boiler	6

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1. **Economic speed test on an IC Engine.**
 - 1.1. Identify various parts of an I.C engine
 - 1.2. Understand the working principles of an IC engine
 - 1.3. Understand the terms SFC ,Break power
 - 1.4. Calculate SFC, Break power for various load conditions.
 - 1.5. Plot graph SFC vs Speed
2. **Optimum cooling water flow and optimum cooling water temperature test**
 - 2.1 Identify various parts of an I.C engine
 - 2.2 Understand the working principles of an IC engine
 - 2.3 Understand the terms S.F.C, Break power
 - 2.4 Calculate SFC for respective engine jacket water flow rate
 - 2.5 Note engine jacket water outlet temperature
 - 2.6 Plot graphs SFC vs Engine jacket water flow rate, water outlet temperature
3. **Morse Test on a multi cylinder IC Engine**
 - 3.1 Identify various parts of an I.C engine
 - 3.2 Understand the working principles of an SI engine
 - 3.3 Understand the terms Friction power, engine efficiency
 - 3.4 Calculate friction power of the engine
4. **Performance test on IC engine.**
 - 4.1. Identify various parts of an I.C engine
 - 4.2. Understand the working principles of an IC engine
 - 4.3. Understand the terms Break power, S.F.C, Break thermal Efficiency
 - 4.4. Calculate Break power, S.F.C , Break thermal Efficiency
 - 4.5. Plot graphs B.P vs S.F.C, B.P vs Break thermal Efficiency
 - 4.6. Know the loading of IC Engine
 - 4.7. Know the application and usage of Tachometer
5. **Heat Balance sheet on an IC Engine.**
 - 5.1. Identify various parts of an I.C engine
 - 5.2. Understand the working principles of an IC engine
 - 5.3. Understand the terms Calorific value, specific heat Break power, S.F.C .
 - 5.4. Calculate heat lost to Break power, cooling water and exhaust gases.
 - 5.5. Tabulate heat balance sheet of given I.C engine

6. Study of Boilers

6.1. Identify various mountings and accessories of boilers.

6.2. Understand the working principle of fire-tube and water-tube boilers

6.3. Understand the terms Boiler horse power, Boiler efficiency

COURSE OUTCOMES		CL	Linked POs
CO1	Importance of economic speed of given IC Engine	R, U, A	1,2,3,4,7
CO2	Importance of optimum flow rate and temperature of cooling water in an IC Engine	R, U, A	1,2,3,4,6,7
CO3	Importance of Morse Test On Multi-Cylinder IC Engine	R, U, A	1,2,3,4,7
CO4	Importance of Performance Characteristics of given IC Engine	U, A	1,2,3,4,6,7
CO5	Importance of Heat Balance of Given IC engine	R, U, A	1,2,3,4,6,7
CO6	Study of boilers	R, U, A	1,4,7

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO Attainment Matrix:

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	3	1	1	-	-	3
CO2	3	2	1	2	-	1	3
CO3	2	2	1	2	-	-	3
CO4	3	1	2	2	-	1	3
CO5	3	3	2	2	-	1	3
CO6	2	-	-	1	-	-	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

State Board of Technical Education, Telangana State
Model Paper
ME-408 – Thermal Engineering Lab
Mid Sem-I (CIE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Find economical speed of IC engine.
2. Determine the variation of the fuel consumption, heat carried away by the cooling water and also find optimum temperature of cooling water at same load.
3. Determine the IHP and mechanical efficiency of IC engine
4. Conduct a test on IC engine and determine BP,FP and IP and mechanical efficiency.
5. Conduct a test on IC engine at constant speed and draw the performance curves.
6. Conduct a test on IC engine and prepare the Heat balance sheet.
7. Using a boiler evaluate relationship between pressure and temperature of saturated steam.

State Board of Technical Education, Telangana State
Model Paper
ME-408 – Thermal Engineering Lab
Mid Sem-II (CIE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Find economical speed of IC engine.
2. Determine the variation of the fuel consumption, heat carried away by the cooling water and also find optimum temperature cooling water at same load.
3. Determine the IHP and mechanical efficiency of IC engine
4. Conduct a test on IC engine and determine BP,FP&IP and mechanical efficiency.
5. Conduct a test on IC engine at constant speed and draw the performance curves.
6. Conduct a test on IC engine and prepare the Heat balance sheet.
7. Using a boiler the evaluate relationship between pressure and temperature of saturated steam.

State Board of Technical Education, Telangana State
SEE Model Paper
ME-408 – Thermal Engineering Lab

Time : 2 Hour

Total Marks : 40 M

Note: Answer any one question.

1. Find economical speed of IC engine.
2. Determine the variation of the fuel consumption, heat carried away by the cooling water and also find optimum temperature cooling water at same load.
3. Determine the IHP and mechanical efficiency of IC engine
4. Conduct a test on IC engine and determine BP,FP&IP and mechanical efficiency.
5. Conduct a test on IC engine at constant speed and draw the performance curves.
6. Conduct a test on IC engine and prepare the Heat balance sheet.
7. Using a boiler the evaluate relationship between pressure and temperature of saturated steam.

ME-409-SOLID MODELING LAB
(Common to AU-308)

Course Title :	Solid Modeling Lab	Course Code	ME-409
Semester	IV	Course	Practical
Teaching Scheme in Periods(L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact periods	45
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic knowledge of manufacturing process and Auto CAD

COURSE OUTCOMES

At the end of the course the students will have the ability :	
CO 1	List the commands of 3D
CO2	Create three-dimensional entities using different methods
CO3	Practice on Primitives with 3d Basics
CO4	Apply edit tools on Primitives
CO5	Apply the selection of material from library
CO6	Create the part drawing with a given geometry using Solid Modeling software

COURSE CONTENT

- **Viewing entities in three dimensions**
 - Setting a new viewing direction
 - Dynamically setting a view direction
- **Creation of three-dimensional entities using different methods**
 - Drawing of two dimensional entities in three dimensional space
 - Converting two dimensional planar entities into three dimensional entities by applying elevation and thickness
 - Converting two dimensional planar entities into three dimensional entities by revolving or extruding.
 - Creation of three-dimensional faces, rectangular meshes, ruled surface meshes, extruded surface meshes, revolved surface meshes, three dimensional entities

such as boxes, Cylinders, Cones, Spheres, wedges, torus, Regions, extruded solids, revolved solids, composite solids, intersect solids.

➤ **Editing in three dimensions**

Rotating in three dimensions, Array in three dimensions (Rectangular and polar)

Mirroring in three dimensions, Aligning in three dimensions

➤ **Editing of three dimensional solids**

Sectioning and Slicing of solids, hiding, shading and rendering

➤ **Selection of material from library**

Enable the material library, Editing materials and material library

➤ **The importance of Solid Modeling software like CREO/ SOLID EDGE/SOLID WORKS /**

Use any of the solid modelling packages stated above and generate a solid model of a machine component for different 3D components

Suggested learning outcomes

Upon completion of the course the student shall be able to understand the concepts of 3D

- View entities in three dimensions
- To set a new viewing direction
- To dynamically set a view direction
- **Create three-dimensional entities using different methods**
 - Draw two dimensional entities in three dimensional space
 - Convert two dimensional planar entities into three dimensional entities by applying elevation and thickness
 - Convert two dimensional planar entities into three dimensional entities by revolving or extruding.
 - Create three-dimensional faces
 - Create rectangular meshes
 - Create ruled surface meshes
 - Create extruded surface meshes
 - Create revolved surface meshes
 - Create three dimensional entities such as boxes, Cylinders, Cones, Spheres, wedges, torus, Regions,
 - Create extruded solids

- Create revolved solids
- Create composite solids
- Create intersect solids

➤ **Edit in three dimensions**

- Rotate in three dimensions
- Array in three dimensions (Rectangular and polar)
- Mirror in three dimensions
- Align in three dimensions

➤ **Edit three dimensional solids**

- Practice Sectioning and Slicing solids
- Practice hiding, shading and rendering

➤ **Practice the selection of material from library**

- Enable material library
- Edit materials and material library
- Use any of the solid modelling packages stated above and generate a solid model of a machine component for different 3D components

Exercise	Key components	Periods
1.0 View entities in three dimensions	A. Set a new viewing direction B. Set dynamically view direction	02
2.0 Create three-dimensional entities	A. Create three-dimensional faces B. Create rectangular meshes, ruled surface meshes, extruded surface meshes, revolved surface meshes C. Create three dimensional entities such as boxes, Cylinders.	18
3.0 Edit in three dimensions	A. Rotate in three dimensions B. Array in three dimensions (Rectangular and polar) C. Mirror in three dimensions D. Align in three dimensions	06
4.0 Edit three dimensional solids	A. Practice Sectioning and Slicing solids B. Practice hiding, shading and rendering	10
5.0 Practice the selection of material from library	A. Enable material library B. Edit materials and material library	03
6.0 Appreciate the importance of Solid Modelling software like PRO-E / UNIGRAPHICS / CATIA	A. Use any of the solid modelling packages stated above and Generate a solid model of a machine component for different 3D components using Solid modelling packages	06
Total		45

ME-409- SOLID MODELING LAB
MODEL PAPER FOR MID -1 (CIE)

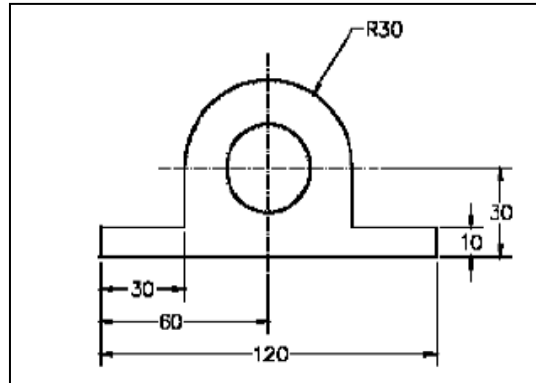
TIME: 1hr

Marks: 20M

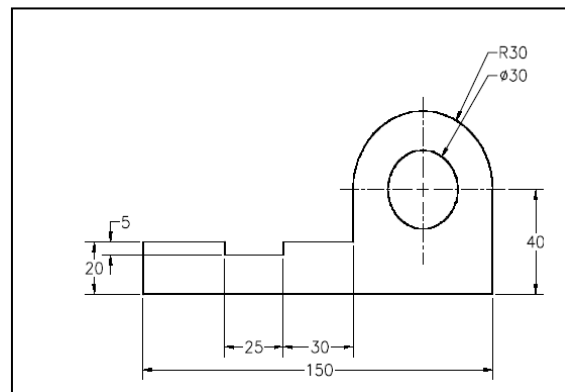
NOTE: Answer any one of the following

PART-A

1. Create the below 2D drawing and dimension it using any solid modeling software.



2. Create the below 2D drawing and dimension it using any solid modeling software.



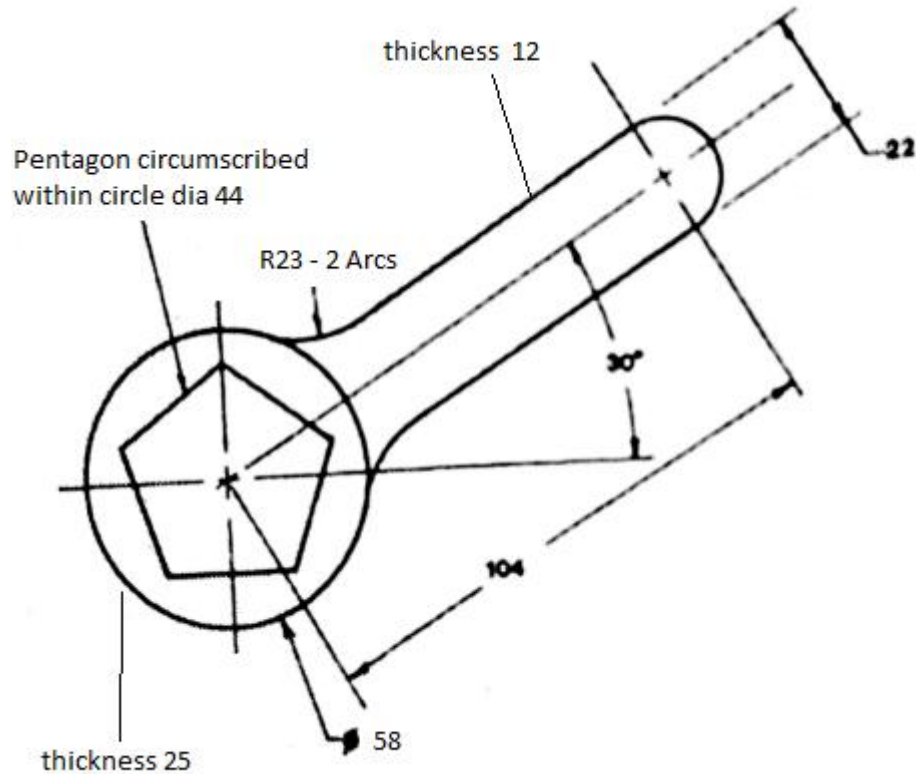
ME-409- SOLD MODELING LAB
MODEL PAPER FOR MID -2 (CIE)

TIME: 1hr

Marks: 20M

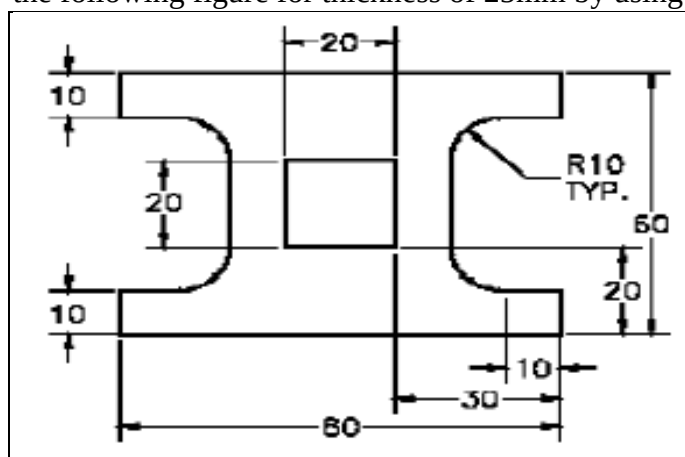
NOTE: Answer any one of the following

1. Draw the following figure by using solid modeling software.



Note: All dimensions are in mm

2. Draw the following figure for thickness of 25mm by using solid modeling software.



Note: All dimensions are in mm

BOARD DIPLOMA EXAMINATION
ME-409- SOLID MODELING LAB
MODEL PAPER FOR SEE

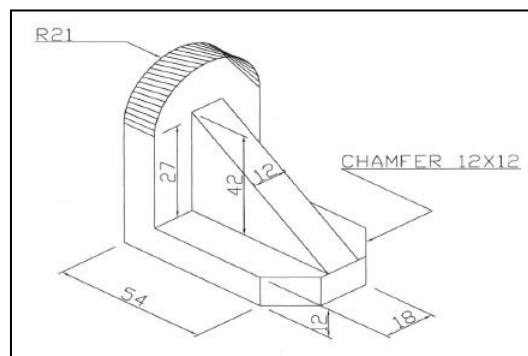
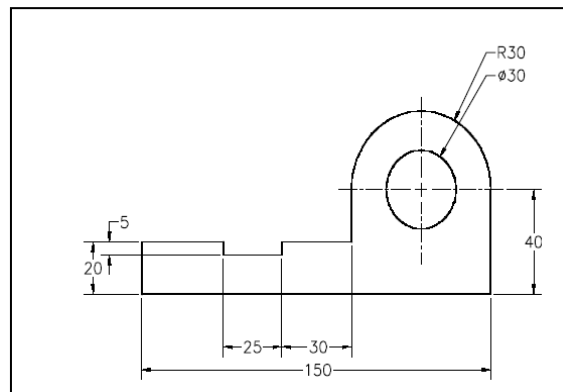
Time: 02 Hour

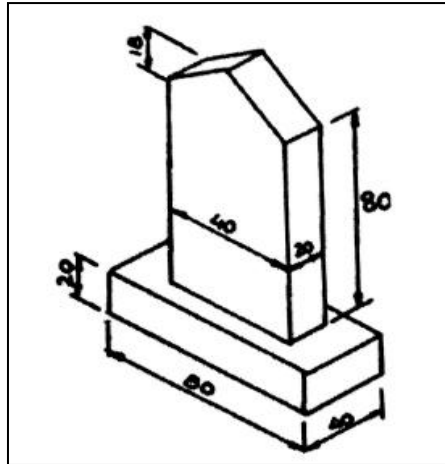
Total Marks: 40

Answer any ONE question.

01×40=40 M

3. 1. Draw the following figure by using solid modeling software.





Marks breakup

1. Model creation – 25M
2. Viva – 10M
3. For writing answer – 5M

HU-410 – Employability Skills Lab

Course Title	Employability Skills Lab	Course Code	HU-410
Semester	IV	Course Group	Core
Teaching Scheme in Hrs (L:T:P)	1:0:2	Credits	1.5
Methodology	Pair Work, Group Work, Activities, Lecture, Self-Learning	Total Contact Hours	45 (3 contact hours per week)
CIE	60 Marks	SEE	40 Marks

Rationale:

The course is designed to impart employability skills to make the students of diploma get the initial employment, maintain the employment and get better employment, if they wish.

Prerequisites:

The course requires the basic knowledge of vocabulary, grammar, four language learning skills, viz. listening, speaking, reading and writing and life skills.

Course Outcomes

CO1	Comprehend the importance of employability skills and strategies to survive in a job.
CO2	Converse fluently and accurately accordingly in JAM sessions. Group Discussions will enhance the willingness to take the Initiative, accept adaptability in turn developing leadership qualities and Communication Skills.
CO3	Understand purpose and process of interview in turn knowing how to prepare and succeed in interview.
CO4	Making effective presentation, Develop Public speaking skills and learn to make visually attractive PPTs.
CO5	Learn various writing formats useful at workplace and to develop an ability to apply technical information in documentation.
CO6	Build strong workplace relationships by learning workplace etiquette, professional ethics and importance of gender sensitization.

Course Contents

Module 1: Introduction to Employability Skills

Duration: 6 Periods (L 2 P 4)

- a. Filling the Curriculum gaps
 - i. Attributes and values
 - ii. Specific and general skills
 - iii. Academic Knowledge and Aptitude Skills
 - iv. Analytical skills / Data Analysis
- b. How to get into a job?
 - i. Good personal presentation and attitude
 - ii. Core generic skills
 - iii. Technical / Professional skills

- iv. Good Communication skills
- c. How to survive in a job?
 - i. Learning skills needed for self-advocacy and networking
 - ii. Adaptability to cope with the changing circumstances.
 - iii. Reliability and Integrity
 - iv. Continuous Learning and Consistency in performance.

Module 2: JAM & Group Discussion

Duration: 9 Periods (L 3 P- 6)

- i. What is JAM?
- ii. Significance of JAM
- iii. Enhancing Speaking skills, fluency, usage, coherence, spontaneity, voice modulation, eye contact, body language, Creativity, Sense of humor, Confidence and Time management.
- iv. Learn avoiding hesitation, deviation and repetition
- v. Purpose of Group Discussion
- vi. Types of Group Discussion
- vii. Different expressions and phases and their effective usage
 - a. Opinion expression agrees and disagrees, partially agree or disagree, interrupt politely, add new information and conclusion
- viii. Dos and Don'ts of a Group Discussion
- ix. Importance of body language, Etiquettes and awareness of group dynamics
- x. Practice.

Module 3: Interview Skills

Duration: 9 Periods (L 3 P 6)

- i. Importance of interview skills
- ii. Types of interviews
 - a) Face to Face / One to One, Telephonic / Video, Panel Interview.
- iii. Understanding the process of interview.
 - a) Before the interview
 - b) On the day of the interview
 - c) After the interview
- iv. FAQs, Common expressions of an interviewer and interviewee
- v. Acceptable and unacceptable gestures. Body language, and Attire,
- vi. Do's and Don'ts of an interview
- vii. Mock Interviews

Module 4: Presentation Skills:

Duration: 9 Periods (L-3 P-6)

- a) Significance of presentation
- b) Types of presentations.
 - i. Informative, Instructional, Arousing, Persuasive and Decision-Making
- c) . What makes a good presentation?
 - i. Understand, Collect, Organize, Use presentational aids and Practice

- d) Tips for an effective presentation
 - i. Good Beginning – Greeting, Confidence, Body Language, Opening Ideas (Funny Videos, Ridicule. Asking Questions, Quote someone/Proverb or telling a story/referring an historical event)
 - ii. Unveiling – Develop systematically, usage of appropriate linkers or discourse markers. Eye contact and Effective usage of PPTs
 - iii. Conclusion – Summarize - Giving time to the audience for queries and Time management
- e) Guidelines for PPTs
- f) Public Speaking Skills
 - i. Benefits – Personal and Professionals.
 - ii. Strategies to improve public speaking skills.
 - iii. Obstacles to effective public speaking.
 - iv. Overcoming the barriers of public speaking.
- g) Prepare presentation template.

Module 5: Writing Skills at Workplace:

Duration: 6 Periods (L – 2 P – 4)

- a) Various writing formats useful at workplace
- b) Skills involved in writing at workplace
- c) Different templates for different purposes
- d) Useful technical information in documentation

Module 6: Workplace Awareness

Duration 6 Periods (L – 2 P – 4)

- a) Workplace etiquette
- b) Knowledge, skills and attributes useful at workplace
- c) Workplace Relationships
- d) Professional ethics
- e) Importance of gender sensitization
- f) Sense of responsibility towards the society

Suggested Student Activities:

- Paper Presentations
- Seminars
- Mock Interviews
- Telephonic Interviews
- Group Discussions
- Role Plays
- Creating advertisements
- Five-minute activities
- Creating a model of workplace

Course Outcomes

CO1	Comprehend the importance of employability skills and strategies to survive in a job.
CO2	Converse fluently and accurately accordingly in JAM sessions. Group Discussions will enhance the willingness to take the Initiative, accept adaptability in turn developing leadership qualities and Communication Skills
CO3	Understand purpose and process of interview in turn knowing how to prepare and succeed in interview.
CO4	Making effective presentation, develop public speaking skills and learn to make visually attractive PPTs.
CO5	Learn various writing formats useful at workplace and to develop an ability to apply technical information in documentation.
CO6	Build strong workplace relationships by learning workplace etiquette, professional ethics and importance of gender sensitization.

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
410.1	-	-	-	-	3		3	5,7
410.2	-	-	-	-	3	2	3	5,6,7
410.3	-	-	-	-	3	3	3	5,6,7
410.4	-	-	-	-	2	2	3	5,6,7
410.5	-	-	-	-	2	2	3	5,6,7
410.6		-	--	--	2		3	5,7

Evaluation Pattern:**I. Continuous Internal Examination: 60 Marks**

- a. **Mid Sem - I** 20 marks
 - Syllabus:
 - i. Introduction to Employability skills
 - ii. JAM & Group Discussion
- b. **Mid – II** 20 Marks
 - Syllabus:
 - i. Interview Skills
 - ii. Presentation skills
- c. **Internal assessment** 20 marks
 - i. Seminars: 10 marks
 - ii. Assignments: 5 marks
 - iii. Lab record submission: 5 marks

II. Semester End Examination: 40 Marks

- a. Write an essay on a given topic or participate in an activity: 15 Marks
- b. Interview or Group Discussion: 15 Marks
- c. *Viva Voce* 10 marks

References:

- Adair, John. *Effective Communication*. London: Pan Macmillan Ltd., 2003.
- Ajmani, J. C. *Good English: Getting it Right*. New Delhi: Rupa Publications, 2012.
- Amos, Julie-Ann. *Handling Tough Job Interviews*. Mumbai: Jaico Publishing, 2004.
- Collins, Patrick. *Speak with Power and Confidence*. New York: Sterling, 2009.
- Fensterheim, Herbert and Jean Baer. *Don't Say Yes When You Want To Say No*. New York: D
- Raman, Meenakshi & Sangeeta Sharma. *Technical Communication: Principles and Practice*. Second Edition. New Delhi: Oxford University Press, 2011

E-Learning Resources:

- <http://www.dailywritingtips.com/>
- <http://www.englishdaily626.com/c-errors.php>
- <http://www.owl.net.rice.edu/~cainproj/>
- <http://www.thehumorsource.com/>
- <http://www.indiabix.com/group-discussion/topics-with-answers/>
- <http://networketiquette.net/>
- <https://public.wsu.edu/~brians/errors>

Unit No	Unit name	Periods	Questions for SEE			Marks weightage	% Weightage
			R	U	A		
1.	Introduction to Employability Skills	6			2	2	
2	JAM/ Group Discussions	9			2	2	
3	Interview Skills	9			2	2	
4.	Presentation Skills	9			2	2	
5.	Writing skills at work place	6			1	1	
6.	Workplace awareness	6			1	1	
	Total	45			10		100

BOARD DIPLOMA EXAMINATION (C-21)
MID SEMESTER EXAMINATION – I
HU-410- EMPLOYABILITY SKILLS LAB

Time: 1 Hour

Total Marks: 20

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. Write a paragraph on the importance of employability skills.
2. List out the important employability skills.
3. Mention the different strategies to enhance the employability skills.

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. What are the rules to be implemented in a JAM session?
5. What are the do's and don'ts of a group discussion.
6. List out the steps involved in a group discussion and mention some phrases and expressions commonly used.

BOARD DIPLOMA EXAMINATION (C-21)
MID SEMESTER EXAMINATION - II
HU-410- EMPLOYABILITY SKILLS LAB

Time : 1 Hour

Total Marks: 20

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. Write a list of frequently asked questions in an interview. Write the answers for the questions.
2. Mention the instructions to attend a telephonic interview.
3. What are the do's and don'ts for a formal interview?

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. Write the various steps involved in making presentations effectively.
5. What are the do's don'ts of body language during a presentation?
6. List out a few audio-visual aids and explain their role in making an effective presentation.

BOARD DIPLOMA EXAMINATION (C-21)
SEMESTER END EXAMINATION
HU-410- EMPLOYABILITY SKILLS LAB

Time: 3 Hours

Total Marks:

40

Part – A

10 marks

Instruction: *Pick any one question from the given lot.*

1. How are employability skills helpful to secure a good job?
2. Describe the steps involved in JAM and group discussion.
3. Write the guidelines involved in making a good presentation.
4. List few professional ethics useful at workplace.
5. Mention few skills involved in writing at workplace.

Part – B

15 marks

6. Interview / Group Discussion

Part – C

15 marks

7. *Viva Voce*

ME-411-Skill Upgradation

Course Title	Skill Upgradation	Course Code	ME-411
Semester	IV	Course Group	Practical
Teaching Scheme in Periods (L:T:P:)	0:0:8	Credits	2.5
Methodology	Practical's	Total Contact Periods	120

ME-402

1. Study movement of cam and draw cam profile.
2. Design a open belt drive for a simple application.
3. List out and identify common bearings and the material used

ME-403

1. Visit a nearby industry
 - a. Know the complete process and identify energy produced and utilised areas
 - b. conduct energy auditing and draw heat balance sheet by using excel sheet
 - c. From the above heat balance sheet, identify the areas of energy wastage and find remedies.
 - d. Prepare a report and present a seminar
2. Solve Velocity triangles problems by graphical method using CAD software and analyse.
3. Prepare a model of Turbines, Pumps

ME-404

1. Search for literature from journal to know latest trends in Marching methods and present a seminar with PPT's
2. Make a gear using wood or plastic.

ME-406

1. Visit a nearby fabrication industry / repair shop or any
 - a. Identify one product prepared by machining and involving 4/5 individual parts and
 - b. Measure the dimensions and the geometrical shapes of the parts
 - c. Prepare a production drawing of product model involving Limit, Fits and Tolerances
 - d. Prepare the process sheet for all the possible parts

C21_ Curriculum

DIPLOMA IN MECHANICAL ENGINEERING



OFFERED BY

STATE BOARD OF TECHNICAL EDUCATION & TRAINING,

TELANGANA: HYDERABAD

V SEMESTER

Sl No	Course Code	Course Name	Teaching Scheme				Credits	Examination Scheme						
			Instruction periods per week			Total Periods per semester		Continuous internal evaluation			Semester end examination			
			L	T	P			Mid Sem 1	Mid Sem 2	Internal evaluation	Max Marks	Min Marks	Total Marks	Min marks for Passing including internal
1	ME-501	Industrial Management and Entrepreneurship	4	1	0	75	3	20	20	20	40	14	100	35
2	ME-502	Refrigeration and Air-Conditioning	4	1	0	75	3	20	20	20	40	14	100	35
3	ME-503	CAD/CAM	4	1	0	75	3	20	20	20	40	14	100	35
4	ME-574	Fluid Power Systems	4	1	0	75	3	20	20	20	40	14	100	35
	ME-584	Automobile Engineering												
	EE-594	Electric Vehicles												
5	ME-575	Industrial Engineering & Estimation and Costing	4	1	0	75	3	20	20	20	40	14	100	35
	ME-585	Mechatronics												
6	ME-506	CAM LAB	1	0	2	45	1.5	20	20	20	40	20	100	50
7	ME-507	Advanced Manufacturing & Fabrication Engineering Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
8	ME-508	Refrigeration and Air Conditioning Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
9	ME-509	Metrology & Pneumatics Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
10	ME-510	Project Work	0	0	3	45	1.5	20	20	20	40	20	100	50
11	ME-511	Skill Upgradation	0	0	8	120	2.5	0	0	Rubrics		--	-	

Activities: student performance is to be assessed through Rubrics

ME-501 - INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Course title	Industrial Management and Entrepreneurship	Course code	ME-501
Semester	V	Course group	Core
Teaching scheme in periods (L:T:P)	4:1:0	Credits	3
Methodology	Lecture+ Tutorial	Total Contact Periods	75
CIE	60 Marks	SEE	40 Marks

Prerequisites: Knowledge of Basic Sciences.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

Course Outcomes	
CO1	Understand the principles and functions of management and Outline Organization structure& organizational behavior
CO2	Understand the Functions of Production Management
CO3	Analyse the functions of Materials Management.
CO4	Compare Marketing, sales & Feasibility study.
CO5	Know the use of ISO 9000 & T.Q.M
CO6	Understand Industrial legislation & safety and role of entrepreneur and entrepreneurial development

Blue Print of Marks for SEE:

Units		No of periods	Questions to be set for SEE				Remarks	
			R		U	A		
Part-A	1.Principles and functions of management and organisation structure and behaviour	13	Q4	Q1	Q9(a)	Q13(a)		
	2.Production management	12						
Part-B	3.Materials management	13		Q2	Q10(a)	Q14(a)		
	4.Marketing, sales & feasibility study	12						
Part-C	5.Introduction to ISO 9000 & T.Q.M	13		Q3	Q5 Q6	Q9(b) Q11(a) Q11(b)	Q13(b) Q15(a) Q15(b)	
	6.Industrial legislation & safety and Entrepreneurial development	12						Q7 Q8
TOTAL		75	08		08	08		

COURSE CONTENT

1. Principles and functions of management and organisation structure and behaviour

Definitions of Industry, Commerce and Business, Evolution of management theories, Principles of Scientific Management, functions of management, Difference between administration and management, Role of industry, Types of ownership – Sole proprietorship, Partnership, Private limited, public limited company, Industrial Cooperatives, Philosophy, types of Organizations, Line and Staff and functional organizations, Advantages, limitations, departments in a large-scale industry, Effective organization, Motivation, different theories of motivation, leadership styles.

2. Production management

Production, planning and control, relation with other departments, need for planning and its advantages, Routing, scheduling, dispatching, PERT and CPM, simple problems.

3. Materials management

Materials in industry, inventory control model, ABC Analysis, Safety stock, re-order level, Economic ordering quantity, Stores layout, stores equipment, Stores records, purchasing procedures, purchase records, Bin card, Cardex.

4. Marketing, sales & feasibility study

Sellers and Buyers markets, Marketing, Sales, Market conditions, monopoly, oligopoly, perfect competition, Cost -Elements of Cost, Contribution, Break even analysis, Market Survey, Product and production Analysis, Materials input, Manpower, Location, Economic and Technical Evaluation, preparation of Feasibility study reports.

5. Introduction to ISO 9000 & T.Q.M

Concept of quality, Definition of the terms quality policy, quality management, quality systems, quality control and quality assurance, Elements of quality systems: Management responsibility, Quality system, contract review, design control, document control, purchasing, purchaser– supplied product, product identification and traceability, process control, Inspection and testing. Definition and Principles of quality assurance, Know the necessity of International standards –ISO- Evolution, Meaning, importance, Various standards under ISO, ISO 9000 series of standards- Features, series, Constituents, Advantages, Draw backs and beneficiaries (Whom does ISO 9000 help). 5-S principles-concept of zero defects. TQM-Meaning, Characteristics.

6. Industrial legislation & safety and Entrepreneurial development

Employer – Employee relations, Trade, Union Settlement of disputes, collective bargaining, Welfare activities, Total Welfare concept, rights and responsibilities of Employers and employees, Salient features of Indian Factories Act, Importance of Safety at work places, Hazards, causes of accidents, Entrepreneur and entrepreneurship -Concept, definition, role, expectation, Entrepreneurship Vs Management, promotion of S.S.I. Self – employment schemes, Product selection, site selection, Institutional support needed, financial assistance programs. Start up Scheme- Importance, Features and Eligibility for startup registration, Benefits

REFERENCE BOOKS

1. Industrial engineering and management by O.P Khanna.
2. Production management by Buffa
3. Industrial Engineering & Management Science by TR Banga
4. Engineering Economics and management science by Banga & Sharma
5. Personnel management by Flippo
6. Entrepreneurship by NITTTR Chennai.

ELECTRONIC RESOURCES

1. <https://nptel.ac.in/courses/>
2. <https://www.slideshare.net/>
3. <https://en.wikipedia.org/wiki/>
4. <http://ndl.ethernet.edu.et/bitstream/>

SUGGESTED STUDENT ACTIVITIES

1. Identify any 5 industries with different types of ownerships.
2. Prepare an organizational structure of institution
3. Make a survey on marketing a product.
4. Prepare a list of ISO 9000 series as well as latest quality standards
5. Prepare sign boards representing safety measures.
6. Role play as an entrepreneur

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1. Understand the principles and functions of management and Outline Organization structure& organizational behavior

- 1.1 Define industry, commerce (Trade) and business.
- 1.2 Know the need for management.
- 1.3 Understand the evolution of management
- 1.4 Explain the principles of scientific management.
- 1.5 Understand functions of Management.
- 1.6 Differentiate between management and administration.
- 1.7 Understand types of ownerships
- 1.8 Differentiate types of ownerships.
- 1.9 Understand salient features of joint stock companies.
- 1.10 Understand the philosophy and need of organization structure of an industry.
- 1.11 Understand the line, staff and Functional organizations.
- 1.12 List the advantages and limitations of line, staff and functional organizations.
- 1.13 List different departments in a large scale industry.
- 1.14 Explain the factors of effective organization.
- 1.15 Understand organizational behaviour.
- 1.16 Explain job analysis.
- 1.17 State motivation theories.
- 1.18 State Maslow 's Hierarchy of needs.
- 1.19 List out different leadership models.
- 1.20 Explain the trait theory and behavior theory of leadership

2. Understand the Functions of Production Management

- 2.1 Differentiate production, planning and control.
- 2.2 Relate the production department with other departments.

- 2.3 State the need for planning and its advantages.
- 2.4 Explain the stages of Production, planning and control.
- 2.5 Explain routing methods.
- 2.6 Explain scheduling methods.
- 2.7 Explain dispatching.
- 2.8 Draw PERT/CPM networks.
- 2.9 Identify the critical path
- 2.10 Problems on PERT & CPM.

3 Analyze the functions of Materials Management

- 3.1 State the importance of material management.
- 3.2 Objectives and functions of material management.
- 3.3 Derive expression of EOQ for inventory control.
- 3.4 Explain ABC analysis.
- 3.5 Define safety stock, Buffer stock
- 3.6 Define reorder level.
- 3.7 Functions of stores department, duties of store keeper
- 3.8 Explain stores layout,
- 3.9 Explain the stores records.
- 3.10 Describe Cardex method.
- 3.11 Objectives and functions of purchasing department
- 3.12 Explain purchasing procedures.
- 3.13 List out purchase records.
- 3.14 Describe the stores equipments

4 Compare Marketing, sales & Feasibility study.

- 4.1 Explain marketing functions.
- 4.2 Explain Sales function.
- 4.3 List out marketing conditions.
- 4.4 Differentiate Sellers and Buyers 'market.
- 4.5 Differentiate monopoly, oligopoly, and perfect competition.
- 4.6 Steps in conducting market and demand surveys.
- 4.7 Advantages and disadvantages of market and demand surveys
- 4.8 Differentiate product and production analysis.
- 4.9 Identify the input materials, i.e. Bill of materials
- 4.10 Explain the concept of cost..
- 4.11 Explain break-even analysis..
- 4.12 Evaluate Economic and Technical factors.
- 4.13 Preparation of feasibility study.
- 4.14 List out different products currently in demand with market or industry.

5 Know the use of ISO 9000 & T.Q.M

- 5.1 Understand the concept of quality.
- 5.2 Know the quality systems and elements of quality systems.
- 5.3 Know the principles of quality Assurance.
- 5.4 Know the evolution of ISO standards.
- 5.5 Discuss ISO standards and ISO 9000 series of quality systems.
- 5.6 State the constituents of ISO 9000 series of standards for quality systems.
- 5.7 Benefits and Drawbacks of ISO 9000 series of standards.
- 5.8 List out the beneficiaries of ISO 9000.
- 5.9 Understand 5-S principles and ZERO DEFECT
- 5.10 Know TQM concept and elements.

6 Understand Industrial legislation & safety and role of entrepreneur and entrepreneurial development

- 6.1 Describe employer and employee relations.
- 6.2 Objectives, functions, advantages and disadvantages of Trade Unions.
- 6.3 Explain Causes and settlements of industrial disputes..
- 6.4 List out Welfare activities..
- 6.5 List out the rights and responsibilities of employees and employers.
- 6.6 List out the salient features of Indian Factories Act.
- 6.7 Explain the importance of safety at Work place.
- 6.8 List out the important provisions related to safety.
- 6.9 Explain hazard and accident.
- 6.10 Explain the causes of accidents..
- 6.11 Define the word entrepreneur..
- 6.12 Difference between entrepreneurship and management.
- 6.13 Explain, expectations, role and qualities of an entrepreneur..
- 6.14 Determine the role of entrepreneurs in promoting Small Scale Industries.
- 6.15 Describe the details of self-employment schemes.
- 6.16 Explain the method of product selection.
- 6.17 Explain the method of site selection.
- 6.18 List the financial assistance programs.
- 6.19 List out the organizations that help an entrepreneur
- 6.20 Importance of Start-ups
- 6.21 Different Start-up schemes
- 6.22 Features and Eligibility for startup registration
- 6.23 Benefits of Start-ups

COURSE OUTCOMES		CL	Linked POs	Teaching Periods
CO1	Understand the principles and functions of management and Outline Organization structure & organizational behavior	R, U, A	5,6,7	13
CO2	Understand the Functions of Production Management	R, U, A	2,5,6	12
CO3	Analyse the functions of Materials Management.	U, A	1,6,7	13
CO4	Compare Marketing, sales & Feasibility study.	U, A	1,6,7,	12
CO5	Know the use of ISO 9000 & T.Q.M	U, A	1,6,7	13
CO6	Understand Industrial legislation & safety and role of entrepreneur and entrepreneurial development	R, U, A	1,6,7	12
			Total Periods	75

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO Attainment Matrix:

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1					2	3	1
CO2		2			1	3	
CO3	1					2	3
CO4	1					3	2
CO5	2					3	1
CO6	1					2	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Principles and functions of management and organisation structure and behaviour	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Production management	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Materials management	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Marketing, sales & feasibility study	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Legend	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MID SEM-I Model Paper
ME-501-INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP
Time: 1 hr Max. Marks:20

PART-A **4x1=4Marks**

- NOTE: 1) Answer all questions and each carries **one** mark.
2) Answers should be brief and straight to the point and shall not be exceed three simple sentences.
1. Define Industry.
 2. Write any two qualities of a leader.
 3. What do you mean by Planning?
 4. What does CPM Stands for.?

PART-B **2X3M=6**
Marks

- NOTE: 1) Answer all questions and each carries **three** mark.
2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.
- 5.(a) what is administration OR
- 5.(b) List out theories of motivation.
- 6.(a) what is the need for planning. OR
- 6.(b) what is routing?

PART-C **2X5M=10**
Marks

- NOTE: 1) Answer all questions and each carries **five** mark.
2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.
- 7.(a) Explain the principles of scientific management OR
- 7.(b) a) Compare between PERT AND CPM.
b) Explain about Scheduling and Dispatching.
- 8.(a) Draw the project network of the given project and identify all paths through it.
Find the critical path, TL and T_E on the network.

Activity	Optimistic Time(a)	Most likely Time (m)	Pessimistic Time (b)
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-5	2	6	10
5-6	3	6	15

OR

- 8.(b) State the ERG theory of motivation.

MID SEM-II
Model Paper:: ME-501
INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Time: 1 hr

Max. Marks:20

PART-A

4x1=4Marks

NOTE: 1) Answer all questions and each carries **one** mark.
2) Answers should be brief and straight to the point and shall not be exceed three simple sentences.

1. Write the formula to calculate EOQ?
2. What is Buffer Stock?
3. What Is feasibility study?
4. What is Breakeven Point?

PART-B

2X3M=6 Marks

NOTE: 1) Answer all questions and each carries **three** mark.
2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.

5.(a) List the advantages of ABC analysis.

OR

5.(b) State the functions of Material Management.

6.(a) List out the element of cost ?

OR

6.(b) what is buyer's market and seller's market.

PART-C

2X5M=10

Marks

NOTE: 1) Answer all questions and each carries **five** mark.
2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.

7.(a) Explain the functions of Purchase management.

OR

7.(b) Explain various records used in stores.

8.(a) What is Break Even analysis? Illustrate graphically the concept of Break even point.

OR

8.(b) Differentiate product and product analysis.

BOARD DIPLOMA EXAMINATION, (C-21)
SEE-MODEL PAPER ME-501
DME– V SEMESTER EXAMINATION
INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP

Time: 2 Hours

Max. Marks: 40

PART-A

8 X 1 =

8

Instructions: 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.

1. Define Trade.
2. What is a bin card
3. List two benefits of ISO 9000 certification.
4. Define a Network.
5. Define quality control.
6. What is ISO.
7. What is the purpose of Trade unions.
8. Define an entrepreneur.

PART-B

4 X 3 =

12

Instructions: 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

9. (a) State any three differences between share and debenture.
OR
9. (b) What are the 5-S principles.
10. (a) List any three advantages of ABC analysis.
OR
10. (b) Mention three qualities required for a good entrepreneur .
11. (a) List the beneficiaries of ISO 9000
OR
11. (b) State the features of ISO 9000.
12. (a) What are the expectations of an entrepreneur
OR
12. (b) Explain the significance of collective bargaining.

PART-C

4 X 5 = 20

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

13. (a) Explain the principles of Scientific management stated by F.W. Taylor

OR

13(b) What is quality system? Explain various elements of quality systems.

14 (a) Explain ABC analysis in inventory control with graph.

OR

14(b) Explain the factors influencing the site selection for a plant location.

15 (a) What is TQM? Write the principles or elements of TQM.

OR

15(b) Explain the importance of certification of confirmation to ISO 9000 and the procedure of obtaining it ?

16(a) List out the three rights and responsibilities of Employees.

OR

16(b) State Indian electricity rules with regard to safety.

ME-502-REFRIGERATION AND AIR CONDITIONING

Course Title:	Refrigeration and Air Conditioning	Course Code:	ME-502
Semester:	V	Course group :	Core
Teaching Scheme(L:T:P):	4:1:0	Credits:	3
Methodolgy :	Lecture + Assignment	Total contact periods:	75
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: Basic knowledge of Thermodynamics

COURSE OUTCOMES

	On Successful completion of the course, the student will be able to
CO 1	Analyze the methods of refrigeration and interpret air refrigeration cycles.
CO 2	Evaluate Vapour compression, vapour absorption refrigeration systems.
CO 3	Explain Refrigerants and various equipment used in refrigeration.
CO 4	Analyze Air conditioning and understand psychrometry.
CO 5	Assess working of various air conditioning equipment.
CO 6	Explain different applications of refrigeration and air conditioning systems.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Periods	Questions to be set for SEE (Q No)				Remarks
			R		U	A	
1	Air refrigeration systems	12	4	1	9(a)	13(a)	
2	Vapour refrigeration systems	13					
3	Refrigerants and refrigeration equipment	13		2	10 (a)	14 (a)	
4	Air conditioning & Psychrometry	12					
5	Distribution of air - Air conditioning equipment	12		3	5, 6	9(b), 11(a), 11(b)	13(b), 15(a), 15(b)
6	Applications of refrigeration and air conditioning	13					
				7, 8	10(b), 12(a), 12(b)	14(b), 16(a), 16(b)	

Legend: R; Remembering, U: Understanding A: Applying

COURSE CONTENT

Refrigeration and Air conditioning

Unit – 1

Duration: 12 Periods (L: 10 – T:2)

Air refrigeration systems

Definition of refrigeration , Air conditioning - methods of refrigeration – Basic terms involved in refrigeration – Thermodynamic analysis of Reversed Carnot refrigeration cycle and Bell Coleman refrigeration cycle - Open air refrigeration system and closed air refrigeration system.

Unit – 2

Duration: 13 Periods (L: 10 – T: 3)

Vapour refrigeration Systems

Vapour compression refrigeration system (VCRS):-Principle –Thermodynamic analysis of VCRS -Factors effecting performance of VCRS - Wet and dry compression –Receiver, Accumulator, strainer , drier and flash chamber.

Vapour absorption refrigeration system(VARS):-Principle – Refrigerant absorbent pairs-**Two fluid VARS:-** Working of Ammonia water vapour absorption refrigeration system – Working of Lithium Bromide- Water vapor absorption refrigeration system-**Three fluid VARS :**Electrolux refrigeration system - Expression for COP of VARS.

Unit – 3

Duration: 13 Periods (L:10 – T:3)

Refrigerants and refrigeration equipment

Refrigerants:- Definition - Primary and secondary refrigerants — properties of good refrigerants – Commonly used refrigerants – Ozone depletion, phase out of Chlorofluoro carbon refrigerants – Montreal and Kyoto protocols

Refrigeration equipment :- Compressors: Classification – Hermetic compressor –

Condensers: types - Natural draught, forced draught, evaporative and shell & tube condensers –**Expansion devices:** Capillary tube and thermostatic expansion valve.-

Evaporators: Dry expansion evaporator, Flooded evaporator – Bare tube, finned tube and Plate surface evaporator.

Unit – 4

Duration: 12 Periods (L: 10 – T:2)

Air conditioning & Psychrometry

Fundamentals of A/C:- Definition of air conditioning - Classification of air conditioning systems - Human comfort conditions – Effective temperature – Factors governing effective temperature – comfort chart.

Psychrometry:-Definition– Psychrometric terms – Carrier Equation - Psychrometric chart – Psychrometric processes

Unit – 5

Duration: 12 Periods (L: 10 – T:2)

Air Distribution

Modes of heat transfer :- Heating loads – cooling loads. **Air distribution :-**General Air distribution (Air flow diagram for an ac system) – **Air distribution system in a Room :-** Ejection system, Downward system and Upward system. **-Ducts:** -Definition, Types, material used, Duct system. Fans and blowers – Supply air outlets – Filters – Heating and cooling coils - AHU (Air handling units). - Chiller

Unit – 6

Duration: 13 Periods (L:10 – T:3)

Applications of refrigeration and air conditioning

Applications of refrigeration :- Domestic refrigerator – Ice plant – Water cooler – Production of Dry Ice. **Applications of air conditioning**:-Window air conditioner, Desert/air cooler(**Evaporative cooling**), Summer air conditioning system – Winter air conditioning system – year round air conditioning system – Central air conditioning system

REFERENCE BOOKS

1. Refrigeration and Air Conditioning – by C. P Arora
2. Refrigeration and Air Conditioning – by Domakundwar
3. Basic Refrigeration and Air conditioning - by P N Ananthanarayana
4. Refrigeration and Air Conditioning – by Dosatt
5. Refrigeration and Air Conditioning – by Stoecker

SUGGESTED LEARNING OUTCOMES

1.0 Air refrigeration systems

- 1.1 Define refrigeration and know natural method and mechanical methods of refrigeration.
- 1.2 Explain different methods of refrigeration such as ice, dry, ice, Air expansion refrigeration.
- 1.3 Define Refrigeration effect, Work of compression, COP, unit of refrigeration (Ton of refrigeration- TR), Evaluate power required per ton of refrigeration and simple problems.
- 1.4 Analyze reverse Carnot refrigeration cycle -Know its limitations.
- 1.5 Know expression for COP of reverse Carnot refrigeration cycle (derivation omitted) and solve problems on it.
- 1.6 Analyze Bell-Coleman air cycle.
- 1.7 Know expression for COP of Bell-Coleman air refrigeration cycle (derivation omitted) and Solve problems on it.
- 1.8 Differentiate open air system and closed air system.

2.0 Vapour refrigeration Systems

- 2.1 Explain principle and working of simple (basic) vapour compression refrigeration system with the help of T-S and P-h diagrams.
- 2.2 Write the expression for its COP
- 2.3 Distinguish between wet and dry compression.

- 2.4 State the use of receiver, accumulator, strainer, drier and flash chamber.
- 2.5 Solve simple problems on basic vapour compression refrigeration system
- 2.6 Summarize the effects of evaporator pressure, condenser pressure, under cooling and super heating on COP.
- 2.7 Explain principle of simple vapor absorption systems.
- 2.8 State the desirable properties of refrigerants -absorbers and list commonly used refrigerant – absorber pairs.
- 2.9 Know two fluid systems of Vapour absorption refrigeration system (VARs) – Explain the construction and working of Ammonia-Water VARs
- 2.10 Explain the construction and working of Water-Lithium Bromide VARs.
- 2.11 Know three fluid systems of VCRS – Explain the construction and working of Electrolux VARs.
- 2.12 Write expression of COP of VARs (without derivation) and solve simple problems

3.0 Refrigerants and refrigeration equipment

- 3.1 Distinguish between primary and secondary refrigerants.
- 3.2 List the desirable properties of refrigerants and Classify refrigerants.
- 3.3 Know the difference between chloro fluoro carbon refrigerants, hydro chloro fluoro refrigerants and hydro carbon refrigerants.
- 3.4 Write chemical formula designation name and application of the following refrigerants – R 12, R 22, R 134 a, R 290a, R 600a, R 401a, Cyclopentane, Care 30 , R 717, R 718, R 729, R 744
- 3.5 Know the reasons of Ozone depletion – Need to phase out of Chlorofluoro carbons and hydro Choro fluoro carbons –
- 3.6 Understand Montreal protocol and Kyoto protocol. (Statements of protocol)
- 3.7 Know the function of compressor, Classification of compressors
- 3.8 Explain construction and working of hermetic reciprocating compressor.
- 3.9 State the function of condenser and explain the working of natural draught air cooled condensers type (tube and fin condenser) –and forced draught air cooled condensers
- 3.10 Explain the working of shell & tube water cooled condensers with help of a legible sketch.
- 3.11 Explain the function of expansion devices. Know working of capillary tube.
- 3.12 Explain thermostatic expansion valve with the help of a legible sketch.
- 3.13 State the function of evaporator – Explain construction and working of plate surface evaporator.

3.14 Explain construction and working principle of flooded type evaporator with a sketch

4.0 Air conditioning & Psychrometry

4.1 Define air conditioning and classify air conditioning systems

4.2 Know the following terms: human comfort, effective temperature and comfort chart.

4.3 Define the terms: Psychrometry, dry air and moist air, DBT, WBT, DPT and adiabatic saturation temperature, humidity, absolute humidity, relative humidity, specific humidity.

4.4 Know carrier's equation and solve problems involving psychrometry.

4.5 Know different psychrometers- Laboratory, continuous recording, sling, aspirating psychrometers.

4.6 Explain the features of psychrometric chart, plot all psychrometric processes on the chart.

4.7 Simple problems on psychrometric processes using psychrometric chart only.

4.8 Know the concept of mixing of air streams and solve problems.

5.0 Air Distribution

5.1 Know the different modes of heat transfer – conduction, convection and radiation

5.2 Draw the general air flow diagram for AC system and explain the air flow, explain different air distribution systems in a room like ejection system, downward system and upward system.

5.3 Explain the need of duct- Know duct materials, shapes and classify ducts

5.4 Explain the duct system based on arrangement of supply ducts like: loop perimeter system, radial perimeter system and extended plenum system.

5.5 Explain duct system based upon number of ducts used like: single duct system, dual duct system and dual duct with induction system.

5.6 Differentiate fan and blower.

5.7 Know the factors governing selection of fans.

5.8 Classify fans according to direction of air flow.

5.9 Classify supply air outlets and know about grill outlets, slot diffusers, ceiling diffusers, perforated ceiling panels and their applications.

5.10 Know different types of filters (Dry, Viscous, Wet, Electronic and HEPA filters)-

5.11 Explain heating and cooling coils.

5.12 Know about air handling unit (AHU).

5.13 Know the function of chillers in air conditioning.

6.0 Applications of refrigeration and air conditioning

- 6.1 Explain construction and working of domestic refrigerator.
- 6.2 Explain the layout of ice plant and process of production of ice
- 6.3 Explain construction and working of storage type water cooler.
- 6.4 Explain the process of production of dry ice
- 6.5 Explain working of window air conditioner.
- 6.6 Know the difference between unitary air conditioner, split air conditioner
- 6.7 Explain the working of desert type air cooler.
- 6.8 Explain summer air conditioning system for hot & humid out door conditions and hot & dry conditions.
- 6.9 Explain winter air conditioning system for cold & dry out door conditions
- 6.10 Explain year round air conditioning system.
- 6.11 Explain central air conditioning system

SUGGESTED E-RESOURCES / STUDENT ACTIVITIES.

- 1. Visit nearest outlet and list out Domestic Refrigerators manufacturers and know the capacity of the refrigerator and the refrigerant used in it.
- 2. Know the colour coding of refrigerant cylinders.
- 3. Make a report of Montreal and Kyoto protocols.
- 4. Assemble and disassemble the air cooler and know all the parts.
- 5. Clean an air cooler, replace pads of air cooler.
- 6. Visit a RAC workshop and watch the method of vacuumisation and charging of refrigerant.
- 7. Visit a duct manufacturing unit and study how fabrication is done and submit a report.
- 8. Visit a site where ducting is being carried out.
- 9. Collect data sheet to find heating and cooling loads for an air conditioning system and study its contents.
- 10. Visit a site where split air conditioner is being installed.
- 11. Visit a central air conditioning plant.
- 12. Working of domestic refrigerator
: <https://www.youtube.com/watch?v=h5wQoA15OnQ&v=0>
- 13. Working of window air conditioner:
<https://www.youtube.com/watch?v=0PkOEHMNOLk>
- 14. Working of Air handling unit (AHU)
<https://www.youtube.com/watch?v=uWwVsFqNFp4>
- 15. Working of chiller

16. Working of ductable air conditioning system

17. Working of tube axial fan

18. Working of vapour compression system

19. Working of Ammonia Water VARS

20. Working of Water lithium bromide VARS

21. Working of Electrolux VARS

22. Working of Receiver, Drier and Accumulator

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
CO1	2	3	2	-	-	1	2	1, 2,3,6,7
CO2	2	3	2	-	-	1	2	1, 2,3,6,7
CO3	1	3	2	-	3	2	2	1, 2,3,5, 6,7
CO4	2	3	2	-	-	1	2	1, 2,3,6,7
CO5	2	3	2	-	-	1	2	1, 2,3,6,7
CO6	2	3	2	-	-	1	2	1, 2,3,6,7

Course-PO Attainment Matrix

Course Name	Program Outcomes (PO)						
	1	2	3	4	5	6	7
R & A/c	2	3	2	-	1	1	2
Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed							

QUESTION PAPER BLUE PRINT FOR CIE (MID SEM I)

Unit No	Unit Name	Questions to be set for CIE (Q No)			Remarks
		R	U	A	
1	Air refrigeration systems	1	5(a)	7(a)	
		2	5(b)	7(b)	
2	Vapour refrigeration systems	3	6(a)	8(a)	
		4	6(b)	8(b)	

QUESTION PAPER BLUE PRINT FOR CIE (MID SEM II)

Unit No	Unit Name	Questions to be set for CIE (Q No)			Remarks
		R	U	A	
3	Refrigerants and refrigeration equipment	1	5(a)	7(a)	
		2	5(b)	7(b)	
4	Air-conditioning and Psychrometry	3	6(a)	8(a)	
		4	6(b)	8(b)	

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM I EXAMINATION
DME V SEMESTER
REFRIGERATION AND AIR CONDITIONING

Time : 1 Hour**Total Marks : 20 M****PART – A**

Marks: 4 X 1M = 4 M

- NOTE: 1) Answer all questions and each question carries one mark.
 2) Answers should be brief and straight to the point and shall not exceed three simple sentences
1. Define the term Refrigeration effect. Write its units.
 2. Find COP of a refrigerating machine working on reverse carnot refrigerating cycle operating between -10°C and 40°C .
 3. Why wet compression is preferred in VCRS.
 4. Why Ammonia-water is most prominently used as refrigerant-absorbent in VARS.

PART – B

Marks : 2 X 3M= 6 M

NOTE: 1) Answer **all** questions and each question carries **three** marks
 2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

5. (a) Explain about dry ice refrigeration
 OR
5. (b) Differentiate open and closed cycle refrigeration system.
6. (a) Draw the layout of water-lithium bromide VARS..
 OR
- 6 (b) Draw layout of Electrolux refrigeration system.

PART – C

Marks : 2 X 5 M = 10 M

NOTE :

1. Answer **all** questions and each question carries **five** marks.
 2. The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer
- 7(a) Explain bell coleman refrigeration cycle with a layout
 OR
 - 7(b) A refrigeration plant works between -15°C and 30°C . The refrigerant is dry and saturated at the end of compression. Calculate Refrigerating effect, Carnot COP and COP of VARS, if enthalpies before and after compression are 1280 kJ/kg and 1470 kJ/kg, fluid enthalpy at 30°C is 320 kJ/kg.
 - 8 (a) Explain with help of pressure enthalpy diagram the effect of increase in condenser pressure on performance of refrigeration system
 OR
 - 8 (b) Differentiate wet compression with dry compression refrigeration system.

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM II EXAMINATION
DME V SEMESTER
REFRIGERATION AND AIR CONDITIONING

Time : 1 Hour

Total Marks : 20 M

PART – A

Marks: 4 X 1M = 4 M

NOTE: 1) Answer **all** questions and each question carries **one** mark.

2) Answers should be brief and straight to the point and shall not exceed **three** simple sentences

1. What is a primary refrigerant. Give an example.
2. What is chemical formula of R22 .
3. How does air conditioning differ from refrigeration.
4. Define the term specific humidity.

PART – B

Marks : 2 X 3M= 6 M

NOTE: 1) Answer **all** questions and each question carries **three** marks

2) The answers should be comprehensive and the criteria for valuation is the content but not the length of the answer.

5. (a) Write short notes on Montreal protocol
OR
5. (b) Differentiate natural draught and forced draught refrigerant condensers.
6. (a) What are the factors governing effective temperature
OR
- 6 (b) Explain working of aspirating psychrometer.

PART – C

Marks : 2 X 5 M = 10 M

NOTE : Answer all questions and each question carries five marks.

- 7(a) Explain working of shell and tube condenser.

OR

- 7(b) Explain working of thermostatic expansion valve.

- 8 (a) Draw sensible heating, sensible cooling, humidification and dehumidification process on psychrometric chart.

OR

- 8 (b) Explain the concept of mixing of air streams in air conditioning.

BOARD DIPLOMA EXAMINATIONS (C21)
MODEL PAPER (SEE)
DME V SEMESTER
REFRIGERATION AND AIR CONDITIONING

TIME : 2 Hours

Max. Marks: 40

PART – A

Marks: 8 X 1 M = 8 M

NOTE : 1) Answer **all** questions and each question carries **one** marks.

2) Answers should be brief and straight to the point and shall not exceeding **three** simple sentences

1. Define the term Ton of Refrigeration.
2. What is function of accumulator in VCRS.
3. Write any two duct materials.
4. Write carriers equation.
5. Write two materials used for ducts in air distribution.
6. What is relative humidity of Hyderabad.
7. What are main components in indoor unit of split air conditioner.
8. What does AHU stands for?

PART – B

Answer **all** questions. Each question carries **three** marks

4x 3 M = 12M

9(a) Write expression for COP of refrigerator and heat pump of reverse Carnot refrigeration cycle

OR

9(b) Explain working of electronic filters.

10(a) what are secondary refrigerants give two examples.

OR

10 (b) Explain working of air cooler

11 (a) Differentiate slot diffuser and ceiling diffuser.

OR

11(b) Differentiate conduction and convection heat transfer

12(a) Draw the layout for production of dry ice.

OR

12(b) Draw the layout for storage type water cooler.

PART – C

*Answer **all** questions. Each question carries **five** marks*

4x 5 M = 20 M

13 (a) Explain bell coleman refrigeration cycle .

OR

13 (b) Explain radial perimeter duct system with a neat sketch.

14 (a) Explain working of hermetic reciprocating compressor.

OR

14 (b) Explain working of storage type water cooler.

15 (a) Explain ejector type air distribution system.

OR

15 (b) Explain loop perimeter duct system.

16 (a) Explain summer air conditioning system for hot and humid outdoor conditions

OR

16 (b) Explain working of a window air conditioner.

ME-503-CAD/CAM

Course Title:	CAD/CAM	Course Code:	ME-503
Semester:	V	Course group :	Core
Teaching Scheme(L:T:P):	4:1:0	Credits:	3
Methodolgy :	Lecture + Assignment	Total contact periods:	75
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: Basic knowledge of Computers.

COURSE OUTCOMES

	At the end of the course the students will be able to :
1	Understand the basic concepts of Computer aided Design (CAD) and Computer Aided Manufacturing
2	Understand the Concepts of NC, CNC and DNC systems
3	Familiar with the CNC Machines and Components and Attachments
4	Familiar with the CNC Part Programming concepts
5	Understand the concepts of CIM, FMS and Additive Manufacturing
6	Familiar with the fundamentals of Robots, Automated Storage and Retrieval Systems and Automated Guided Vehicles.

COURSE CONTENT AND BLUE PRINT OF MARKS FOR SEE

Unit No	Unit Name	Periods	Questions to be set for SEE(Q No)				Remarks	
			R		U	A		
1	Introduction to Computer Aided Design and Manufacturing	10	4	1		9(a)	13(a)	
2	Introduction to NC, CNC and DNC Machines	15						
3	CNC Machines and their Components	12		2		10(a)	14 (a)	
4	CNC Part Programming	13						
5	CIM and Introduction to Additive Manufacturing	15		3	5 ,6	9(b), 11(a), 11(b)	13(b), 15(a), 15(b)	
6	Fundamentals of Robotics and Automation	10			7 , 8	10(b), 12(a), 12(b)	14(b), 16(a), 16(b)	

Legend: R Remembering, U: Understanding A: Applying

COURSE CONTENTS

Unit – 1

INTRODUCTION TO COMPUTER AIDED DESIGN AND MANUFACTURING

Introduction to Computer Aided Design (CAD): Introduction to CAD- Benefits of CAD-Stages of CAD-List of CAD Input, Output and display devices - Types of CAD software-Features of different CAD software - computer communications-Types of computer communications networks, Advantages and Disadvantages.

Introduction to Computer Aided Manufacturing (CAM): Introduction to CAM- Functions of CAM-Benefits of CAM; Fundamentals of Computer Aided Process Planning CAPP and Types of CAPP: Generative and Retrieval, MRP I and MRP-II: Concept and advantages – Introduction to ERP and SAP and Advantages and Limitations.

Unit- 2

INTRODUCTION TO NC AND CNC MACHINES

Introduction to Numerical Control (NC) System - Classification of NC System, Features of NC system, Block diagram of NC System, Motion control in NC system, Feedback control of NC system, Applications of NC system, Advantages of NC system- Limitations of NC system in comparison to conventional systems.

Computer Numerical Control (CNC) Machining: Introduction to CNC, Manufacturing methodology of Modern CNC Machining, Classification of CNC Machining centers, Block diagram of CNC system, Functions of each components of CNC system, Features of CNC, Advantages and Disadvantages of CNC over NC, Applications of CNC.

Direct Numerical Control (DNC) systems: Basic concept of DNC, Block diagram of DNC system with basic components and working principle, Concept of DNC system with and without satellite, Functions of DNC, Advantages of DNC, Comparison between NC, CNC and DNC Machine tools.

Unit-3

CNC MACHINES AND THEIR COMPONENTS

Machining Centres (MC): Types, Construction features of machining centres, specification of MC, Components of CNC: Automatic tool changer, working of Tool gripper and tool magazine, types of tool magazines, Automatic pallet changer, Care and maintenance of CNC machines, Spindle drives, feed drives, Slide ways, types with illustrations- Bearings, linear motion bearings, recirculatory ball screws, Feedback devices, transducers, encoders, linear transducers.

Unit-4

CNC PART PROGRAMMING

Introduction, Steps involved in CNC part programming, Types of Part Programs: Manual and Computer Assisted- CNC Part Programming languages, CNC coordinate system: NC axis system for milling, drilling and turning, Co-ordinates referencing methods: Absolute positioning, Incremental positioning, Concept of Fixed point zero, Floating-point zero,

NC Part Programming: Structure of NC Part Programming, Standard NC Functions/Words used in NC Part Programming language, Preparatory functions (G-Codes): Interpolation -Linear Interpolation, Circular Interpolation, Cutter/Tool Compensation, Miscellaneous functions (M-Codes)- Part programming formats, Canned cycles: Simple Turning Cycle, Thread Cutting Cycles, Peck Drilling Cycles, Grooving Cycles, Subroutines, Macros – Programming: Practice problems on Plain turning, Step turning, Taper turning and thread cutting. APT programming: APT statements, Coding for simple examples.

Unit-5

CIM AND INTRODUCTION TO ADDITIVE MANUFACTURING

Computer integrated manufacturing system: Introduction, Definition of CIM, Various process involved in CIM – CIM Cycle with integration of all functions, Importance, Necessity and features of CIMS, Flexible Manufacturing System(FMS): Definition– Application characteristics of FMS, Need of FMS, Basic Components of FMS, Features of FMS, Advantages of FMS, Limitations of FMS. Computer Aided Inspection: Introduction to CNC CMM – features, working and advantages of CNC-CMM.

Additive Manufacturing (AM) - Introduction: Necessity of AM, Use of AM Parts, Types of materials for AM, Process or Steps in Additive manufacturing, Classification of AM processes, Concepts of AM Processes: Vat Photopolymerization / Stereolithography, Material Jetting, Binder jetting, Material extrusion, Powder bed fusion, Sheet lamination, Directed energy deposition, Benefits of AM, Disadvantages, Applications of AM, Distinction Between AM and CNC Machining.

Unit-6

FUNDAMENTALS OF ROBOTICS AND AUTOMATION

Robotics: Definition of a robot, necessity, Degrees of freedom (DOF) of Robot, Classification of Robots: Definition of each robot under each classification, Basic Components of a Robotic System, Manipulator and Working, End-Effectors: Different Grippers and Tools, Applications of Industrial Robots, Disadvantages, Role of robots in CIM.

Automation: Automatic Guided Vehicles: Introduction, Simple AGV System, Components of AGV system, Types of AGVs - Automatic Storage and Retrieval System (ASRS): Definition, Objectives, Terms used in ASRS, Components of ASRS, Advantages of ASRS.

REFERENCE BOOKS:

Computer Integrated Design and Manufacturing, McGraw Hill – Bed worth David. D
Computer Integrated Manufacturing, PHI – Paul G. Ranky

Industrial Robotics, PHI – Gordon. N. Mair

Numerical Control And Computer Aided Manufacturing, TMH – T. K. Kundra, P.N. Rao

Computer Aided Manufacturing, TMH – T. K. Kundra, P.N. Rao CNC Machines,
New Age – B.S. Pabla and M. Adithan

CAD, CAM, CIM -----BY Radha Krishnan.

SUGGESTED LEARNING OUTCOMES

On completion of the course the student should be able to

1. Understand the basic concepts of Computer aided Design (CAD) and Computer Aided Manufacturing

- 1.1. Appreciate the CAD
- 1.2. Identify advantages or Benefits of CAD
- 1.3. Identify different CAD softwares
- 1.4. List various CAD Input, Output and Display devices
- 1.5. Appreciate importance of Auto CAD as a CAD software
- 1.6. Familiar with the concept and need of networking
- 1.7. List the different types of communication networks and know the concept of each
- 1.8. Know the advantages and disadvantages of networks
- 1.9. Understand the importance of CAM
- 1.10. Identify the benefits and functions of CAM
- 1.11. Understand the concept of CAPP
- 1.12. Know the concept of Generative and Retrieval Process planning
- 1.13. Familiarize with the terms material requirement planning (MRP I) and manufacturing resources planning (MRP II) and advantages
- 1.14. Familiar with the block diagram of MRP-I
- 1.15. Familiar with the block diagram of MRP-II
- 1.16. Introduction to ERP and SAP
- 1.17. Identify the functions of CAM
- 1.18. Appreciate the advantages of CAM
- 1.19. Familiarize the Stages of CAM
- 1.20. Understand the concept of Computer Aided Process Planning(CAP
- 1.21. Familiarize with the term computer integrated production system

2. Understand the Concepts of NC, CNC and DNC systems

- 2.1. Familiarize Numerical Control(NC)
- 2.2. List the features and advantages of NC
- 2.3. Identify the limitations of NC when compared to the conventional system

- 2.4. Understand the motion control in NC system
- 2.5. Familiar with the motion control system of NC: Point to point, continuous and contouring
- 2.6. Understand the chronology of developments of CNC and DNC systems
- 2.7. Illustrate the working principle of CNC system
- 2.8. Know the functions of each components of CNC system
- 2.9. Illustrate the working principle and advantages of DNC system
- 2.10. Know the specifications of CNC
- 2.11. Differentiate between NC, CNC & DNC systems

3. Familiar with the CNC Machines and Components and Attachments

- 3.1. Familiarize the term Machining Centre.
- 3.2. Identify the maintenance aspects of CNC machines
- 3.3. Appreciate the role of CNC in computer integrated manufacturing environment
- 3.4. Identify the various spindle drives
- 3.5. Appreciate the accuracy of Stepper and Servo motor
- 3.6. Illustrate slide ways
- 3.7. Familiarize with linear motion bearings, recirculatory ball screws
- 3.8. Familiarize the important components/attachments of CNC Machines
- 3.9. Appreciate the importance of automatic tool changer and its components.
- 3.10. Illustrate tool gripper and tool magazine
- 3.11. Identify the various feedback devices.
- 3.12. Know the Specification of Machining centre
- 3.13. Illustrate the constructional features of machining centres
- 3.14. Features of Automatic pallet changer
- 3.15. Working of linear and rotary transducer

4. Familiar with the CNC Part Programming concepts

- 4.1. Know the steps to write CNC part program
- 4.2. Understand the Absolute and Incremental CNC Co-ordinate systems
- 4.3. Understand the concept of Machine zero and Work zero referencing methods
- 4.4. Familiarize with structure of NC part program
- 4.5. Differentiate between manual and computer aided programming methods
- 4.6. Familiarize with G & M codes
- 4.7. Know the method of programming tool information, feed, speed data
- 4.8. Interpolation and types linear and circular
- 4.9. Write a part program in G & M codes.
- 4.10. Write part program for Facing, plain turning, taper turning and step turning
- 4.11. Identify the various programming cycles like simple turning cycle, peck drilling cycle, Grooving cycle, Boring cycle and thread cutting cycle.
- 4.12. Appreciate the importance of macros, sub routines, canned cycles.
- 4.13. Familiarize with APT programming

5. Understand the concepts of CIM, FMS and Additive Manufacturing

- 5.1. Define CIMS
- 5.2. Appreciate the necessity of CIMS
- 5.3. Appreciate the advantages of CIMS
- 5.4. Identify FMS as a sub set of CIMS
- 5.5. Identify the components of AGV's and ASRS
- 5.6. Illustrate the working of FMS
- 5.7. Identify the benefits of FMS
- 5.8. Appreciate the importance of coordinate measuring machine.
- 5.9. Illustrate the main features of CNC-CMM
- 5.10. Advantages of CNC-CMM
- 5.11. Know the concept of Additive Manufacturing (AM)
- 5.12. Know the necessity and use of AM
- 5.13. Familiarize the types of materials for AM
- 5.14. Understand the process or Steps in Additive manufacturing,
- 5.15. Classify the AM processes/3D Printing Processes,
- 5.16. State the basic concepts of AM Processes:
 - Vat Photo-polymerization / Stereolithography,
 - Material Jetting,
 - Binder jetting,
 - Material extrusion,
 - Powder bed fusion,
 - Sheet lamination,
 - Directed energy deposition,
- 5.17. Know the benefits of AM
- 5.18. Know the disadvantages of AM
- 5.19. Know the applications of AM
- 5.20. Understand the distinction between AM and CNC Machining.

6. Familiar with the fundamentals of Robots, Automated Storage and Retrieval Systems and Automated Guided Vehicles (AGVs).

- 6.1. Define a robot
- 6.2. Understand the necessity of robot
- 6.3. Understand the concept of Degree of Freedom of a robot
- 6.4. Classify robots and familiar with the each type under each classification
- 6.5. Identify the various components of a robotic system
- 6.6. Illustrate the working of a manipulator
- 6.7. Illustrate the types of end effectors
- 6.8. Familiar different types of Grippers (Mechanical, Magnetic and Vacuum type) and List the tools for specific purpose
- 6.9. Identify the applications of industrial robots
- 6.10. Appreciate the role of robots in CIMS
- 6.11. Know the Advantages and Limitations of Robots
- 6.12. Know the concept of AGVs with simple AGV system components
- 6.13. Familiar with the basic concept of different types of AGVs
- 6.14. Understand the basic concept and terms used in ASRSs system
- 6.15. Know the basic components of ASRS
- 6.16. Familiar with the advantages of ASRS

SUGGESTED E RESOURCES/STUDENT ACTIVITIES

- A Visit to a nearest Industry working on CNC Machines.
- Identify various machine tools including CNC and write the report differentiating an ordinary machine tool with CNC machine tool
- Write a part program for producing work pieces like round rods, stepper rods and screwed fasteners etc.
- www.nptel.ac.in
- www.coursera.com

Course Outcomes		CL	Linked PO	Teaching Hours
CO1	Understand the basic concepts of Computer aided Design (CAD) and Computer Aided Manufacturing	U/A	1,2,5,6,7	3
CO2	Understand the Concepts of NC, CNC and DNC systems	U/A	1,2,5,6,7	12
CO3	Familiar with the CNC Machines and Components and Attachments	U/A	1,2,5,6,7	6
CO4	Familiar with the CNC Part Programming concepts	A	1,2,3,4,6,7	6
CO5	Understand the concepts of CIM, FMS and Additive Manufacturing	U/A	1,2,3,4,5,6,7	3
CO6	Familiar with the fundamentals of Robots, Automated Storage and Retrieval Systems and Automated Guided Vehicles.	A	1,2,3,5,6,7	15

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
1	1	3	-	-	3	1	2
2	1	3	-	-	3	1	2
3	3	3	-	-	3	3	3
4	1	3	2	1	-	3	3
5	1	1	1	1	1	1	1
6	2	2	1	-	3	2	2

QUESTION PAPER BLUE PRINT FOR CIE (MID I)

Unit No	Unit Name	Questions to be set for CIE (Q No)			Remarks
		R	U	A	
1	Introduction to Computer Aided Design and Manufacturing	1	5(a)	7(a)	
		2	5(b)	7(b)	
2	Introduction to NC, CNC and DNC Machines	3	6(a)	8(a)	
		4	6(b)	8(b)	

QUESTION PAPER BLUE PRINT FOR CIE (MID II)

Unit No	Unit Name	Questions to be set for CIE (Q No)			Remarks
		R	U	A	
3	CNC Machines and their Components	1	5(a)	7(a)	
		2	5(b)	7(b)	
4	CNC Part Programming	3	6(a)	8(a)	
		4	6(b)	8(b)	

BOARD DIPLOMA EXANIMATIONS, (C21)

Model Paper
CAD /CAM
Mid Sem-I (CIE)

Time : 1 Hour

Total Marks : 20 M

PART – A

Marks: 4 X 1M = 4 M

*NOTE: Answer **all** questions and each question carries **one** mark.*

1. Define CAD
2. Define MRP-II.
3. Write one limitation of the NC System
4. What is the full form of DNC?

PART – B

Marks: 2 X 3M = 6 M

*NOTE: Answer **all** questions and each question carries **Three** marks*

5(a). List any three reasons for Networking

Or

5(b). List any three advantages of CAPP.

6(a). Explain Straight Cut motion control of NC.

Or

6(b) List any three limitations of NC over conventional machining.

PART – C

Marks: 2 X 5M = 10 M

*NOTE: Answer **all** questions and each question carries **Five** marks.*

7(a) List any five features of CAD packages.

Or

7(b) Explain the concept of SAP briefly.

8(a) Draw the Block Diagram of the CNC Machining system and label all the components.

Or

8(b) List any five advantages of DNC.

BOARD DIPLOMA EXANIMATIONS, (C21)

Model Paper

CAD /CAM

Mid Sem-II (CIE)

Time: 1 Hour

Total Marks : 20 M

PART – A

Marks: 4 X 1M = 4 M

*NOTE: Answer **all** questions and each question carries **one** mark.*

1. What is the full form of ATC related to CNC Machining?
2. Write the use of CNC Automatic Pallet Changer.
3. What is the meaning of the 'S2000' CNC word?
4. Mention the functions of G-Codes G00 and G01.

PART – B

Marks: 2 X 3M = 6 M

*NOTE: Answer **all** questions and each question carries **Three** marks*

5(a). Write any three CNC Machining center components

Or

5(b). Specify the function of the CNC Spindle drive

6(a). What is T-Word in CNC part programming?

Or

6(b). What is circular interpolation in the CNC part program?

PART – C

Marks: 2 X 5M = 10 M

*NOTE: Answer **all** questions and each question carries **Five** marks.*

7(a) Draw a neat sketch of Automatic Tool Changer (ATC).

Or

7(b) Write a short note on the following

i) Servo motor ii) Stepper motor

8(a) Briefly explain the Co-Ordinates Referencing Methods in CNC.

Or

8(b) Write the Steps Involved in CNC Part Programming.

BOARD DIPLOMA EXANIMATIONS, (C18)
SEMESTER END EXAMINATION (SEE)
Model Paper
CAD /CAM

Time: 2 Hours

[Total Marks: 40]

PART-A

8X01=08

Instructions:

1. Answer **ALL** questions.
2. Each question carries **ONE** mark.
1. Mention any three advantages of CAD.
2. Define numerical control. What are the basic components of NC system?
3. What is the full form of ASRS?
4. What is the actuator of a Robot?
5. FMS is best suited for?
6. What is the necessity of Additive Manufacturing?
7. What is a robot?
8. What is the full form of AGV?

PART-B

04X03=12

Instructions: 1. Answer any **FOUR** questions.

2. Each question carries **THREE** marks.

9. (a) Explain various stages involved in design of a component using CAD.
(or)
9. (b) Mention the importance of Computer Integrated Manufacturing System (CIMS).
10. (a) How do you call a P2000 Subroutine repeating 6 times?
(or)
10. (b) Classify the Robots as per the Degrees of Freedom.
11. (a) Mention the importance of Computer Integrated Manufacturing System (CIMS)
(or)
11. (b) List any three benefits of Additive Manufacturing.
12. (a) Write a short note on SCARA Robot.
(or)
12. (b) Write a short note on driverless trains.

PART-C

04X5=20

Instructions:

1. Answer any **FOUR** questions.
2. Each question carries **FIVE** marks.

13. (a) What is MRP-II? Explain in detail various functions of MRP-II.
(or)
13. (b) Illustrate the basic concept of Powder bed fusion Additive Manufacturing processes.
14. (a) Explain in detail the procedure involved in computer aided part programming.
(or)
14. (b) Draw a neat sketch of a Robot showing Six Degrees of freedom in motion
15. (a) Draw a Figure showing the application characteristics of FMS.
(or)
15. (b) List the steps involved in Additive manufacturing process.
16. (a) Classify the Robots as per the Workspace Geometry.
(or)
16. (b) Briefly explain the components of the AS/RS system.

ME-574-FLUID POWER SYSTEMS

Course Title:	Fluid Power Systems	Course Code:	ME-574
Semester:	V	Course group :	Core
Teaching Scheme(L:T:P):	4:1:0	Credits:	3
Methodolgy :	Lecture + Assignment	Total contact periods:	75
CIE:	60 Marks	SEE:	40 Marks

Pre requisites

Basic Knowledge of hydraulics, pneumatics and control systems

Course Outcome

On successful completion of the course, the students will be able to attain below Course Outcome (CO):

Course Outcome	
CO1	Explain and Evaluate Hydraulic and Pneumatic Pump
CO2	Explain and differentiate Hydraulics motors
CO3	Describe the construction of various directional, Pressure and Flow control valves.
CO4	Hydraulic circuit design and Analysis.
CO5	Understand and explain Actuators
CO6	Design the single Actuator Circuits

Blue Print of Marks for SEE

Unit Name		Questions to be set for SEE Marks					Remarks	
		periods	R		U	A		
PART-A	Introduction to hydraulics and pumps	13	Q4	Q1		9(a)	13(a)	
	Hydraulic Motors and Actuators	12						
PART-B	Directional pressure and flow control valves	13		Q2		10(a)	14(a)	
	Hydraulic circuit design and analysis	12						
PART-C	Introduction to pneumatics and actuators	13		Q3	Q5 Q6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	
	Single Actuator circuits	12						Q7 Q8
TOTAL		75	10	8	06	06		

COURSE CONTENT

UNIT-I

Introduction to Hydraulics and Hydraulic pumps

Definition and scope of fluid power, Advantages and drawbacks of fluid power, Applications of fluid power, Components of Fluid power system - Hydraulic & Pneumatic systems Comparison between Hydraulic and Pneumatic Systems, Comparison of Different Power Systems - mechanical, electrical, hydraulic and pneumatic power systems, Future of Fluid power industry - in general and related to India. Classification of pumps based on Displacement, Delivery and Motion, Positive and Non-positive displacement pumps, Advantages and disadvantages of Non-positive displacement pumps Differences between Positive and Non positive displacement pumps, Classification of positive displacement pumps Pumping Theory, Gear pumps - External and internal gear pumps, Lobe and Screw pumps, Advantages, Disadvantages and applications of the above pumps, Vane pumps -Unbalanced and Balanced vane pumps, Advantages, Disadvantages and applications of vane pumps, Piston Pumps - Axial and Radial Piston Pumps Bent - Axis type and Swash - P Advantages, Disadvantages and applications of vane pumps, plate type piston pumps, Advantages, Disadvantages and applications of piston pumps, Volumetric and Mechanical efficiencies of pumps.

UNIT-2

Hydraulic Motors and Actuators

Introduction- Differences between hydraulic pump and motor, Applications of hydraulic motors, Comparison between hydraulic and electric motors, Classification of hydraulic motors, Gear motors, Vane motors, Piston motors, Theoretical torque, power and flow rate, Volumetric, Mechanical and Overall efficiencies of hydraulic motor. Introduction- Classification of actuators, Types of hydraulic cylinders – Single acting - Gravity return and spring return single acting cylinders, Double-acting - Piston rod on one side and both the sides, Telescope and Tandem cylinders, Cylinder force, velocity and power, First, Second and Third Class lever systems used in cylinders, Cylinder cushions and its importance.

UNIT-3

Directional, pressure and Flow control valves

Introduction to valves used in fluid power, Functions of direction control valves, Classification of direction control valves on different criteria, Classification of DCVs based on Fluid Path, Design Characteristics, Control Method, Construction of Internal Moving Parts, Symbols of various direction control valves, Different types of actuators - Manually operated, mechanically operated, Solenoid operated and Pilot operated actuators, Check valve – construction and operation details of Ball type, Poppet, Pilot operated and Solenoid actuated check valves, Two way and Three way control valves and their applications. Necessity and functions of pressure control valves, Classification of pressure control valves, Pressure relief valves - construction and working of simple and compound (pilot operated) pressure relief valves, Pressure reducing valves, Unloading valves - Direct Acting and Pilot operated unloading valves - construction and operation, Counter balance valves, Pressure sequence valves, Cartridge valves - Balanced and unbalanced poppet controlled cartridge valves, Applications of pressure control valves. Functions of flow control valves, Classification of flow control valves, Construction and operation of Non - pressure compensated and Pressure compensated flow control valves.

UNIT-4

Hydraulic circuit design and Analysis

Describing the operation of complete hydraulic circuits drawn using graphic symbols for all components, Control of single - acting hydraulic cylinder, Control of double - acting hydraulic cylinder, Regenerative cylinder circuit – expression for the cylinder extending speed, Load carrying capacity during extension, Pump unloading circuit, Double - pump hydraulic circuit, Counter balance valve application, Hydraulic cylinder sequencing circuit, Cylinder synchronizing circuits - cylinders connected in parallel and series, Fail - safe circuits, fail - safe system with overload protection, Two - handed safety system.

UNIT-5

Introduction to Pneumatics and Actuators

Introduction to Pneumatics, Choice working medium and system, Advantages and disadvantages of compressed air, Applications of pneumatics, Basic components of pneumatic systems, Advantages and disadvantages of pneumatic systems, Comparison of Mechanical / Electrical, Hydraulic and Pneumatic transmission systems Introduction to pneumatic actuators, Types of pneumatic actuators – Linear actuators (pneumatic cylinders), Rotary actuators (Air motors) and Limited angle actuators, Classification of Linear actuators based on, Application for which cylinders are used, cylinder's action, cylinder's movement and cylinder's design, Materials of construction for light, medium and heavy duty cylinders, Single acting cylinders - construction of Diaphragm cylinder, Rolling diaphragm cylinders, Gravity return and Spring return single acting cylinders, Construction of double - acting cylinders with piston rod on one side and both the sides, Telescopic cylinder, Tandem cylinder, Rodless cylinder, Cable cylinder, Sealing band Cylinder with slotted cylinder barrel, Cylinder with Magnetically Coupled Slide, Impact cylinders and Duplex cylinders, Graphic symbols of cylinders, Cylinder Seals - characteristics and classification, Static and Dynamic seals, Different types of cylinders used in cylinders, Working and applications of Air Motor.

UNIT-6

Single Actuator circuits.

Functions of the pneumatic circuits, Direct and indirect control of single acting cylinders, Control of single acting cylinder with OR, AND, NOT valves, Direct and indirect control of double acting cylinders, Control of double acting cylinders with Supply air - throttling, Exhaust air throttling, Time dependent controls - Time delay valve NC-type, Time delay valve NO-type.

REFERENCE BOOKS

1. Fluid power with applications by Anthony Esposito - Printice Hall of India
2. Fluid power control - NPTEL Web course
3. Pneumatics by SRIHARI RAO
4. Pneumatic controls by FESTO
5. Fluid Power Pneumatics by ALAN H. JOHN
6. Pneumatics by FLIPPO
7. Pneumatics By TTI
8. Hydraulics & Pneumatics by RAY & RAOd
9. Fluid Power & Pneumatics by AUDEL Series

E resources/ suggested student activities

1. <https://www.youtube.com/watch?v=YlmRa-9zDF8> basics
2. <https://www.youtube.com/watch?v=8xd7cWvMrvE> npTEL
3. <https://www.youtube.com/watch?v=p7kaKmw09g> practical examples
4. visit nearby JCB cranes, tippers and identify pneumatic devices and circuits and prepare a report about their working and their location.

SUGGESTED LEARNING OUTCOMES

On successful completion of the course the student shall be able to

1. Explain and Evaluate Hydraulics, Pneumatics and Pump

- 1.1 Explain the meaning of fluid power.
- 1.2 List the various applications of fluid power.
- 1.3 Differentiate between fluid power and transport systems.
- 1.4 List the advantages and disadvantages of fluid power.
- 1.5 Explain the industrial applications of fluid power.
- 1.6 List the basic components of the fluid power.
- 1.7 Explain the meaning of Pneumatics.
- 1.8 Differentiate between electrical, pneumatic and fluid power systems.
- 1.9 Appreciate the future of fluid power in India.
- 1.10 Classify the hydraulic pumps used in the industry.
- 1.11 Differentiate between positive displacement and non-positive displacement pumps.
- 1.12 Explain the working and construction of gear, vane and piston pumps.
- 1.13 Define mechanical, volumetric and overall efficiency of pumps.
- 1.14 Differentiate between internal and external gear pumps.

2 Explain and differentiate Hydraulics motors and actuators

- 2.1 Differentiate between a hydraulic motor and a hydraulic pump.
- 2.2 List various applications of hydraulic motor in fluid power.
- 2.3 Discuss various classifications of hydraulic motor.
- 2.4 Explain the construction and working of gear, vane and piston motors.
- 2.5 Explain various types of efficiency terms used in hydraulic motors.
- 2.6 Determine the torque and power delivered by hydraulic motors
- 2.7 Explain the classification of hydraulic actuators.
- 2.8 Explain various types of hydraulic cylinders.
- 2.9 Describe the construction and working of double-acting cylinders.
- 2.10 Derive an expression for force, velocity and power for hydraulic cylinders.
- 2.11 Analyze various lever systems using hydraulic cylinders.
- 2.12 Explain the importance of cylinder cushioning.

3 Describe and constructions of various directional, Pressure and Flow control valves.

- 3.1 List different types of valves used in fluid power.
- 3.2 Explain various classifications of directional control valves.
- 3.3 Describe the working and construction of various direction control valves.
- 3.4 Identify the graphic symbols for various types of direction control valves.
- 3.5 Explain the different applications of direction control valves.
- 3.6 Explain the working principle of solenoid-actuated valves.
- 3.7 Define valve overlap.
- 3.8 Evaluate the performance of hydraulic systems using direction control valves.

- 3.9 Explain various functions of pressure-control valves
- 3.10 Explain various classifications of pressure-control valves.
- 3.11 Describe the working construction of various pressure-control valves.
- 3.12 Differentiate between a pressure relief valve, a pressure-reducing valve, a sequence valve and unloading valve.
- 3.13 Identify the graphic symbols for various types of pressure-control valves.
- 3.14 Explain different applications of pressure-control valves.
- 3.15 Explain various functions of flow-control valves.
- 3.16 Explain various classifications of flow-control valves.
- 3.17 Describe the working and construction of various non-compensated flow control valves.
- 3.18 Differentiate between compensated and non-compensated flow-control valves.
- 3.19 Identify the graphic symbols for various types of flow-control valves.
- 3.20 Explain different applications of flow-control valves.

4. Hydraulic circuit design and Analysis.

- 4.1 Identify the graphic symbols for various types of hydraulic components.
- 4.2 Explain various hydraulic circuits to control single-acting and double acting cylinders.
- 4.3 Explain a regenerative circuit and determine the load-carrying capacities.
- 4.4 Describe the working of a double-pump circuit along with its advantages.
- 4.5 Explain the working of a sequencing circuit and a counterbalancing circuit.
- 4.6 Differentiate between series and parallel synchronization circuits.

5. Understand and explain Actuators.

- 5.1 Explain the meaning of Pneumatics
- 5.2 Describe the various properties desired of an air medium in pneumatic system
- 5.3 Explain the advantages and disadvantages of compressed air
- 5.4 Identify and appreciate the application of pneumatic systems in various Industries
- 5.5 List the basic components required for a pneumatic system
- 5.6 Describe the various power transmission systems
- 5.7 Compare hydraulic, pneumatic and mechanical systems.
- 5.8 Explain the meaning of Pneumatic Actuator
- 5.9 Classify the various types of Pneumatic actuators
- 5.10 Explain the working of various pneumatic actuators
- 5.11 Study the seals used in the Pneumatic actuators
- 5.12 Explain the working and application of air motors

6. Design the single Actuator Circuits.

- 6.1 Differentiate between pneumatic circuit and pneumatic circuit diagram
- 6.2 State basic rules used in design of pneumatic circuits
- 6.3 Explain the memory, delay, **OR**, **AND** and **NOT** functions
- 6.4 Explain the direct and indirect control of single acting cylinder

- 6.5 Explain the direct and indirect control of double acting cylinder
 6.6 Differentiate supply and exhaust air throttling
 6.7 Design pressure and time dependent circuits

Course Outcome			Linked PO	Teaching Periods
CO1	Explain And Evaluate Hydraulic and Pneumatic Pump	R, U, A	1,2,3,7	13
CO2	Explain and differentiate Hydraulics motors	R, U, A	1,2,3,7	12
CO3	Describe the construction of various directional, Pressure and Flow control valves.	U, A	1,2,3,7	13
CO4	Hydraulic circuit design and Analysis.	U, A	1,2,3,7	12
CO5	Understand and explain Actuators	U, A	1,2,3,	13
CO6	Design the single Actuator Circuits	R, U, A	1,2,3,7	12
		Total Sessions		75

○

Legends: R = Remember U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO Attainment Matrix:

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	2	2	-	-	-	1
CO2	3	2	3	-	-	-	1
CO3	3	2	3	-	-	-	
CO4	3	3	3	-	-	-	1
CO5	3	2	3	-	-	-	
CO6	3	3	3	-	-	-	1

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

MID SEM-1 EXAM
BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM I, MODEL PAPER
Fluid Power Systems

Time : 1 Hours]

[Total Marks: 20

-
- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.

1. What is the fluid transport system? 04x01=04 M
2. State two applications of fluid power in Automobiles.
3. Why is the actual torque output delivered by the hydraulic motor is less than the calculated theoretical torque?
4. What is the function of Hydraulic cylinder?

PART-B

02X03=06M

- Instructions :**
1. Answer any **TWO** questions.
 2. Each question carries **THREE** marks.
-
5. (a) Mention any three differences between hydraulic system and pneumatic system.
(or)
 5. (b) Define overall efficiency of a pump. Write an expression for overall efficiency.
-
6. (a) State the advantages of Hydraulic motor over Electric motor.
(or)
 5. (b) What is meant by cylinder cushioning?

PART-C

- Instructions :**
1. Answer any **TWO** questions. 05X02=10M
 2. Each question carries **FIVE** marks.
-
7. (a) Explain the Classification of hydraulic pumps in fluid power systems.
(or)
 7. (b) Explain the working and construction of Vane pump.
-
8. (a) Explain third class lever system used in hydraulic cylinder.
(or)
 8. (b) State the formulae for various efficiencies of a motor?

BOARD DIPLOMA EXAMINATIONS (C21)
MID SEM II
MODEL PAPER
Fluid Power Systems

Time : 1 Hours]

[Total Marks: 20

-
- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.

1. State the function of a pneumatic valve. 04x01=04 M
2. List any two applications of flow control valves.
3. Draw the graphical symbol for cooler.
4. Draw the graphical symbol for cylinder - double acting.

PART-B

02X03=06M

- Instructions :**
1. Answer any **TWO** questions.
 2. Each question carries **THREE** marks.
5. (a) Explain various functions of pressure-control valves.
(or)
 5. (b) State the functions of flow control valve?
6. (a) Draw the graphic symbols for the following (i) Component enclosure (ii) Reservoir – Vented
(iii) Reservoir - Pressurized
(or)
 6. (b) What are the factors considered for designing hydraulic circuits?

PART-C

- Instructions :**
1. Answer any **TWO** questions. 05X02=10M
 2. Each question carries **FIVE** marks.
7. (a) Explain ball type check valve with neat sketch?
(or)
 7. (b) Explain the working principle of solenoid actuated valve.
8. (a) Explain the protection against over load circuit
(or)
 8. (b) Describe the working of a pump-unloading circuit using circuit diagram

BOARD DIPLOMA EXAMINATIONS (C18)
SEE-MODEL PAPER
DME– V SEMESTER EXAMINATION
Fluid Power Systems

Time : 2 Hours]

[Total Marks: 40

PART-A

08X01=08

- Instructions :**
1. Answer **ALL** questions.
 2. Each question carries **ONE** mark.
1. Define hydraulic rotary actuator.
 2. State the function of a check valve
 3. List the types of pneumatic actuators
 4. Write the classification of hydraulic motors.
 5. State the different power transmission systems.
 6. What is dynamic seal?
 7. State the basic rules used in design of pneumatics.
 8. State the function of pneumatic circuits.

PART-B

04X03=12

- Instructions :**
1. Answer any **FOUR** questions.
 2. Each question carries **THREE** marks.
9. (a) List out the types of hydraulic cylinders.
(or)
 9. (b) Write a short note on free air and standard air.
-
10. (a) Explain briefly functions of direction control valve.
(or)
 10. (b) Why Exhaust air throttling is used for speed control of the double acting cylinder ?
-
11. (a) State the rules followed in selection of working medium in fluid power system.
(or)
 11. (b) Write the advantages of pneumatic system
-
12. (a) State the rules used in design of Pneumatic circuits.
(or)
 12. (b) How does a 3/ 2 way valve work?

PART-C

04X5=20

Instructions : 1. Answer any **FOUR** questions.

2. Each question carries **FIVE** marks.

13. (a) Explain screw pump with a neat sketch.

(or)

13. (b) What are the basic components of Pneumatic system? Explain their function

14. (a) Describe the working of Double-Pump hydraulic system using circuit diagram.

(or)

14. (b) Explain the Control of single acting cylinder with "NOT" valve.

15. (a) Write briefly about advantages and disadvantages of compressed air.

(or)

15. (b) State the specific applications of pneumatic systems in various industries.

16. (a) Explain the direct control of double acting cylinder

(or)

16. (b) Explain Exhaust air throttling?

ME-584-AUTOMOBILE ENGINEERING

Course Title:	Automobile Engineering	Course Code:	ME-584
Semester:	V	Course group :	Elective
Teaching Scheme(L:T:P):	4:1:0	Credits:	3
Methodolgy :	Lecture + Assignment	Total contact periods:	75
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: Basic knowledge of Science, Work shop technology, Thermal engineering , theory of Machines

COURSE OUTCOMES

On successful completion of the course, the students will be able to

Course Outcomes	
CO1	Explain basic structure of Automobile and analyze Chassis, Frame and Engine
CO2	Analyze Transmission system of an Automobile
CO3	Analyze and construct Propeller Shaft and rear axle of an Automobile
CO4	Explain and illustrate front axle and steering system
CO5	Explain Suspension system and types of wheels& tyres
CO6	Explain braking system and classification of brakes

Blue Print of Marks for SEE:

Units		No of periods	Questions to be set for SEE				Remarks	
			R		U	A		
Part-A	1. Introduction & chassis, engine construction	12	Q4	Q1		Q9(a)	Q13(a)	
	2. Ttransmission system &clutches	13						
Part-B	3. Propeller Shaft and rear axle	12		Q2		Q10(a)	Q14(a)	
	4 Front Axle and Steering	13						
Part-C	5.Suspension systems and wheels and tyres	13		Q3		Q9(b) Q11(a) Q11(b)	Q13(b) Q15(a) Q15(b)	
	6.Brakes	12						
TOTAL		75	08		08	08		

COURSE CONTENT**1. Introduction to basic structure of Automobile- construction of Chassis and Frame**

Introduction to various components of an automobile-functions of basic structure-transmission system, the auxiliaries, the controls and super structure -Chassis -various types of Chassis construction-the functions of frame- the loads on frame- frame construction with neat sketch- materials for frame-defects in frame- frameless construction with neat sketch

2. Transmission system & clutches

Introduction to transmission system- functions of transmission system- concept of total resistance to the vehicle motion- tractive effort-necessity of transmission- working of sliding mesh-synchromesh gear boxes-working of selector mechanism with gear lever on top of transmission case- lubrication of gear box- function of clutches- requirements of Clutch- brief description of components of Clutch-Mechanical operation of Clutch-main types of Clutches(friction Clutch and fluid clutch only)- principle of friction clutches-description and working of dry friction clutches- simple problems -working of Hydraulically operated single plate clutch

3. Propeller Shaft and rear axle

Functions of propeller shaft-construction of propeller shaft with neat sketch- various universal joints in automobile- the function and operation of a Differential in an automobile- general arrangement of a live rear axle- different loads on rear axle- different methods of supporting rear axle shafts with sketch-difference between semi-Floating and fully floating rear axle.

4. Front Axle and Steering system

Introduction to front Axle- types of stub axle- brief description of Elliot - Reverse Elliot-Lamoine -Reverse Lamoine -description of front wheel stub axle assembly- Steering system- Functions & Requirement of steering system. Construction and working of steering linkage – principle of correct steering angle(without mathematical analysis) simple equation- –steering geometry- camber, caster, toe-in, toe-out- details of Ackerman steering mechanism-Power steering

5. Suspension systems and wheels& tyres:

Need for good suspension system-elements of suspension system- different types of suspension springs- Leaf Springs-Helical Springs-construction of leaf spring - Construction & working of McPherson & wishbone suspension –Air Suspension System- Construction & working of Telescopic shock absorbers-Types of Automobile wheels, their construction & working- essential requirements of wheels - Construction, working & comparison of radial, cross-ply and tubed , tubeless tyre - Tyre specifications-Factors affecting tyre life-Wheel Alignment and Balancing.

6. Brakes

Requirements of automobile Brake-transfer of weight during braking operation- wheel skidding and techniques to prevent wheel skidding-various factors influencing braking effect-Classification of brakes- mechanical shoe brake with legible sketch- the layout of hydraulically operated four wheel brake system with simple diagram and it's working in detail-schematic diagram showing the layout of complete air brake system and explain it's working in detail. Internal expanding brake - Disc brake- Anti-lock braking system(ABS).

REFERENCE BOOKS

1. Automobile Engineering Vol I, II, Kirpal Singh, Standard Publishers Distributors, Delhi. 2012.
2. Automobile Mechanics, A.K. Babu, S.C. Sharma, Khanna Publications, New Delhi
3. Automobile Engineering R.B.Guptha –
4. Automobile Mechanics William Crouse Tata Mcgraw hill
5. Automotive Mechanics Joseph Hitner
6. Automotive Engineering, Jain and Asthana, Tata McGraw Hill.
7. Automotive Engineering-G.B.S Narang
8. Automobile Engineering- Kirpalsingh
9. Automobile Engineering- Rajput
10. The motor vehicle- Newton steeds & Garret
11. Automotive Chassis- P.M. Heldt.

SUGGESTED RESOURCES

1. Automatic Transmission System
https://www.youtube.com/watch?v=u_y1S8C0Hmc
2. Rack & Pinion Steering mechanism.
<https://www.youtube.com/watch?v=L41jg9h-S0>
3. Anti-lock braking system(ABS)

<https://www.youtube.com/watch?v=ru4JIZ-x8yo>

4. McPherson & wishbone .

<https://www.youtube.com/watch?v=oZz7RD7KRI0>

5. Wheel Alignment and Balancing.

https://www.youtube.com/watch?v=7d2K_mKgsZ0

6. hydraulically operated four wheel brake system

<https://www.youtube.com/watch?v=82qBBJ8iwcc>

SUGGESTED STUDENT ACTIVITIES

1. Prepare list of various major automobile manufacturers of Two wheeler and four wheelers in India, along with their specification.
2. Prepare report on Top 10 Car/MUV/2W/Heavy vehicle Manufacturers in India & their sale in last 2 Years.
3. Collect the detail specification on Top 5 models of Car Manufactured in India
4. Download technical specifications/ catalogues, videos or any other suitable presentations on Automobile engines used in four wheelers
5. Download technical specifications/ catalogues, videos or any other suitable presentations on Automobile tyres/Power steering/Suspension system
6. Visit to four- wheeler service station & any automobile manufacturing unit. Prepare hand written report on aspects they observed in service station

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1.0 Introduction to basic structure of an automobile

- 1.1 Explain various components of an automobile.
- 1.2 Define the basic structure, the power plant, transmission system, the auxiliaries, the controls and the superstructure of an automobile.
- 1.3 List types of Chassis construction.
- 1.4 Define functions of frame.
- 1.5 Define loads on frame.
- 1.6 Explain Frame construction with a neat sketch.
- 1.7 Write various materials for frames
- 1.8 Explain Sub frames and defects in frames.
- 1.9 Explain Frameless construction with a sketch.
- 1.10 Explain Engine construction with a neat sketch.
- 1.11 Explanation of stationary and moving parts of engine

2.0 Transmission system & clutches

- 2.1 Functions of transmission system.
- 2.2 Explain Concept of total resistance to the vehicle motion-Tractive effort-necessity of transmission.
- 2.3 State Working of sliding mesh-Constant mesh-Synchromesh gear boxes.
- 2.4 State Working of selector mechanism with gear lever on top of transmission case

- 2.5 Explain Lubrication of gear box.
- 2.6 Explain Functions of Clutches.
- 2.7 Know Requirements of Clutch.
- 2.8 Give Brief description of components of Clutch, clutch plate-clutch facing- pressure plate-springs-Bearings.
- 2.9 Know Mechanical operation of clutch.
- 2.10 Illustrate Main types of clutches (Friction clutch and fluid clutch only).
- 2.11 Understand Principle of friction clutches - Coefficient of friction, Axial pressure (w) and mean radius of contact surfaces(R).
- 2.12 Give Description and working of dry friction clutches-Single plate, multi plate.
- 2.13 Formulas for Torque transmission for uniform pressure and uniform wear criterion (without derivation)
- 2.14 Simple problems on single plate and multiplate friction clutches.
- 2.15 Understand Working of hydraulically operated single plate clutch

3.0 Propeller Shaft and rear axle

- 3.1 Explain the functions of propeller shaft.
- 3.2 Understand the construction of propeller shaft with a neat sketch.
- 3.3 Explain various universal joints in automobiles.
- 3.4 Analyze the function and operation of differential in an automobile.
- 3.5 Understand the general arrangement of a live rear axle.
- 3.6 Give different loads on rear axle.
- 3.7 Explain Different methods of supporting rear axle shafts with sketch.
- 3.8 Give the difference between semi-floating and fully floating rear axle.

4.0 Front Axle and Steering

- 4.1 Define front axle.
- 4.2 Explain Stub axle-ELLIOT-Reversed ELLIOT-LAMOINE-ReversedLAMOINE-brief description.
- 4.3 Description of front wheel stub axle assembly.
- 4.4 Explain Factors influencing of wheel alignment.
- 4.5 Understand Factors pertaining to wheels -Balance of wheels-Inflation of tyres -Brake adjustment-Concept of Steering geometry - Camber - Kingpin inclination - Combined angle - castor - Toe-in & Toe-out and their effects
- 4.6 Explain Steering linkage - principle of correct steering angle (without mathematical analysis) simple equation.
- 4.7 Give details of Ackerman steering mechanism.
- 4.8 Understand concept of cornering force-self righting torque.
- 4.9 Understand concept of under steering & over steering.
- 4.10 Understand concept of Rack & Pinion Steering mechanism-Power steering

5.0 Suspension systems wheels and tyres

- 5.1 Explain Suspension system.
- 5.2 Know the Need for good suspension system.
- 5.3 List elements of suspension system.
- 5.4 Explain Leaf Springs.

- 5.5 Explain Helical Springs.
- 5.6 Explain Construction & working of McPherson & wishbone.
- 5.7 Explain Construction & working of Telescopic shock absorbers.
- 5.8 List types of Automobile wheels.
- 5.9 Explain construction & working of different Automobile wheels.
- 5.10 Explain essential requirements of wheels .
- 5.11 Explain Construction, working & comparison of radial, cross-ply and tubed , tubeless tyre .
- 5.12 Give Tyre specifications.
- 5.13 Explain Factors affecting tyre life.
- 5.14 Explain Wheel Alignment and Balancing.

6.0 Brakes

- 6.1 Know the requirements of a automobile brake.
- 6.2 Understand the transfer of weight during braking operation.
- 6.3 Explain wheel skidding and describe techniques to prevent wheel skidding.
- 6.4 Explain various factors influencing braking effect.
- 6.5 Give Classification of brakes.
- 6.6 Understand mechanical shoe brake with a neat sketch.
- 6.7 Explain the layout of hydraulically operated four wheel brake system with a simple diagram and explain its working in detail.
- 6.8 Explain the schematic diagram showing the layout of complete air brake system and explain the working of its main units in detail.
- 6.9 Explain the working of disc brakes
- 6.10 Explain about ABS

CO1	Explain basic structure of Automobile and analyze Chassis, Frame and Engine	R, U, A	1, 2, 4,5,6, 7	13
CO2	Analyze Transmission system of an Automobile	R, U, A	1, 2, 4,5, 7	12
CO3	Analyze and construct Propeller Shaft and rear axle of an Automobile	U, A	1, 2, 4,5, 7	12
CO4	Explain and illustrate front axle and steering system	U, A	1, 2, 4,5, 7	13
CO5	Explain Suspension system and types of wheels& tyres	U, A	2, 4,5, 7	12
CO6	Explain braking system and classification of brakes	R, U, A	1, 2, 4,5, 6,7	13
			Total Periods	75

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO Attainment Matrix:

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	2		3	2	2	3
CO2	1	2		3	2		3
CO3	1	2		3	2		3
CO4	1	2		3	2		3
CO5	1	2		3	2		3
CO6	1	2		3	2	2	3

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	1. Introduction to basic structure of an automobile	1, 2	5(a) 5(b)	7(a) 7(b)	
2	2. Transmission system	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	3.Cooling and lubrication system	1, 2	5(a) 5(b)	7(a) 7(b)	
2	4.Steering system and Braking system	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Legend	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MID SEM - I
MODEL PAPER
ME-584- AUTOMOBILE ENGINEERING

Time: 1 Hours

Max. Marks: 20

PART-A

4 X 1 = 4

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.
7. Define piston?
 8. List two functions of piston rings
 9. What is the requirements of Clutch
 10. What is the purpose of Clutch

PART-B

2 X 3 = 6

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.
11. (a) List various components of an automobile.
OR
5 .(b) What are different loads on frame.
 12. (a) List different types of gear boxes.
OR
6(b) What are the functions of transmission system.

PART-C

2 X 5 = 10

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.
- (7(a) Explain Engine construction with a neat sketch
OR
7(b) Explanation of stationary and moving parts of engine
 - 8(a) Explain Working of hydraulically operated single plate clutch
OR
8(b) Explain the working of Sliding mesh Gear box with a neat sketch

MID SEM - II
MODEL PAPER
ME-584- AUTOMOBILE ENGINEERING

Time: 1 Hours

Max. Marks: 20

PART-A

4 X 1 = 4

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.
1. What is the function of a propeller shaft?
 2. What is differential?
 3. Define front axle?
 4. Write correct steering angle?

PART-B

2 X 3 = 6

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.
5. (a) Give different loads on rear axle.

OR

5(b) what are Various universal joints in automobiles

6(a) List the functions of steering mechanism

OR

6(b) What are the requirements of steering mechanism

PART-C

2 X 5 = 10

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.
7. (a) Explain Different methods of supporting rear axle shafts with sketch.

OR

7(b) Give The difference between semi-floating and fully floating rear axle

8 (a) Explain Construction and working of Power Steering mechanism with a neat sketch.

OR

8(b) Explain Ackerman steering mechanism.

BOARD DIPLOMA EXAMINATION, (C-21)
SEE-MODEL PAPER
DME– V SEMESTER EXAMINATION
ME-584- AUTOMOBILE ENGINEERING

Time: 2 Hours

Max. Marks: 40

PART-A

8 X 1 = 8

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **ONE** mark.
1. List the different types of gear boxes.
 2. Define Kingpin inclination.
 3. List the elements of suspension system.
 4. List the types of Automobile wheels.
 5. List the factors affecting the tyre life.
 6. What is the Need for good suspension system.
 7. What is the requirements of a automobile brake.
 8. What is wheel skidding

PART-B

4 X 3 = 12

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **THREE** marks.

9(a). what are different types of Chassis construction

OR

9(b) . Explain tubed tyres.

10(a). Explain the construction of propeller shaft with a neat sketch

OR

10(b). list the types of Excavators.

11 (a) Explain telescopic shock absorbers

OR

11 (b) Explain the elements of suspension system.

12(a). Give Classification of brakes.

OR

12(b). Explain various factors influencing braking effect.

PART-C

4 X 5 = 20

- Instructions:** 1. Answer **ALL** questions.
2. Each question carries **FIVE** marks.

13 (a). Explain various components of an automobile.

OR

13 (b). explain wishbone suspension system.

14 (a) Explain working of Rack & Pinion Steering mechanism

OR

14 (b) Explain Anti-lock braking system.

15 (a) Explain McPherson suspension system..

OR

15 (b) Explain wheel alignment and balancing in a vehicle.

16 (a). Explain mechanical shoe brake with a neat sketch.

OR

16 (b) Explain wheel skidding and describe techniques to prevent wheel skidding.

EE-594-ELECTRIC VEHICLES

Course Title :	Electric Vehicles	Course Code	EE-594
Semester	V	Course Group	Core
Teaching Scheme in periods (L:T:P)	4:1:0	Credits	3
Methodology	Lecture + Assignments	Total Contact Periods :	75
CIE	60 Marks	SEE	40 Marks

Prerequisites

Basic knowledge of electrical machines, electric circuit analysis, power electronic converters
Battery technology, drive train, engines working principles of automobiles.

Course outcomes

On Successful completion of the course, the student will be able to

CO1 :	Analyze the architecture of electric vehicle
CO2 :	Explain the working concept of different components of EV and charging station
CO3 :	Design/size the drive train for EV, Battery, and charging station
CO4 :	Analyze and troubleshoot basic faults in different EV components and charging system
CO5 :	Repair and retrofit different components of EV and the charging station
CO6	Analyze the impact of EV integration on distribution system

Blue Print of Marks for SEE

Unit no	Unit name	Questions to be set for SEE (Q No)				Remarks	
		R		U	A		
1	Introduction to Electric Vehicles	4	1		9(a)	13(a)	
2	EV components						
3	Drive train in EV & HEV		2		10(a)	14(a)	
4	Battery charging Technologies and EV Charging Infrastructure						
5	Electric vehicle grid integration	3	5,6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)		
6	EVs and renewable energy (RE) integration, Troubleshooting			10(b) 12(a) 12(b)	14(b) 16(a) 16(b)		
Total questions		8		8	8		

Legend: R; Remembering, U: Understanding A: Applying

COURSE CONTENT

UNIT-1

Periods 10 (L: 08 – T: 02)

Introduction to Electric Vehicles

Introduction to Electric Vehicle(EV) – Hybrid Electric vehicle(HEV) – Plug-in Hybrid Electric vehicle (PHEV) - Types of Electric vehicles based on with and without differential – Types of HEV series, parallel, series-parallel and Complex - Fuel cell vehicles -Differences between EV and conventional vehicles - Differences between complete EV and Hybrid vehicles - Benefits of EV including environmental impacts – Single speed transmission - Government Schemes and Progress: FAME-1, FAME-2; Transformative -mobility and Energy Storage Mission, and other latest central level policies - State Policies, subsidies, and incentives - Global experiences and success stories on EV production

UNIT-2

Periods 15 (L: 12 – T: 03)

EV Components

Main components of EV sub-systems and configuration – an introduction - **Motor drive Technologies** - Electric Propulsion unit - Configuration and control of DC Motor drives - Induction Motor drives - Permanent Magnet Motor drives - Switched reluctance motor - **Energy storage technologies** – speed variation in EV - Introduction to energy storage devices in EV and

HEV- Definition of different battery parameters - Lead Acid Battery – Nickel based batteries – Lithium based batteries - Fuel Cell - Super Capacitor - Super Flywheel based energy storage and its analysis - Hybridization of different energy storage devices.

UNIT-3

Periods 10 (L: 08 – T: 02)

Drive train in EV and HEV:

Basic Architecture of Electric Drive Trains: General configuration of an electric vehicle, Alternatives Based on Drive train Configuration, Alternatives Based on Power Source Configuration, Single and Multi-motor Drives - In Wheel Drives.

Energy saving potential of Hybrid drive trains - Various HEV configurations and their operation modes - Power Flow in HEVs: Power Flow Control in Series Hybrid -Power Flow Control in Parallel Hybrid - Power Flow Control in Series-Parallel Hybrid - Power Flow Control in complex Hybrid - Torque Coupling and Analysis of Parallel Drive Train - Braking in EV – Regenerative braking – Hybrid braking.

UNIT-4

Periods 15 (L: 12 – T: 03)

Battery charging Technologies and EV Charging Infrastructure

Methods of charging - Domestic Charging Infrastructure - Public Charging Infrastructure – Fast Charging Station - Battery Swapping Station - Move-and-charge zone - Battery Management System - Power electronics related to power conversion related to charging, drive and control - Control systems for EV - Sizing the drive system - Sizing the propulsion motor, sizing the power electronics - Selecting the energy storage technology - Communications - supporting subsystems

EV Charging Infrastructure - EV Charging Fundamentals - Onboard and off board charger - Electric Vehicle Supply Equipment (EVSE) Types Characteristics - EVSE Standards and Communication Protocols - Next Generation Technologies: Super Chargers - Wireless Chargers - EVSE Management and Settlement Solutions - Effect of EV charging on generation and load profile - Smart charging technologies - EV charging facility planning - Centralized charging schemes - Decentralized charging schemes - Energy storage integration into Microgrid

UNIT-5

Periods 10 (L: 08 – T: 02)

Electric vehicle grid integration

Introduction - Impact of EV charging on distribution system (congestion, power quality issues etc.) – Smart charging - Vehicle to anything (V2X) technology (V2G, V2V, V2H, V2B etc.) - Grid up gradation for fast charging stations - Cost estimate of an EV charging station - Demand response from EVs - Voltage/reactive power support from EVs - Frequency support (inertial, primary, and secondary) from EVs - Fleet aggregation approaches for grid support services

UNIT-6

Periods 15(L: 12 – T: 03)

EVs and renewable energy (RE) integration, Troubleshooting

Scheduling of EVs for increased RE generation uptake - RE based EV charging stations - Correlation between EV charging and RE integration - Coordinated operation of EVs and distributed generation - Cost comparison of RE based EV charging with other alternatives Maintenance, repairing and services Troubleshooting faults in different EV components (Motor, drive train, battery etc.) - Repairing and rectifying faults in EV motor and components - EV battery and battery management systems - EV charging device repairing - Battery disposal & recycling

REFERENCE BOOKS

- 1 ATB on Modern EV, HEV and Fuel cell vehicles by Mehرداد Eshani, Yimin Gao
- 2 Hand book on EV charging Infrastructure Implementation by NITI Ayog, Govt Of India
- 3 NEPTel Notes on Introduction to EV & HEV
- 4 [Electric Vehicle trends - Electrical Installation Guide \(electrical-installation.org\)](http://electrical-installation.org/)
- 5 Electric Vehicles Integrated with Renewable Energy Sources for Sustainable Mobility
<https://www.intechopen.com>
- 6 [\(PDF\) A REVIEW ON RENEWABLE ENERGY INTEGRATION FOR ELECTRIC VEHICLES \(researchgate.net\)](https://www.researchgate.net/publication/312111111)

Suggested E-Learning references

1. <https://nptel.ac.in/courses/108/106/108106170/>
2. https://en.wikipedia.org/wiki/Category:Heavy_equipment
3. How does an Electric Car work? | Tesla Model S
<https://www.youtube.com/watch?v=3SAxXUIre28>
4. Tesla Model 3's motor - The Brilliant Engineering behind it
<https://www.youtube.com/watch?v=esUb7Zy5Oio>
5. Toyota Hybrid System <https://www.youtube.com/watch?v=jNuixuVhc5E>
6. How Does It Work? Honda's 2 Motor Hybrid System Explained!
https://www.youtube.com/watch?v=-P_VChTmGK8
7. Understanding the Honda Hybrid E-Drive
<https://www.youtube.com/watch?v=QLUIExAnNcE>

8. Electric Engine PRODUCTION - Audi e-tron MOTOR
<https://www.youtube.com/watch?v=uWBEPEspbWI>
9. BMW Electric Drive HOW IT'S MADE - Interior BATTERY CELLS Production Assembly Line
<https://www.youtube.com/watch?v=xvaQMTcckSg>
10. How Tesla Builds Cars So Fast <https://www.youtube.com/watch?v=KqXi6EkCdpQ>

SUGGESTED LEARNING OUTCOMES

Up on completion of the course the student shall be able to

1. Introduction to Electric Vehicles

- 1.1 Introduce to Electric vehicle and latest technology.
- 1.2 Know BEV, HEV and PHEV
- 1.3 List the advantages of BEV, HEV and PHEV
- 1.4 List disadvantages and limitations
- 1.5 Classify an EV based on Drive train Configuration (In wheel drives)
- 1.6 Know the effect of EV on environment
- 1.7 Summarise the concept of 'In Wheel Drives' in EV
- 1.8 Compare BEV and ICE
- 1.9 Compare BEV and HEV

2. EV components

- 2.1 List the various components of EV like
 - 2.1.1 Traction battery pack.
 - 2.1.2 DC-DC Converter.
 - 2.1.3 Electric motor.
 - 2.1.4 Power inverter.
 - 2.1.5 Charge Port.
 - 2.1.6 Onboard charger.
 - 2.1.7 Controller.
- 2.2 Know the purpose of each component
- 2.3 Introduce Electric motor as Propulsion unit
- 2.4 Know the types of Electric motors AC/DC
- 2.5 List the advantages of DC motors over AC
- 2.6 Know the construction and working of Induction motor
- 2.7 Explain the construction and working of Permanent magnet motor
- 2.8 Understand the construction and working of Switched reluctance motor
- 2.9 Know the various energy storage devices like Battery, Fuel cell, Super capacitor and super fly wheel

- 2.10 Know battery terminology like
 - 2.10.1 Depth of Discharge
 - 2.10.2 Daily Depth of Discharge
 - 2.10.3 Battery State of Charge (BSOC)
 - 2.10.4 self discharge rate
 - 2.10.5 Charge equalization
- 2.11 Know the effect of Temperature on battery performance
- 2.12 Understand the C- Rate parameter
- 2.13 Understand the Chemistry of Lead acid battery
- 2.14 Explain the construction and chemistry of Nickel based Battery
- 2.15 Know the complete details about Lithium based battery like Li-P and Lithium ion battery
- 2.16 Know the advantages/ Merits of Lithium battery as a energy source for EV
- 2.17 Know the need and concept of Hybridisation of various energy sources

3. Drive train in EV and HEV.

- 3.1 Explain General configuration of an electric vehicle.
- 3.2 Classify an EV based on Drive train Configuration.
- 3.3 Contrast the Alternatives in EV Based on Power Source Configuration.
- 3.4 Explain the concepts of Single and Multi-motor Drives in EV.
- 3.5 Summarise the concept of 'In Wheel Drives' in EV.
- 3.6 List the conceptual advantages and limitations of HEV's in terms of overall energy efficiency.
- 3.7 Explain the conceptual advantages and limitations of HEV's in terms of overall energy efficiency.
- 3.8 List the various possible ways of combining the power flow to meet the driving requirements in HEV.
- 3.9 Name the various drivetrain configurations in HEVs.
- 3.10 Outline the various drivetrain configurations in HEVs.
- 3.11 Spell the goals in power flow control in HEV's.
- 3.12 Infer four operating modes of power flow control in a Series HEV.
- 3.13 Explain the operating modes of power flow control in a Parallel HEV.
- 3.14 Interpret the ICE dominated power flow control modes in a Series Parallel HEV.
- 3.15 Summarize the EM dominated power flow control modes in a Series Parallel HEV.
- 3.16 Explain the basic concepts of mechanical coupling in Parallel HEV.

- 3.17 Outline concept of torque coupling in Parallel HEV.
- 3.18 Summarize the concept of speed coupling in Parallel HEV.
- 3.19 Illustrate two-shaft configuration or Dual transmission of parallel HEV using torque coupler.
- 3.20 Rephrase the pre-transmission configuration of a parallel HEV with torque coupling
- 3.21 Summarise the pre-transmission configuration of a parallel HEV with speed coupling

4. Battery charging Technologies and EV Charging Infrastructure

- 4.1 Definition and purpose of charging station
- 4.2 Understand AC and DC Charging
- 4.3 Know methods of AC charging
- 4.4 Summerise the domestic and Public charging equipment
- 4.5 Understand Method-1, 2 & 3 charging techniques
- 4.6 Types of connectors to plug the charging cable to the vehicle inlet like Type-1, type-2 and type-3 connector
- 4.7 Understand CHAdeMO connector, Combined charging system(CCS) Combo-1 and combo-2 connectors
- 4.8 Know the DC Method-4 charging
- 4.9 List advantages of DC fast charging
- 4.10 Understand the draw backs of Method- 1 &2 charging
- 4.11 Know onboard and off board charging
- 4.12 Understand Manual and automated battery swapping
- 4.13 List merits and demerits of battery swapping
- 4.14 Know the Indian standards IS17017 for AC charging
- 4.15 Know the difference between charging station and charging point
- 4.16 Understand the Wireless charging
- 4.17 Identify the various parts and working of Electric Vehicle Supply Equipment (EVSE)

5. Electric Vehicle Grid Integration

- 5.1 Know AC and DC Charging station and their specificness
- 5.2 Know the load calculation of a charging station
- 5.3 Analyse the effect of charging station on the local grid
- 5.4 Understand the requirements for locating a charging station
- 5.5 Know the International Electro technical Commission (IEC) standards for establishing EV charging station
- 5.6 Understand charging station output, single and multiple output

- 5.7 Identify various modes of charging communication Like Ethernet, Wi-Fi, 3G/4G, Bluetooth, NFC and even dry contact.
- 5.8 Know wall and floor charging installation
- 5.9 Explain charging station with and without cable
- 5.10 Explain fast charging station along with advantages and disadvantages
- 5.11 Understand the functions of Residual current devices and Over current protective devices
- 5.12 Understand the impact of EV charging on maximum power demand
- 5.13 Explain different types of power management for EV charging station
- 5.14 Define smart charging and various options V2X tech (V1G ,V2G, V2V, V2H, V2B)
- 5.15 Identify various elements of a EV charging station

6. EVs and renewable energy (RE) integration, Troubleshooting

- 6.1 List and understand various types of renewable energy sources
- 6.2 Know the term smart grid
- 6.3 Know the need of EV integration with renewable energy
- 6.4 Know advantages of EV integration with renewable energy
- 6.5 Know the safety aspects of EV
- 6.6 Understand the service and maintenance schedules of EV
- 6.7 Identify the challenges in EV integration with renewable energy
- 6.8 Explain EV integration with Wind energy
- 6.9 Explain EV integration with Solar energy
- 6.10 Know EV coordination
- 6.11 Identification of battery faults like
 - 6.11.1 Over charge and Over discharge
 - 6.11.2 Overheating and under cooling
 - 6.11.3 Short circuit or open circuit of inner cell
- 6.12 Know how to identify dead battery
- 6.13 Understand dead battery disposal and recycling
- 6.14 Identification of Motor faults
- 6.15 Identification of software problems
- 6.16 Know using OBD (On-board diagnostics) scanning tools
- 6.17 Understand Remote diagnostics
- 6.18 Identify the Power electronics faults

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	2	1	-	-	-	2	1,2,3,7
CO2	2	1	-	-	-	-	2	1,2,7
CO3	3	2	-	-	1	1	2	1,2,5, 6,7
CO4	3	2	1	-	-	1	3	1,2,3,6,7
CO5	3	2	1	-	-	1	2	1,2,3,6,7
CO6	1	1	1	-	-	-	2	1,2,3,7

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No.of Questions	Marks for each question	Questions to be attempted	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

Question Paper Blue Print for CIE (MID I)

Unit no	Unit name	Questions to be set for MID-I			Remarks
		R	U	A	
1	Introduction to Electric Vehicles	1,2	5(a) 5(b)	7(a) 7(b)	
2	EV components	3,4	6(a) 6(b)	8(a) 8(b)	
Total questions		4	4	4	

Question Paper Blue Print for CIE (MID II)

Unit no	Unit name	Questions to be set for MID-II			Remarks
		R	U	A	
3	Drive trains in EV & HEV	1,2	5(a) 5(b)	7(a) 7(b)	
4	Battery charging Technologies and EV Charging Infrastructure	3,4	6(a) 6(b)	8(a) 8(b)	
Total questions		4	4	4	

ME-575- INDUSTRIAL ENGINEERING & ESTIMATION AND COSTING

Course Title:	Industrial Engineering & Estimation and Costing	Course Code:	ME-575
Semester:	V	Course group :	Core
Teaching Scheme(L:T:P):	4:1:0	Credits:	3
Methodolgy :	Lecture + Assignment	Total contact periods:	75
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: Knowledge of Basic Sciences and Industrial Management.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

Course Outcomes	
CO1	Explain the need of method study and work measurements
CO2	Explain wage payment methods and incentives and compare various merit-rating methods and
CO3	Express the importance of inspection and quality control and apply SQC tools in a given situation
CO4	Identify the constituents of Estimation and costing, and explain difference between Estimation and costing
CO5	Identify various overheads and compute selling price of a product, explain about depreciation, and Estimate the weight and cost of a material for a given product
CO6	Estimate the machining time and cost of Fabrication, Forging and foundry

Blue Print of Marks for SEE:

Units		No of periods	Questions to be set for SEE				Remarks	
			R		U	A		
Part-A	1.Work study-Method study, Work measurement	13	Q4	Q1		Q9(a)	Q13(a)	
	2. Wages & Incentives and Merit rating	12						
Part-B	3. Inspection, Statistical quality control	13		Q2		Q10(a)	Q14(a)	
	4. Fundamentals of Estimation & Costing	12						
Part-C	5. Estimation of Selling Price, Depreciation and weight of materials	13		Q3		Q9(b) Q11(a) Q11(b)	Q13(b) Q15(a) Q15(b)	
	6. Estimation of Manufacturing Time and cost	12						Q7 Q8
TOTAL		75	08		08	08		

COURSE CONTENT

1. **Work study-** Meaning and purpose- Components of Work study-Productivity-Methods of improving Productivity

Method Study

Method study – purpose, Basic procedure for conduct of method study, Tools used: Outline process chart, Flow process chart, Two hand process chart, Micro motion study- Principles of Motion economy, Therbligs, SIMO Chart, Cyclegraph, Chronocyclegraph

Work measurement

Time study –Purpose, Basic procedure for conduct of Time study, Performance rating, Rating scales, Time allowances, Determination of Normal Time & standard time, Techniques of work measurement, Stop watch study, Procedure, PMTS, advantages, Work sampling, advantages, Simple problems on Work sampling.

2. Wages & Incentives and Merit Rating

Wage –Definition, types, causes for wage differentials, Standard Wage payment methods, Incentives-meaning, types-Methods of incentive payments-Halsey premium plan, Rowan plan, Emerson's efficiency bonus system, Taylor's differential piece rate system illustration, problems Merit rating-Definition, Objectives, Methods, Advantages-disadvantages.

3. Inspection & Statistical Quality Control

Inspection – objectives, Functions of inspection Department, Methods of inspection(No Explanation) . Quality control-necessity, variation in manufacture-assignable causes, chance causes, Quality characteristics-variables, attributes, Control charts for variables and attributes, advantages. Sampling plans-OC curve, illustration, importance, Single sampling plan, Double sampling plan, Difference between Control charts and sampling plans.

4. Fundamentals of Estimation & Costing

Estimation-objectives, Functions of estimation, qualities of estimator, Constituents of Estimation - design time, drafting, planning and production time, design and procurement, manufacture of special tools and equipment,labour,materials, overheads, miscellaneous expenses - estimation procedure

Costing– objectives, elements of costing viz., material, labour and expenses, Estimation and costing differences.

5. Estimation of Selling price, Depreciation and weight of materials

Prime cost, On cost(Expenses), Total cost of a product, Selling price of a product, Simple problems. Depreciation- Introduction, Causes of depreciation, Methods for calculating depreciation (No Explanation)- Sinking fund method illustration, Simple problems on sinking fund method. Estimation of weights – Principles of dividing the component drawing into simple and smaller geometrical configurations, Calculation of volume and the weight of the material, Estimation of cost of material, Problems on calculation of weights of material and material cost.

6. Estimation of Manufacturing Time

Estimation of machining time-Formulae for calculation of machining times for turning, drilling, simple problems on calculation of machining time for the above mentioned operations. Estimation of fabrication cost-Fabrication – types, cost of fabrication by gas welding and arc welding, Simple Problems

Estimation of forging cost-Components of forging cost, estimation of stock length, net weight, gross weight, estimation of stock size (No Problems)

Estimation of foundry costs--Components of foundry cost-cost of metal, cost of metal melting, moulding cost, core cost, cleaning cost, grinding and tooling cost.

REFERENCE BOOKS

1. Introduction to Work-study by ILO.
2. Work study by Ralph & Barnes
3. Industrial Engineering and Management, O.P. Khanna, Revised Edition, Dhanpat Rai Publications (P) Ltd.,
4. Industrial Engineering & Management Science by TR Banga
5. SQC by Juran
6. SQC by M.Mahajan.
7. SQC by Grant &Levenworth
8. Mechanical Estimating and costing by TR Banga, SC Sharma, Khanna Publishers.

ELECTRONIC RESOURCES

1. <https://nptel.ac.in/courses/>
2. <https://www.slideshare.net/>
3. <https://en.wikipedia.org/wiki/>
4. <http://ndl.ethernet.edu.et/bitstream/>

SUGGESTED STUDENT ACTIVITIES

1. Prepare a case study on productivity improvement by using Work study .
2. Identify various jobs in any organization and their pay.
3. Identify various quality control methods for daily used products .
4. Identify various administrative expenses in your institution.
5. Estimate the Total cost of a sheetmetal tray you done in the workshop.
6. Estimate the Forging cost of one experiment you done in the Forging shop

SUGGESTED LEARNING OUTCOMES

Upon completion of the course the student shall be able to

1. Work study-Method study, Work measurement

- 1.1. Define Work study, Method study, Work measurement.
- 1.2. Define productivity and methods of improving productivity.
- 1.3. State the objectives of Work study, Method study, Work measurement
- 1.4. State the advantages and disadvantages of Work study, Method study, Work measurement
- 1.5. Explain the Method study procedure.
- 1.6. Explain micro motion study in method study.
- 1.7. Explain Therbligs symbols
- 1.8. Use of various recording techniques
- 1.9. Explain Time study procedure
- 1.10. Illustrate performance rating and rating scales
- 1.11. Explain work measurement techniques

2. Wages & Incentives and Merit Rating

- 2.1. Define the term wage,
- 2.2. Explain types of wages
- 2.3. Explain Causes for wage differentials
- 2.4. Explain standard wage plans.
- 2.5. Define Incentive
- 2.6. List types of incentives.
- 2.7. Explain Methods of incentive payments-Halsey premium plan, Rowan plan, Emerson's efficiency bonus system, Taylor's differential piece rate system
- 2.8. Practice Problems to find incentives
- 2.9. State the purpose of merit rating

- 2.10. Explain the methods of merit rating a) Rating scale method b) Check list method c) Employee comparison method.
- 2.11. State the advantages and disadvantages of merit rating

3. Inspection & Statistical Quality control.

- 3.1. Define the term Inspection.
- 3.2. List different inspection methods
- 3.3. Explain the functions of inspection department
- 3.4. State the types of causes of variations –Assignable and Chance causes
- 3.5. Define Variable and attributes
- 3.6. State the objectives for X and R Chart
- 3.7. Construct control charts for variables and attributes charts in a given situation
- 3.8. Explain OC curve
- 3.9. Explain single sampling plan
- 3.10. Explain Double sampling plan
- 3.11. State the difference between control charts and sampling plans.

4 Fundamentals of Estimation and costing.

- 4.1. Definition of Estimation
- 4.2. Definition of costing
- 4.3. State Objectives of Estimation
- 4.4. Constituents of Estimation
- 4.5. Explain Qualities of a Estimator
- 4.6. Illustrate Constituents of Costing
- 4.7. Explain direct material cost and indirect material cost
- 4.8. Explain direct labour cost and indirect labour cost
- 4.9. Define various overheads with examples
- 4.10. Explain Difference between Estimation and costing

5 Estimation of selling price, depreciation, and weight of a material.

- 5.1 Define direct overheads and indirect overheads
- 5.2 Define Prime cost, factory cost, office cost, Total cost and selling price
- 5.3 Estimate the selling price of a given product
- 5.4 Define Depreciation,
- 5.5 Explain the terms book value ,scrap value, appreciation and depreciation
- 5.6 Explain Causes of Depreciation
- 5.7 List methods of Depreciation
- 5.8 Explain sinking fund method to find depreciation of a machine.
- 5.9 Compute Depreciation of a machine using sinking fund method.
- 5.10 Review of mensuration formulae for regular 2D figures including fillets, segments of circles

- 5.11 Review of mensuration formulae for regular 3D solids including solids of revolutions and segments
- 5.12 Principles of dividing the component drawing into simple and smaller geometrical configurations
- 5.13 Practice Simple problems on estimation of weights of various machine components

6 Estimation of Manufacturing time

- 6.1 Define machining time
- 6.2 Recall the meaning of cutting speed, feed, depth of cut
- 6.3 Practice simple problems on Estimation of machining time
- 6.4 Define Fabrication
- 6.5 List types of Fabrication
- 6.6 Estimate Fabrication cost of Gas welding
- 6.7 Estimate Fabrication cost of Arc welding
- 6.8 Define Forging
- 6.9 Explain components of Forging cost
- 6.10 Explain Estimation of Stock length net weight Gross weight and stock size
- 6.11 Define Foundry
- 6.12 Explain components of Foundry cost

COURSE OUTCOMES		CL	Linked POs	Teaching Periods
CO1	Explain the need of method study and work measurements	R, U, A	2,5,6	13
CO2	Explain wage payment methods and incentives and compare various merit-rating methods and	R, U, A	1,2,7	12
CO3	Express the importance of inspection and quality control and apply SQC tools in a given situation	U, A	2,6,7	13
CO4	Identify the constituents of Estimation and costing, and explain difference between Estimation and costing	U, A	1,5,7	12
CO5	Identify various overheads and compute selling price of a product, explain about depreciation, and Estimate the weight and cost of a material for a given product	U, A	1,2,7	13
CO6	Estimate the machining time and cost of Fabrication, Forging and foundry	R, U, A	1,2,7	12
			Total Periods	75

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO Attainment Matrix:

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1		3			1	2	
CO2	1	2					2
CO3		3				2	1
CO4	3				2		1
CO5	2	3					1
CO6	2	3					1

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	1. Work study-Method study, Work measurement	1, 2	5(a) 5(b)	7(a) 7(b)	
2	2. Wages & Incentives and Merit rating	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	3. Inspection, Statistical quality control	1, 2	5(a) 5(b)	7(a) 7(b)	
2	4. Fundamentals of Estimation & Costing	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Legend	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MID SEM-I
Model Paper :: ME-575
Industrial Engineering & Estimation and Costing

Time: 1 hr

Max. Marks:20

PART-A

4x1=4Marks

NOTE: 1) Answer all questions and each carries one mark.

2) Answers should be brief and straight to the point and shall not exceed three simple sentences.

1. Write any two advantages of work study.
2. Define work measurement.
3. Define incentive.
4. List the different types of wage payment methods.

PART-B

2X3M=6

Marks

NOTE: 1) Answer all questions and each carries three mark.

2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.

5. (a). What are therbligs? Give any two symbols of them.
5. (b). Distinguish between Method study and Time Study?
6. (a). Explain Halsey premium plan.
6. (b). Write three advantages of merit rating.

PART-C

2X5M=10

Marks

NOTE: 1) Answer all questions and each carries five mark.

2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.

- 7.(a). Prepare Two hand process chart for assembly of nut and bolt.
- 7.(b). Define work sampling. State two advantages.
- 8.(a). List merit rating methods any Explain any one.
8. (b). Describe balanced or combined wage payment method.

MID SEM-II
Model Paper :: ME-575
Industrial Engineering & Estimation and Costing

Time: 1 hr

Max. Marks:20

PART-A

4x1=4Marks

NOTE: 1) Answer all questions and each carries one mark.

2) Answers should be brief and straight to the point and shall not exceed three simple sentences.

1. Mention two advantages of inspection.
2. Define Variables?.
3. Define Estimation?
4. What are the elements that constitute prime cost?

.

PART-B

2X3M=6

Marks

NOTE: 1) Answer all questions and each carries three mark.

2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.

5. (a). State three objectives of $\bar{X}$ and R charts.
5. (b). Write any three differences between single sampling plan and double sampling plan?
6. (a) Write the elements of Costing.
6. (b). Give three examples of overheads.

PART-C

2X5M=10

Marks

NOTE: 1) Answer all questions and each carries five mark.

2) Answers should be comprehensive and the criterion for valuation is the content but not length of the answer.

- 7.(a). Draw and explain the main characteristics of an OC curve.
- 7.(b). Write five functions of Inspection department
- 8.(a). Differentiate between estimating and costing.
8. (b) Briefly explain the estimating procedure.

BOARD DIPLOMA EXAMINATION, (C-21)
SEE-MODEL PAPER, ME-575
DME– V SEMESTER EXAMINATION
Industrial Engineering & Estimation and Costing

Time: 2 Hours

Max. Marks: 40

PART-A

8 X 1 = 8

- Instructions: 1. Answer ALL questions.
2. Each question carries ONE mark.
9. Define method study.
 10. List the methods of inspection
 11. Define depreciation.
 12. Define standard time.
 13. Write the formula to find the volume of Frustum of cone and sphere.
 14. Define factory cost.
 15. Write the formula to find stock size in forging.
 16. Write two indirect expenses in foundry.

PART-B

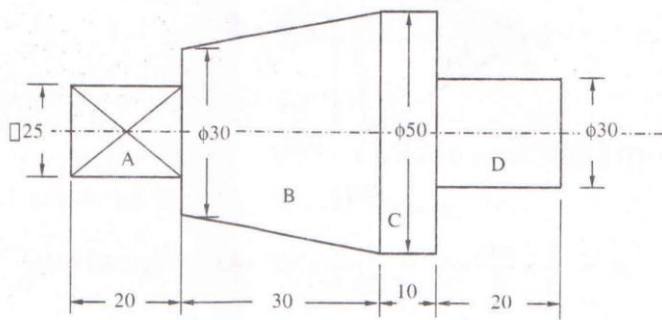
4 X 3 = 12

- Instructions: 1. Answer ALL questions.
2. Each question carries THREE marks.
10. (a) Write three advantages of Work measurement.
OR
 11. (b) Write five causes of depreciation.
 12. (a) Write three functions of inspection department.
OR
 12. (b) Write the components considered in estimation of foundry cost.
 13. (a) Write the procedure for estimating the weight of a material
OR
 13. (b) List various overheads and give one example of each.
 14. (a) Write the components considered for estimation of fabrication cost
OR
 14. (b) List the components considered for direct cost in foundry.

PART-C

4 X 5 = 20

- Instructions: 1. Answer ALL questions.
2. Each question carries FIVE marks.
15. (a) Explain any two recording techniques in method study.
OR
 - 13(b) The density of material for the part shown in figure is 8.5 gm/cc. Calculate the weight of the work piece and also the cost, if rate of material is Rs 30/kg.



All Dimensions are in mm

14(a) Draw and Explain main characteristics of an OC (operating characteristic) curve

OR

14(b) Two 1m long M.S plates of 10mm thick are to be welded by a lap joint with the help of 6mm electrode. Assume the following data. Calculate the cost of welding.

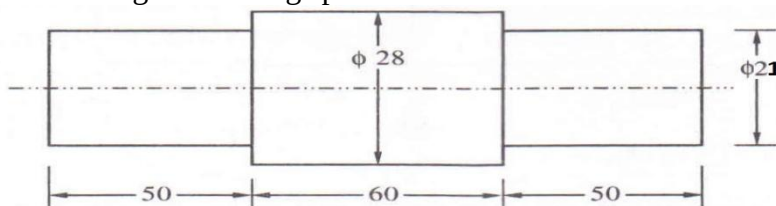
- Current used = 250 amperes
- Voltage = 30V
- Welding speed = 10m/hr
- Electrode used = 0.5 Kg/m of welding
- Labour charges = Rs 15/hr
- Power charges = Rs 1per Kwh
- Cost of electrodes = Rs 15/ Kg
- Machine efficiency = 60%

15 (a) Define the terms book value, Scrap value, appreciation , depreciation and depreciation fund.

OR

15(b) A machine was purchased for Rs. 30,000/-. After 4 years, the value of the machine was estimated at Rs. 10,000. Find the depreciation using sinking fund method. The rate of interest being 5%.

16(a)Find the time required to turn 3.5 cm diameter bar to the dimensions shown in figure. Cutting speed is 15.4 m/min and feed is 1 mm/rev. All cuts are mm deep.



OR

16(b) Write the procedure for estimating the stock size in forging

ME-585-MECHATRONICS

Course Title:	Mechatronics	Course Code:	ME-585
Semester:	V	Course group :	Core
Teaching Scheme(L:T:P):	4:1:0	Credits:	3
Methodolgy :	Lecture + Assignment	Total contact periods:	75
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: Knowledge of Basic Science and Engineering

COURSE OUTCOMES

On successful completion of the course, the students will be able to

CO1	Familiar with the classification and basic mechanisms of the Robots
CO2	Understand the various drive systems and sensors used in robotic systems
CO3	Understand the different Kinematics and Dynamics of Robots
CO4	Understand the concepts of Mechatronics System Models and Controllers
CO5	Know the basic PLC architecture and PLC programming concepts.
CO6	Understand the design examples of mechatronic system and also to know the condition monitoring of production systems using sensors

Blue Print of Marks for SEE:

Units		No of periods	Questions to be set for SEE				Remarks	
			R		U	A		
Part-A	1. Fundamentals of Robotics	12	Q4	Q1	Q9(a)	Q13(a)		
	2. Robotic Drive System and Controller	13						
Part-B	3. Sensors & Applications	12		Q2	Q10(a)	Q14(a)		
	4. Introduction to Mechatronics	13						
Part-C	5. Programmable Logic Controller (PLC)	13		Q3	Q5 Q6	Q9(b) Q11(a) Q11(b)	Q13(b) Q15(a) Q15(b)	
	6. Design Examples in Mechatronics	12				Q7 Q8	Q10(b) Q12(a) Q12(b)	
TOTAL		75	08		08	08		

COURSE CONTENT

1. Fundamentals of Robotics:

Introduction; Definition; Robot anatomy (parts) and its working; Robot Components: Manipulator, End effectors; Construction of links, Types of joints; Classification of robots; Cartesian, Cylindrical, Spherical, SCARA, delta & articulated; Structural Characteristics of robots; Mechanical rigidity; Advantages and disadvantages of robots.

2. Robotic Drive System and Controller: Actuators; Hydraulic, Pneumatic and Electrical drives; Linear actuator; Rotary drives; AC servo motor; DC servo motors and Stepper motors; Conversion between linear and rotary motion; Robot controller; Level of Controller; Open loop and Closed loop controller; Microprocessor based control system; Robot path control: Point to point, Continuous path control and Sensor based path control.

3. Sensors & Applications:

Requirements of a sensor; Principles and Applications of the following types of sensors: Position sensors (Encoders, Resolvers, Piezo Electric); Range sensors (Triangulation Principle, Structured lighting approach); Proximity sensing; Force and torque sensing. Industrial Applications: Application of robots in machining; welding; assembly and material handling.

4. Introduction to Mechatronics:

Importance of Mechatronics; Systems: Measurement systems; Control systems and their types; Open and Closed-loop control Systems; Examples of Open loop and closed loop systems.

Mathematical Model:

Introduction to Mathematical model; Mechanical System building blocks; Electrical System building blocks; Fluid System building blocks; Thermal System building blocks.

System Model:

Engineering Systems: Rotational, Translational Systems; Electro-Mechanical System; Hydraulic and Mechanical Systems;

5. Programmable Logic Controller (PLC):

Definition; Basic block diagram and structure of PLC; Input/output processing; PLC Programming: Ladder diagram, its logic functions, Latching and Sequencing; PLC mnemonics; Timers; Internal relays and Counters; Shift registers; Master and Jump Controls; Data handling; Analog input/output; Selection of PLC, types of PLC

6. Design Examples in Mechatronics:

Design process stages; Traditional Vs Mechatronics designs; possible design solutions: Timed switch, Wind-screen wiper motion, Bath room scale; Case studies of Mechatronics systems: A pick-and-place robot, automatic car parking system, Car engine management system, Automatic Camera and Automatic Washing Machine only

Text Books:

1. Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, "Industrial Robotics, Technology programming and Applications", McGraw Hill, 2012.
2. Craig. J. J. "Introduction to Robotics- mechanics and control", Addison- Wesley, 1999.
3. W.Bolton, "Mechatronics" , Pearson education, second edition, fifth Indian Reprint, 2003.
4. Smaili and F. Mrad, "Mechatronics- integrated technologies for intelligent machines", Oxford university press, 2008.

Reference Books:

1. Mechatronics – W. Bolton, Pearson Education India.
2. A Text Book on Mechatronics – R.K.Rajput, S.Chand&Co, New Delhi.
3. Exploring Programmable Logic Controllers with applications Pradeep Kumar Srivatsava, BPB
4. Publications.
5. Michael B. Hstand and David G. Alciatore, " Introduction to Mechatronics and Measurement Systems", McGraw-Hill International Editions, 2000. D. A. Bradley, Dawson D., Buru N.C. and. Loader A.J, "Mechatronics", Chapman and Hall, 1993.
6. Dan Neculescu, "Mechatronics", Pearson Education Asia, 2002 (Indian Reprint).
7. Lawrence J. Kamm, "Understanding Electro – Mechanical Engineering", An Introduction to Mechatronics, Prentice – Hall of India Pvt., Ltd., 2000.
8. Nitaigour Premchand Mahadik, "Mechatronics", Tata McGraw-Hill publishing Company Ltd, 2003.

ELECTRONIC RESOURCES

1. <https://nptel.ac.in/courses/>
2. <https://www.slideshare.net/>
3. <https://en.wikipedia.org/wiki/>
4. <http://ndl.ethernet.edu.et/bitstream/>

SUGGESTED LEARNING OUTCOMES

1. Fundamentals of Robotics:

- 1.1. Know the history of robots & define the term robot
- 1.2. Understand the basic terminology related to Robots - Accuracy, Repeatability, Resolution, Degree of freedom.
- 1.3. Know the anatomy & basic components of a robot such as manipulator and end effectors.
- 1.4. Familiar with the Grippers-different methods of gripping, Mechanical grippers- Slider crank mechanism, Screw type, Rotary actuators, Cam type gripper, Magnetic grippers, Vacuum grippers, Air operated grippers; Specifications of robot.
- 1.5. Familiar with the construction of links in a robot.
- 1.6. Know the types of joints in a robot.

- 1.7. Understand the Classification of robots such as Cartesian, Cylindrical, Spherical, SCARA, delta & articulated
- 1.8. Understand the Structural Characteristics of robots.
- 1.9. Understand the concept of Mechanical rigidity
- 1.10. Familiar with the advantages and disadvantages of robots

2. Robotic Drive System and Controller:

- 2.1. Familiar with different Drive systems of the Robots like - hydraulic, pneumatic and electric systems
- 2.2. Familiar with different Actuators
- 2.3. Understanding the working of AC servo motor
- 2.4. Understanding the working of DC servo motor
- 2.5. Understanding the working of stepper motors
- 2.6. Familiar with the conversion between linear and rotary motion.
- 2.7. Familiar with the Robot controller & level of controller
- 2.8. Distinguish between Open loop and Closed loop controller
- 2.9. Understanding the microprocessor based control system
- 2.10. Familiar with different Robot path controls such as Point to point, Continuous path control and Sensor based path control.

3. Sensors & Applications:

- 3.1. Understand the functions of sensors in robots
- 3.2. Know about the requirements of a sensor.
- 3.3. Know about the classification of sensors.
- 3.4. Understanding the Principles and Applications of Position sensors (Encoders, Resolvers, Piezo Electric)
- 3.5. Understanding the Principles and Applications of Range sensors (Triangulation Principle, Structured lighting approach)
- 3.6. Understanding the Principles and Applications of Proximity sensors
- 3.7. Understanding the Principles and Applications of Force and torque sensors
- 3.8. Knowing about various applications of robot.
- 3.9. Familiar with the industrial applications of robots in machining & welding
- 3.10. Familiar with the industrial applications of robots in assembly and material handling

4. Introduction to Mechatronics:

- 4.1. Understanding the scope & importance of Mechatronics.
- 4.2. Familiarize with measurement systems.
- 4.3. Familiarize with control systems and their types; Open and Closed-loop control Systems; Examples of Open loop and closed loop systems.
- 4.4. Know the Mathematical Model of a system.
- 4.5. Know the Mechanical & Electrical System building blocks.

- 4.6. Know the Fluid & Thermal System building blocks.
- 4.7. List out the different Engineering System Models.
- 4.8. Understand the Engineering System Models such as Rotational, Translational Systems.
- 4.9. Understand the Engineering System Models such as Electro-Mechanical System.
- 4.10. Understand the Engineering System Models such as Hydraulic and Mechanical Systems.

5. Programmable Logic Controller (PLC):

- 5.1. Understand the basic definition of PLC
- 5.2. Be aware of the basic block diagram and structure of PLC
- 5.3. Understand the concept of Input/output processing
- 5.4. Familiarize basic PLC Programming
- 5.5. Be aware of Ladder diagram its logic functions
- 5.6. Familiarize Latching and Sequencing of PLC
- 5.7. Understand about mnemonics, Timers, Internal relays and Counters
- 5.8. Understand about Shift registers, Master and Jump Controls, Data handling & Analog input/output in PLC
- 5.9. Know the selection of PLC
- 5.10. Illustrate the different types of PLC

6. Design Examples in Mechatronics:

- 6.1. Familiarize the design process stages in Mechatronics
- 6.2. Understand the difference between Traditional Vs Mechatronics designs
- 6.3. Know the concept of timed switch, Wind-screen wiper motion and Bath room scale
- 6.4. Understand the case studies of Mechatronics systems: Pick-and-place robot
- 6.5. Understand the case studies of Mechatronics systems: Car park barrier
- 6.6. Understand the case studies of Mechatronics systems: Car engine management system
- 6.7. Understand the case studies of Mechatronics systems: Automatic Camera and
- 6.8. Understand the case studies of Mechatronics systems: Automatic Washing Machine

COURSE OUTCOMES		CL	Linked POs	Teaching Periods
CO1	Familiar with the classification and basic mechanisms of the Robots	R, U, A	1,2,4,7	12
CO2	Understand the various drive systems used in robotic systems	R, U, A	1,3,4,6,7	13
CO3	Understand the different sensors used in robotic systems & its industrial applications	R, U, A	1,2,3,4,7	12
CO4	Understand the concepts of Mechatronics System Models	R, U, A	1,4,7	13
CO5	Know the basic concepts about PLC	R, U, A	1,2,3,4,6,7	13
CO6	Understand the design examples of mechatronic system	R, U, A	1,2,3,4,7	12
Total Periods				75

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO Attainment Matrix:

CO'S	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	3	1	-	2			2
CO2	3	-	1	2		1	2
CO3	3	2	1	1			2
CO4	3	-	-	2			3
CO5	3	-	1	2		1	2
CO6	3	2	1	2			2

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

MID SEM-I EXAM

Unit No	Unit Name	R	U	A	Remarks
1	Fundamentals of Robotics	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Robotic Drive System and Controller	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

Unit No	Unit Name	R	U	A	Remarks
3	Sensors & Applications	1, 2	5(a) 5(b)	7(a) 7(b)	
4	Introduction To Mechatronics	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

**MID SEM - I
MODEL PAPER
MECHATRONICS (ME-585)**

Time: 1 Hours

Max. Marks: 20

PART-A

4 X 1 = 4

Instructions: 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

1. Define Robot.
2. What is a manipulator of a robot?
3. What is an actuator of a robot?
4. List out any two types of controllers.

PART-B

2 X 3 = 6

Instructions: 1. Answer **ALL** questions.

2. Each question carries **THREE** marks.

5. (a) Classify robots.
OR
5. (b) State advantages of robots.
6. (a) Distinguish between AC & DC servo motors.
OR
6. (b) How a linear motion can be converted into rotary motion.

PART-C

2 X 5 = 10

Instructions: 1. Answer **ALL** questions.

2. Each question carries **FIVE** marks.

7. (a) Explain briefly about Cartesian robot.
OR
7. (b) Explain briefly about end effectors of a robot.
8. (a) Briefly explain the working of a hydraulic driver.
OR
8. (b) Briefly explain about types of robot path control.

**MID SEM - II
MODEL PAPER
MECHATRONICS (ME-585)**

Time: 1 Hours

Max. Marks: 20

PART-A

4 X 1 = 4

Instructions: 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

1. What is a robot sensor?
2. What is an encoder?
3. Give any two examples of mechatronics system?
4. List out any two types of engineering system models.

PART-B

2 X 3 = 6

Instructions: 1. Answer **ALL** questions.

2. Each question carries **THREE** marks.

5. (a) Classify robot sensors. Give examples for each of them.
OR
5. (b) List out various industrial applications of robots.
6. (a) Distinguish between open and closed-loop control Systems.
OR
6. (b) How a linear motion can be converted into rotary motion.

PART-C

2 X 5 = 10

Instructions: 1. Answer **ALL** questions.

2. Each question carries **FIVE** marks.

7. (a) Explain briefly about Cartesian robot.
OR
7. (b) Explain briefly about end effectors of a robot.
8. (a) Briefly explain the working of a hydraulic driver.
OR
8. (b) Briefly explain about types of robot path control.

BOARD DIPLOMA EXAMINATION, (C-21)
SEE-MODEL PAPER
DME– V SEMESTER EXAMINATION
MECHATRONICS (ME-585)

Time: 2 Hours

Max. Marks: 40

PART-A

8 X 1 = 8

Instructions: 1. Answer **ALL** questions.

2. Each question carries **ONE** mark.

17. What is an 'end effector'.
18. List out any two types of sensors.
19. What is a ladder diagram in PLC language?
20. What is the function of a linear actuator?
21. Give a simple example where latching is used in PLC.
22. What is the main function of PLC?
23. Give any two practical applications where mechatronics systems are involved.
24. What is the function of a timed switch?

PART-B

4 X 3 = 12

Instructions: 1. Answer **ALL** questions.

2. Each question carries **THREE** marks.

11. (a) List out different types of drives used in robots.
OR
13. (b) Write short notes on data handling in PLC.
14. (a) What is the importance of mechatronics?
OR
14. (b) Briefly explain about Wind-screen wiper motion.
15. (a) Briefly explain the types of PLCs used in industries.
OR
15. (b) List out any three advantages of PLC control systems.
16. (a) List out the movements that are required for a pick-and-place robot.
OR
16. (b) Draw the block diagram of car engine management system.

PART-C

4 X 5 = 20

Instructions: 1. Answer **ALL** questions.

2. Each question carries **FIVE** marks.

17. (a) Explain briefly about robot anatomy and its working

OR

13. (b) Explain briefly about master and jump controls in PLC.

14. (a) Briefly explain about proximity sensing.

OR

14. (b) Explain various stages in designing mechatronics system.

15. (a) Explain the basic structure of a PLC with a block diagram

OR

15. (b) Explain the input/output processing in a PLC.

16. (a) Distinguish between traditional and mechatronics designs..

OR

(b) Explain the automatic car parking system using PLCs with a block diagram.

ME-506-CAM LAB

Course Title:	CAM Lab	Course Code:	ME-506
Semester:	V	Course group :	Core
Teaching Scheme(L:T:P):	1:0:2	Credits:	1.5
Methodolgy :	Lecture + Assignment	Total contact periods:	45
CIE:	60 Marks	SEE:	40 Marks

Pre requisites

This course requires the basic knowledge of manufacturing process and Auto CAD

COURSE OUTCOMES

At the end of the course the students will have the ability:	
CO1	Identify the parts and functions of each component of CNC Lathe
CO2	To use incremental and absolute coordinate system on dimensioning understands different types of interpolation.
CO3	Familiar with the options/features available in the simulation software screen
CO4	Write a simple part program using G-Codes and M-Codes for various operations.
CO5	Execute a part program using CNC lathe machine simulation software
CO6	Write a part program using cycles as per the drawing and produce parts

OBJECTIVES

Up on the completion of the course the student shall be able to

1. Identify the parts and functions of CNC lathe
2. Use incremental system and absolute system on dimensioning.
3. Understand the meaning and usage of commonly used G & M codes for writing part program
4. Write a simple part program using G-Codes and M-Codes as per the given drawing/problem/ exercise
5. Edit and execute the part program using CNC simulation software.
6. Know the fixing of tools and operation of tool turret.
7. Know the tool offsetting and provide the same if necessary
8. Know the tool compensation and provide the same if necessary
9. Produce the part as per the drawing using CNC lathe machine.

COURSE CONTENT

1. Introduction to CNC
2. Study of each component of the CNC lathe machine
3. Understand the Structure of program and familiar with the important G – Codes and M- Codes/
4. Practice and knowing the options available in CNC Simulation softwares
5. Simple CNC operations: Facing and Turning
6. Turning exercise: Step turning using canned cycle
7. Turning exercise – Circular interpolation with CW and CCW
8. Turning Exercise - Taper turning and Peck drilling cycles
9. Thread cutting and Grooving exercises– Thread cutting and Grooving cycles

Note: The simulation software available in the market: FANUC, SIEMENS, HI NUMERIC, GSK etc.,

Suggested Learning Outcomes

Sl. No	Exercise	Key competencies expected
1	Hands on practice on CNC machine	Identify the various parts and switches Identification of orientation of CNC machine axis. Familiar the operate the various parts and knobs of the machine - Switch on /off Move the tool turret in Z & X axis direction. Index the tool turret Spindle off/on coolant on/off
2	Practice turning Operation on CNC machine	Use incremental system and absolute system of co-ordinate system Use appropriate tools for turning Select the speeds and feeds used for turning Select the depth of cut to be employed
3	Use G-Codes and M-Codes to write part program by understanding its structure	Identify the preparatory and miscellaneous functions of CNC Understand the meanings of various G-Codes and M-Codes Understand interpolation Understand the block numbers Understand various steps in the program
4	Practice with Simulation software	Understand the concept of simulation Practice the setting of software in simulation mode Open an existing part program Practice simulation for the program

5	Simple facing and turning operations	Write a part program to produce a part for Simple Facing operation. Write a part program to produce a part for Simple Turning operation. Write a part program to produce a part for Simple Taper turning operation. Write a part program to produce a part for Simple step turning operation.
6	Practice step turning canned cycle (Turning exercise)	Understand the canned cycle Write a part program to produce the part as per the given drawing Enter the program in the software Fix the job and set the tool Select proper cutting speed, depth of cut and feed for the given job Simulate the program and edit if necessary Execute the part program
7	Practice Turning exercise – Taper turning and Peck drilling Thread cutting and grooving	Select proper values of cutting speeds and feeds for taper turning and peck drilling Select proper values of cutting speeds and feeds for Thread cutting and grooving Write part program for Thread cutting and grooving cycles as per the given drawing

Course Outcomes		CL	Linked PO	Teaching Hours
CO1	Identify the parts and functions of each component of CNC Lathe	U/A	1,2,3,4,7	3
CO2	To use incremental and absolute coordinate system on dimensioning understands different types of interpolation.	U/A	1,2,3,4,7	12
CO3	Familiar with the options/features available in the simulation software screen	U/A	1,2,3,4,7	6
CO4	Write a simple part program using G-Codes and M-Codes for various operations.	A	1,4,7	6
CO5	Execute a part program using CNC lathe machine simulation software	U/A	1,2,3,4,5,7	3
CO6	Write a part program using cycles as per the drawing and produce parts	A	1,2,3,4,6,7	15

CO-PO MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping POs
CO1	3	1	1	3	-	-	3	1,2,3,4,7
CO2	3	1	1	2	-	-	3	1,2,3,4,7
CO3	3	1	1	2	-	-	2	1,2,3,4,7
CO4	3	-	-	2	-	-	2	1,4,7
CO5	3	1	1	2	1	-	1	1,2,3,4,5,7
CO6	3	2	3	3	-	1	2	1,2,3,4,6,7

Course-PO Attainment Matrix

Course Name	Program Outcomes (PO)						
	1	2	3	4	5	6	7
CAM Lab	3	2	2	3	--	--	3
Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Low Addressed							

BOARD DIPLOMA EXAMINATIONS

Model Paper

CAM LAB

Mid Sem-I (CIE)

Time: 1 Hour

Total Marks: 20 M

PART – A

Marks: 4 X 5M = 20 M

*NOTE: Answer **any four** questions and each question carries **Five** marks.*

1. Compare manual and computer aided par programming.
2. Define interpolation and types of interpolation
3. Write short notes on (a) Macros (b) Canned Cycles (c) APT.
4. Explain about coordinate systems and reference points in CNC Machines.
5. What are the types of statements used in APT programming and explain them.
6. What are preparatory and miscellaneous functions give examples each?

BOARD DIPLOMA EXAMINATIONS
CAM LAB
Mid Sem-II (CIE)

Time : 1 Hour

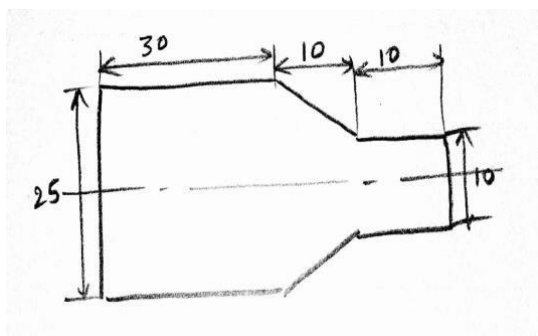
Total Marks : 20 M

PART – A

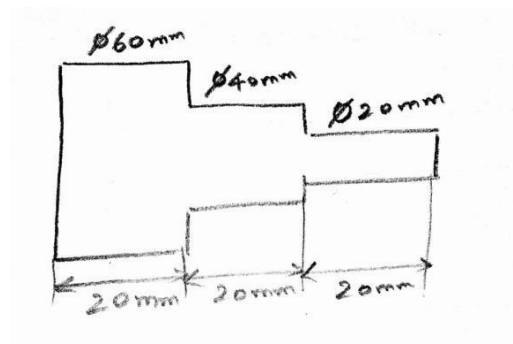
Marks: 2 X 10M = 20 M

*NOTE: Answer **any two** question and each question **10** marks.*

1. Write a CNC Program to reduce a billet of size 50 X 30 mm by turning to a size of 40 X 28 mm. Maximum depth of cut allowed 2 mm.
2. Write a program on manual facing to reduce into 25mm dia 70 mm length rod into 20 mm dia 65mm length. Maximum depth of cut allowed 1.5 mm.



3. Write a program using G codes and M codes to reduce a billet of dia 60mm to dia 20mm in a step of 20mm



BOARD DIPLOMA EXAMINATIONS
CAM LAB
SEMESTER END EXAM (SEE)

Time : 2 Hour

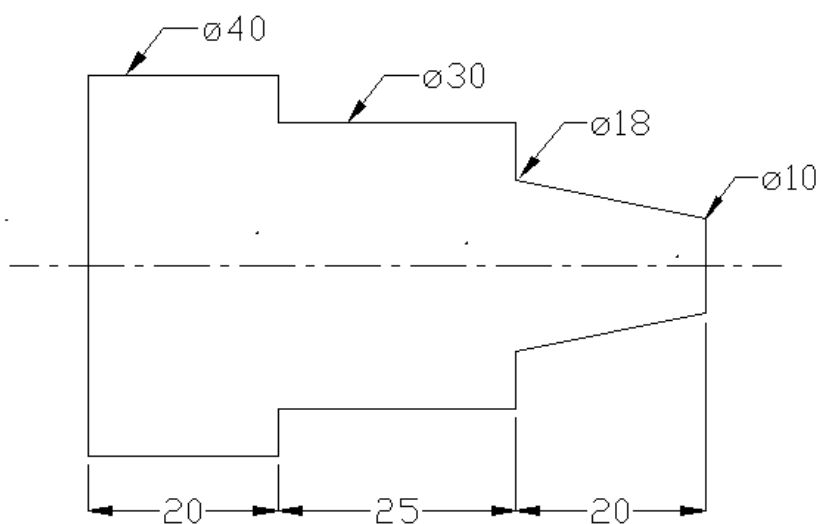
Total Marks : 40 M

PART – A

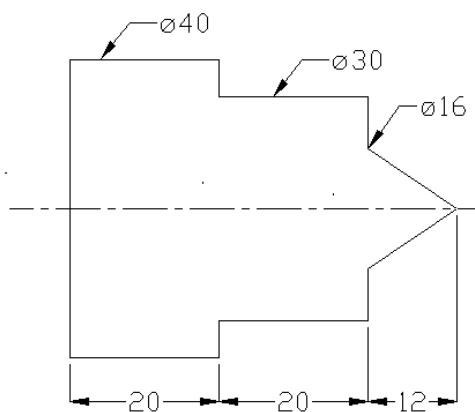
Marks: 1 X 30M = 30 M

*NOTE: Answer **any one** question.*

1. Make the following job of aluminium billet of ϕ 40 mm & 80 mm long using turning operation on CNC machine.

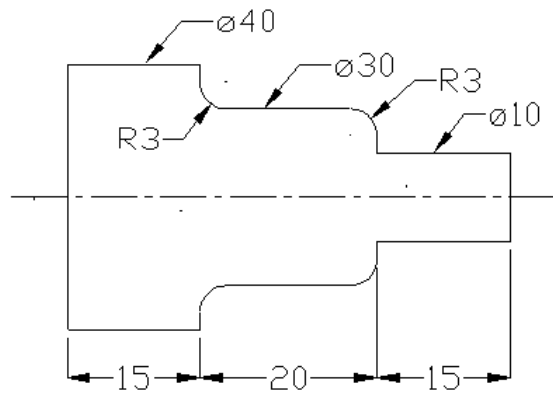


2. Make the following job of aluminium billet of ϕ 40 mm & 70 mm long using turning operation on CNC machine.

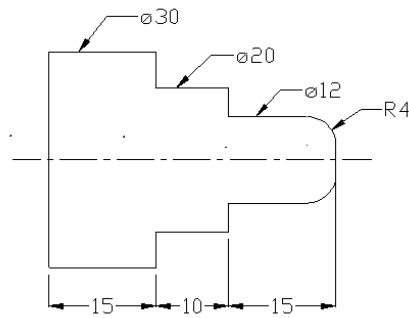


3. Make the following job of aluminium billet of ϕ 40 mm & 70 mm long using turning

operation on CNC machine.



4. Make the following job of aluminium billet of $\phi 30$ mm & 60 mm long using turning operation on CNC machine



ME-507-ADVANCED MANUFACTURING & FABRICATION ENGINEERING LAB

Course Title :	Advanced Manufacturing & Fabrication Engineering Lab	Course Code	ME-507
Semester	V	Course Group	Core
Teaching Scheme in Periods(L:T:P)	1:0:2	Credits	1.5
Methodology	Lecture + Practical	Total Contact Periods:	45
CIE	60 Marks	SEE	40 Marks

Pre requisites This course requires the knowledge in basic manufacturing technology

Unit No	Unit name	Periods	Marks for SEE			Marks weightage	%Weightage
			Handl ing	Manipula tion	Preci sion		
1.	Practice on Lathe machine	12	10	15	15	40	100
2	Practice on Radial drilling machine	03	10	15	15	40	100
3	Practice on milling machine	06	10	15	15	40	100
4	Practice on shaping/planning	06	10	15	15	40	100
5.	Practice on slotting machine	03	10	15	15	40	100
6.	Hands on practice in welding	09	10	15	15	40	100
7.	Servicing and Maintenance	06	10	15	15	40	100
	Total	45					

Course outcomes

CO	Course Outcome	Mapping Pos
CO1	Ability to perform certain lathe operations like Thread cutting, Eccentric turning.	1,2,3,7
CO2	Ability to demonstrate and perform some operations on milling machine.	1,2,3,7
CO3	Ability to demonstrate and perform some operations on slotting, shaping machine	1,2,3,7
CO4	Ability to demonstrate and perform some operations on drilling machine	1,2,3,7
CO5	Ability to prepare angular joints and house hold articles using welding.	1,2,3,7
CO6	Knowing the importance of servicing and maintenance and importance of maintenance schedules	1,2,3,7

COURSE CONTENT

1. Machine shop

1.1 Turning

1.1.1 Thread cutting and eccentric turning

1.1.2 Drilling and boring.

1.1.3 Male and female fit assembly

1.2 Drilling

1.2.1 Drilling, Counter boring and counter sinking and Internal threading (tapping)

1.3 Milling / Shaping / Slotting / Planning

1.3.1 Gear Cutting on Milling Machine

1.3.2 T-slot cutting on milling machine

1.3.3 Produce V-Block on shaping machine

1.3.4 Key way cutting Slotting Machines

1.3.5 Practice on Planning machines

2. Welding

2.1 T. Joint

2.2 H – Joints

2.3 Angular joints.

2.4 Fabrication of any house hold item like stool, shoe rack etc.,

3. Servicing and Maintenance

3.1. Servicing of Lathe tail stock

3.2. Servicing of Chuck

3.3. Servicing of a machine like drilling or grinding etc.

SPECIFIC LEARNING OUTCOMES

Up on the completion of the course the student shall able to Practice the operations on the Lathe.

1.1. Calculate the gear ratio for thread cutting.

1.2. Cut threads on a lathe machine.

1.3. Produce articles of industrial application such as snap gauges, plug gauges,

1.4. Handle etc.

1.5. Perform the combination of operations to produce jobs.

1.6. Perform special turning operations to produce threaded objects, eccentric turning, and male and female fit assembly

- 2.0 **Understand various operations in machine shop**
- 2.1 Perform Cutting operation of V-block on shaping machine.
- 2.2 Practice the cutting operation on slotter
- 2.3 Practice the cutting operation on planer
- 2.4 Practice the principle of indexing on milling machine.
- 2.5 Perform gear Cutting and key way cutting operation on milling machine
- 3.0 **Practice the joining operations in Welding.**
- 3.1 Perform edge preparation and Weld the pieces to prepare T, H, and angular joints.
- 3.2 Produce utility articles such as shoe rack, garden chair, wash basins, stools etc
- 4.0 **Understand various operations of Drilling machine**
- 4.1 Perform various operation of Drilling machine like Drilling, Boring, counter
- 4.2 Bore, Counter sink and Tapping.
- 5.0 **Understand various activities in servicing and maintenance**
- 5.1. Use the testing and inspection methods of machine tools.
- 5.2. Dismantle and assemble the tailstock and chuck of lathe machine
- 5.3. Recondition the parts.
- 5.4. Service and overhaul machine of general nature.
- 5.5. Prepare maintenance schedules and estimates.

Key Competencies to be acquired by Students

S.No	Exercise	Key competency
Machine shop		
Turning		
1	Thread cutting	a. Center the job with dial gauge b. Fix the cutting tool in suitable angle c. Turn the component with suitable speed and feed d. Cut the threads with back gear arrangements
2	Eccentric turning	a. Fix the job in a chuck with correct eccentricity b. Fix the cutting tool in correct position c. Cut the metal with suitable speed and feed
	Drilling and boring.	- Center the job with dial gauge - Fix the drill in tail stock - Drill a hole to the required size by hand feed - Remove drill from tail stock and fix boring tool in tail stock - Bore a hole to an accuracy of $\pm 0.2\text{mm}$ with a tool
3	Male and female	a. Center the job with dial gauge

	fit assembly	b. Fix the cutting tool in suitable angle c. Turn the component with suitable speed and feed d. Locate the center of hole e. Select suitable drill bit f. Drill the hole with suitable speed and feed g. Enlarge the hole to suitable diameter by using boring tool
Milling/slott ing/planning		
1.	V-block on shaping machine.	a. Fix the job on shaping machine table b. Set the tool and give the table feed c. Set the stroke of the ram
2.	Key way cutting by slotting machine	d. Fix the job on slotting machine table e. Set the tool and give the table feed f. Set the stroke of the ram
3.	Indexing on slotting / milling machine	a. Identify of suitable indexing method b. Calculate revolutions of indexing crank c. Select index plate d. Select of hole circle
4.	T-slot cutting on milling machine	a. Identify T-slot cutter b. Exact setting of work-tool location
5.	Spur gear cutting on milling machine	a. Calculate no. of teeth on meshing gears for compound indexing b. Identify suitable HOB c. Select suitable holder for bevel gear blank

Drilling		
1	Drilling , Boring, Counter bore, Counter sink and Internal Threading	a. Fix the job on table with help of Vice/ T-Bolts b. Estimate the RPM and Feed c. Perform various operations d. To remove the drill bit from spindle with help of drift
Welding		
1	T-Joints, H- Joints, Angular Joints	a. Perform edge preparation b. Hold the electrode at suitable angle c. Identify the suitable Method of welding technique. d. Maintain proper distance between work piece and electrode tip produce arc. e. Check the weld bead
Servicing and Maintenance		
1	Tail stock and Chuck	f. Select the suitable tools with specification for dismantling. g. Dismantle the tail stock/ chuck h. Understand the operation of each part i. Know the cleaning and lubrication of parts j. Reassemble the tail stock/ chuck

CO-PO MATRIX

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	Mapping Pos
CO1	3	3	3	-	-	-	1	1,2,3,7
CO2	3	3	3	-	-	-	1	1,2,3,7
CO3	3	3	3	-	-	-	1	1,2,3,7
CO4	3	3	3	-	-	-	1	1,2,3,7
CO5	3	3	3	-	-	-	1	1,2,3,7
CO6	3	3	3	-	-	-	1	1,2,3,7

State Board of Technical Education, Telangana State
Model Paper
ME-507- ADVANCED MANUFACTURING & FABRICATION ENGINEERING LAB
Mid Sem-I (CEE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Cut a V thread on the given MS bar with given pitch
2. Prepare a male female assembly as per the given figure.
3. Produce a hole in MS round rod as per the given figure.
4. Prepare a T- joint as per the given figure.
5. Prepare a H- joint as per the given figure.
6. Prepare a angular joint as per the given figure
7. Prepare V Block on shaper
8. Prepare Spur gear on milling machine of given pitch.
9. Prepare Key way in a metal block on slotting machine.
10. Prepare 'T' slot in a metal block on milling machine
11. Dismantle the tail stock and reassemble after proper servicing
12. Dismantle the chuck and reassemble after proper servicing

- Note:**
1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice
 2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

State Board of Technical Education, Telangana State
Model Paper
ME-507- ADVANCED MANUFACTURING & FABRICATION ENGINEERING LAB
Mid Sem-II (CEE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Cut a V thread on the given MS bar with given pitch
2. Prepare a male female assembly as per the given figure.
3. Produce a hole in MS round rod as per the given figure.
4. Prepare a T- joint as per the given figure.
5. Prepare a H- joint as per the given figure.
6. Prepare a angular joint as per the given figure
7. Prepare V Block on shaper
8. Prepare Spur gear on milling machine of given pitch.
9. Prepare Key way in a metal block on slotting machine.
10. Prepare 'T' slot in a metal block on milling machine
11. Dismantle the tail stock and reassemble after proper servicing
12. Dismantle the chuck and reassemble after proper servicing

- Note:**
1. For Mid sem 15 marks are to be awarded for conduct of experiment, 3 marks for record and 2 marks for Viva voice
 2. Exam should be conducted from the trade in which student undergone training only as classes are conducted on rotation basis.

State Board of Technical Education, Telangana State
Model Paper
ME-507- ADVANCED MANUFACTURING & FABRICATION ENGINEERING LAB
(SEE)

Time: 3 Hours

Total Marks: 40 M

Note: Answer any one question.

1. Cut a V thread on the given MS bar with given pitch
2. Prepare a male female assembly as per the given figure.
3. Produce a hole in MS round rod as per the given figure.
4. Prepare a T- joint as per the given figure.
5. Prepare a H- joint as per the given figure.
6. Prepare a angular joint as per the given figure
7. Prepare V Block on shaper
8. Prepare Spur gear on milling machine of given pitch.
9. Prepare Key way in a metal block on slotting machine.
10. Prepare 'T' slot in a metal block on milling machine
11. Dismantle the tail stock and reassemble after proper servicing
12. Dismantle the chuck and reassemble after proper servicing

Note: marks are to be awarded for conduct of Experiment, writing of procedure and viva voce

ME-508-REFRIGERATION AND AIR CONDITIONING LAB

Course Title	Refrigeration and Air Conditioning Lab	Course Code:	ME-508
Semester:	V	Course group :	Practical
Teaching Scheme(L:T:P):	1:0:2	Credits	1.5
Methodology :	Lecture + Assignment	Total contact periods:	45
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: Basic knowledge of Thermodynamics and Refrigeration & Air conditioning

COURSE OUTCOMES

CO	On Successful completion of the course, the student will be able to
1	Evaluate Refrigeration and Air conditioning system tools and basic operations on soft copper tube
2	Identify and acquire knowledge on working of different parts of Refrigeration and Air conditioning systems.
3	Develop knowledge on refrigerants.
4	Measure Coefficient of Performance (COP) of Refrigeration and Air conditioning system with given data and use p-h chart.
5	Determine Coefficient of Performance (COP) of Refrigeration and Air conditioning systems.
6	Distinguish working of air cooler, water cooler, domestic refrigerator, split air conditioner and window air conditioner.

Course Content and Blue Print of Marks for SEE

	Unit name	Hours/ Periods	Marks for SEE			Marks weightage	%Weightage
			Handling	Manipulation	Precision		
1.	R&AC Tools, Basic Operations on soft Copper tube	3	10	15	15	40	100
2.	Vapour Compression cycle test rig	6	10	15	15	40	100
3.	Water cooler	6	10	15	15	40	100
4	Air conditioning test rig	6	10	15	15	40	100
5	Domestic refrigerator	6	10	15	15	40	100
6	Window air conditioner	6	10	15	15	40	100
7	Split air conditioner	6	10	15	15	40	100
8	Air cooler	6	10	15	15	40	100
	TOTAL	45					

COURSE CONTENT

S.No	Refrigeration and air conditioning lab practice	Number of Periods
1	Familiarisation with Refrigeration and Air conditioning system Tools, Basic Operations on soft Copper tube	03
2	Experimental determination of COP of Vapour Compression cycle test rig	06
3	Experimentally determine COP of water cooler	06
4	Experimentally determine COP of air conditioning test rig	06
5	Experimentally determine COP of domestic refrigerator	06
6	Study of a window air conditioner	06
7	Study of a split air conditioner	06
8	Study of air cooler	06
Total		45

SUGGESTED LEARNING OUTCOMES

S.No	Exercise	Key competency
1	Familiarisation with Refrigeration and Air conditioning system Tools Basic Operations on soft Copper tube	a. Identify basic tools used in RAC b. Use the tools to perform flaring, swaging, bending and brazing operations
2	Experimental determination of Coefficient of Performance(COP) of Vapour Compression cycle test rig	a. Identify the components of vapour compression cycle test rig and draw line diagram b. Know the refrigerant used, its chemical formula and capacity of the plant c. Record the values of pressure and temperature when the pressure gauges are stabilized d. Record the energy meter reading e. Read the values from Pressure Vs Enthalpy diagram of the given refrigerant f. Evaluate COP
3	Experimentally determine Coefficient of Performance(COP) of water cooler	a. Identify the components of water cooler and draw line diagram b. Know the refrigerant used, its chemical formula and capacity of the plant c. Record the values of pressure and temperature when the pressure gauges are stabilized d. Record the energy meter reading e. Read the enthalpy values from Pressure Vs Enthalpy diagram of the given refrigerant f. Evaluate COP
5	Experimentally determine Coefficient of Performance(COP) of domestic refrigerator	a. Identify the components of domestic refrigerator and draw line diagram b. Record the values of pressure and temperature when the pressure gauges are stabilized c. Record the energy meter reading d. Read the enthalpy values from Pressure Vs Enthalpy diagram of the given refrigerant e. Evaluate COP

6	Study of a window air conditioner	a. Identify the components of window air conditioner and draw line diagram b. Know the refrigerant used, its chemical formula and capacity of the window air conditioner
7	Study of a split air conditioner	a. Identify the indoor unit and out door unit. b. Identify the components of split air conditioner and draw line diagram c. Know the refrigerant used, its chemical formula and capacity of the window air conditioner
8.	Study of air cooler	a. Identify the components of air cooler and draw line diagram b. Record the values of temperature of the room before and after switching on air cooler.

CO-PO Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2	-	-	3	1	-	2
CO2	2	-	1	2	1	-	3
CO3	2	-	-	2	1	-	2
CO4	2	1	1	2	-	-	3
CO5	2	1	1	2	1	-	2
CO6	1	-	-	2	2	-	2

COURSE OUTCOMES		CL	Linked POs
CO1	Evaluate Refrigeration and Air conditioning system tools and basic operations on soft copper tube	R, U, A	1,4,5,7
CO2	Identify and acquire knowledge on working of different parts of Refrigeration and Air conditioning systems.	R, U, A	1,3,4,5,7
CO3	Develop knowledge on refrigerants.	R, U, A	1,4,5,7
CO4	Measure Coefficient of Performance(COP) of Refrigeration and Air conditioning system with given data and use p-h chart.	U, A	1,2,3,4,7
CO5	Determine Coefficient of Performance(COP) of Refrigeration and Air conditioning systems systems.	U, A	1,2,3,4,7
CO6	Distinguish working of air cooler, water cooler, domestic refrigerator, split air conditioner and window air conditioner.	R, U, A	1,4,5,7

BOARD DIPLOMA EXAMINATIONS (C21)
Model Paper MID SEM - I
DME V SEMESTER EXAMINATION
REFRIGERATION AND AIR CONDITIONING LAB

TIME : 1 Hours

Max. Marks: 20

Answer any one question

1. List all basic tools used in RAC and identify them
2. Perform flaring and swaging operation on copper tube.
3. Perform brazing operation on given copper tube.
4. Determine COP of Vapour compression cycle from given data numerically
5. Determine COP of Vapour compression cycle from given data using p-h chart.
6. Identify all parts of water cooler and explain their function.
7. Determine COP of air conditioning test rig from given data numerically

BOARD DIPLOMA EXAMINATIONS (C21)
Model Paper MID SEM - II
DME V SEMESTER EXAMINATION
REFRIGERATION AND AIR CONDITIONING LAB

TIME : 1 Hours

Max. Marks: 20

Answer any one question

1. Identify all parts of domestic refrigerator and explain their function.
2. Determine COP of domestic refrigerator from P-h diagram.
3. Identify all major parts of window air conditioner and explain their function.
4. Identify all major parts of split air conditioner and explain their function.
5. Identify all major parts of window air conditioner and explain their function, record the change in temperature of room for every 5 minutes.

BOARD DIPLOMA EXAMINATIONS (C21)
Model Paper (SEE)
DME V SEMESTER EXAMINATION
REFRIGERATION AND AIR CONDITIONING LAB

TIME : 2 Hours

Max. Marks: 40

Answer any one question

1. List out all basic tools used in Refrigeration and Air conditioning system. Identify the tools and perform flaring and swaging operation on copper tube
2. List out all basic tools used in Refrigeration and Air conditioning systems. Identify the tools and perform brazing and swaging operation on copper tube
3. Determine COP of Vapour compression cycle from given data numerically
4. Determine COP of Vapour compression cycle from given data using p-h chart.
5. Determine COP of Vapour compression cycle from experimental data
6. Determine COP of water cooler from experimental data.
7. Determine COP of domestic refrigerator from experimental data.
8. Determine COP of air conditioning test rig from experimental data.
9. Identify all major parts of window air conditioner and explain their function.
10. Identify all major parts of split air conditioner and explain their function.
11. Identify all major parts of window air conditioner and explain their function, record the change in temperature of room for every 5 minutes.

SEE Question paper has to be prepared by Internal and External Examiners together.

ME-509- METROLOGY & PNEUMATICS LAB

Course Title:	Metrology & Pneumatics Lab	Course Code:	ME-509
Semester:	V	Course group :	Core
Teaching Scheme(L:T:P):	1:0:2	Credits:	1.5
Methodolgy :	Lecture + Assignment	Total contact periods:	45
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: Basic knowledge of Metrology

COURSE OUTCOMES

On successful completion of the course, the students will be able to

Course Outcomes	
CO1	Measure various components of angle measurement using sine bar and bevel Protractor
CO2	Measure the geometrical dimensions of V-thread and spur gear
CO3	Understand the concepts of measurement of surface roughness, circularity, and roundness
CO4	Understand the direction and speed control of Single & double acting cylinder
CO5	To know the Control of a double-acting cylinder with OR logic
CO6	To know the Control of a Double-acting cylinder with AND LOGIC

LIST OF EXPERIMENTS

S.No.	Description	No of Periods
1	Introduction to Metrology	3
2	Measure the angle of the machined surface using a sine bar with slip gauges	3
3	To measure the screw thread parameters of a given specimen using Tool Maker's Microscope/Gear tooth vernier	6
4	Check the alignment using Autocollimator	3
5	Measurement of displacement using LVDT	3
6	Measurement of surface roughness using Talysurf tester	3
7	Introduction to Pneumatic components	3
8	Direct control of a single-acting cylinder	3
9	Direct control of a double-acting cylinder	3
10	Speed control of a double-acting cylinder	3
11.	Control of a double-acting cylinder with OR logic	6
12.	Control of a double-acting cylinder with AND logic	6
Total		45

REFERENCE BOOKS

1. Engineering Metrology – R. K. Jain
2. Engineering precision metrology – R. C. Gupta
3. A Handbook of Industrial Metrology – ASME
4. Measurement System (Application and Design) – Ernest O Doebelin
5. Pneumatics by SRIHARI RAO
6. Pneumatic controls by FESTO

SUGGESTED LEARNING OUTCOMES

Upon completion of the course, the student shall be able to

1. Introduction to Metrology

- 1.1. Understand the need and importance of Metrology in
- 1.2. Define metrology
- 1.3. Identify various measuring Instruments and their purpose.
- 1.4. Know the comparators and gauges

2. Measure the angle of the machined surface using a sine bar with slip gauges:

- 2.1. Identify various parts of the sine bar.
- 2.2. Understanding the usages of slip gauges
- 2.3. Understanding the method of finding out angel using sine bar
- 2.4. Knowing the formulae involving the calculation of the angle of any machined surface.

3. To measure the screw thread parameters of a given specimen using Tool Maker's Microscope/Gear tooth vernier:

- 3.1. Define various screw thread parameters
- 3.2. Identify various parts of the apparatus
- 3.3. Understanding the experimental setup
- 3.4. Understanding the method of finding out various screw thread parameters

4. Check the alignment using Autocollimator:

- 4.1. Understanding the concepts and necessity of alignment of parts/surfaces
- 4.2. Identify various parts of the apparatus
- 4.3. Understanding the experimental setup
- 4.4. Knowing the functionalities of Autocollimator

5. Measurement of displacement using LVDT:

- 5.1. Understanding the necessity of precision measurement of displacement
- 5.2. Identify various parts of the apparatus
- 5.3. Understanding the experimental setup
- 5.4. Understanding the method of finding out displacement using LVDT

6. Measurement of surface roughness using Talysurf tester:

- 6.1. Understanding the concepts of surface roughness and the necessity of measuring surface roughness
- 6.2. Identify various parts of the apparatus
- 6.3. Understanding the experimental setup
- 6.4. Understanding the method of finding out Measurement of surface roughness using Talysurf tester

7. Introduction to Pneumatic components

- 7.1. Understand the working of Pneumatic components.
- 7.2. Explain Pneumatics
- 7.3. Identify & List Symbols used in Pneumatic circuits.
- 7.4. Explain the phenomena of compressed air for transmitting power.
- 7.5. State Pascal's law.
- 7.6. List all the pneumatic applications.
- 7.7. Define Pneumatic actuator.
- 7.8. Classify the actuators.
- 7.9. Explain Linear actuators and Rotary actuators.
- 7.10. Define valve.
- 7.11. List different types of valves.
- 7.12. Explain the function of a valve.
- 7.13. Identify the components of a valve.
- 7.14. Identify ports and positions.
- 7.15. List the Applications of valves.

8. Direct control of a single-acting cylinder

- 8.1. Draw the circuit diagram for actuating a single-acting cylinder.
- 8.2. Select the suitable valve. eg: 3/2 valve.
- 8.3. Connect 3/2 valve to the actuator.
- 8.4. Actuate the single-acting cylinder by operating a 3/2 valve.

9. Direct control of a double-acting cylinder

- 9.1. Draw the circuit diagram for actuating a Double-acting cylinder.
- 9.2. Select the suitable valve eg: 4/2 valve.
- 9.3. Connect 4/2 valve to the actuator.
- 9.4. Actuate the double-acting cylinder by operating a 4/2 valve.

10. Speed control of a double-acting cylinder

- 10.1. Draw the pneumatic circuit for controlling the speed of double-acting cylinder
- 10.2. Select 4/2 or 5/2 valve and a throttle valve.
- 10.3. Connect 4/2 valve and throttle valve as per the circuit.
- 10.4. Operate the 4/2 valve and adjust the throttle valve to control the speed of the double-acting cylinder

11. Control of a double-acting cylinder with OR logic

- 11.1. Draw the pneumatic circuit for controlling the speed of double-acting cylinder using OR logic.
- 11.2. Select two 3/2 valves and a shuttle valve (OR Valve).
- 11.3. Connect 3/2 valves and OR valves to the double-acting cylinder as per the circuit.
- 11.4. Operate either one of the 3/2 valves to control the speed of double-acting cylinder.

12. Control of a Double-acting cylinder with AND LOGIC

- 12.1. Draw the pneumatic circuit for controlling the speed of double-acting cylinder using AND logic.
- 12.2. Select two 3/2 valves and AND valve.
- 12.3. Connect 3/2 valves and AND valves to the double-acting cylinder as per the circuit.
- 12.4. Operate two valves simultaneously to control the speed of double-acting cylinder.

COURSE OUTCOMES		CL	Linked POs
CO1	Measure various components of angle measurement using sine bar and bevel Protractor	R, U, A	1,2,4,5,6,7
CO2	Measure the geometrical dimensions of V-thread and spur gear	R, U, A	1,2,4,5,6,7
CO3	Understand the concepts of measurement of surface roughness, circularity, and roundness	R, U, A	1,2,4,5,6,7
CO4	Understand the direction and speed control of Single & double acting cylinder	U, A	1,2,3,4,5,6,7
CO5	To know the Control of a double-acting cylinder with OR logic	U, A	1,2,3,4,5,6,7
CO6	To know the Control of a Double-acting cylinder with AND LOGIC	R, U, A	1,2,3,4,5,6,7

Legends: R = Remember; U= Understand; A= Apply and above levels (Bloom's revised taxonomy)

CO-PO Attainment Matrix:

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	3	-	2	1	3	3
CO2	2	3	-	2	1	3	2
CO3	2	3	-	2	1	3	2
CO4	2	3	1	2	1	3	1
CO5	2	3	1	1	1	3	3
CO6	1	1	2	2	1	3	1

Level 3- Highly Addressed, Level 2-Moderately Addressed, Level 1-Lowly Addressed.

State Board of Technical Education, Telangana State
Model Paper
ME-509 – METROLOGY & PNEUMATICS LAB
Mid Sem-I (CIE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Measure the angle of the machined surface using a sine bar with slip gauges.
2. Measure the screw thread parameters such as pitch, thread angle, and depth of screw of a given specimen using Tool Maker's Microscope/Gear tooth vernier
3. Check the alignment of a given specimen using Autocollimator.
4. Measure the displacement using LVDT.
5. Measure the surface roughness of a given surface using a Talysurf tester.
6. Connect pneumatic devices and control the direction of a Single acting Cylinder
7. Connect pneumatic devices and control the direction of a Double acting Cylinder
8. Connect the Pneumatic controls for Control of a double-acting cylinder with OR logic
9. Connect the Pneumatic controls for Control of a double-acting cylinder with AND logic
10. Connect pneumatic devices and control the speed of a Double acting Cylinder

Note: Exam should be conducted from the experiments in which students undergone training only as classes are conducted on a rotation basis.

State Board of Technical Education, Telangana State
Model Paper
ME-509 – METROLOGY & PNEUMATICS LAB
Mid Sem-II (CIE)

Time : 1 Hour

Total Marks : 20 M

Note: Answer any one question.

1. Measure the angle of the machined surface using a sine bar with slip gauges.
2. Measure the screw thread parameters such as pitch, thread angle, and depth of screw of a given specimen using Tool Maker's Microscope/Gear tooth vernier
3. Check the alignment of a given specimen using Autocollimator.
4. Measure the displacement using LVDT.
5. Measure the surface roughness of a given surface using a Talysurf tester.
6. Connect pneumatic devices and control the direction of a Single acting Cylinder
7. Connect pneumatic devices and control the direction of a Double acting Cylinder
8. Connect the Pneumatic controls for Control of a double-acting cylinder with OR logic
9. Connect the Pneumatic controls for Control of a double-acting cylinder with AND logic
10. Connect pneumatic devices and control the speed of a Double acting Cylinder

Note: Exam should be conducted from the experiments in which students underwent training only as classes are conducted on a rotation basis.

State Board of Technical Education, Telangana State

SEE Model Paper

ME-509 – METROLOGY & PNEUMATICS LAB

Time : 2 Hour

Total Marks : 40 M

Note: Answer any one question.

1. Measure the angle of the machined surface using a sine bar with slip gauges.
2. Measure the screw thread parameters such as pitch, thread angle, and depth of screw of a given specimen using Tool Maker's Microscope/Gear tooth vernier
3. Check the alignment of a given specimen using Autocollimator.
4. Measure the displacement using LVDT.
5. Measure the surface roughness of a given surface using a Talysurf tester.
6. Connect pneumatic devices and control the direction of a Single acting Cylinder
7. Connect pneumatic devices and control the direction of a Double acting Cylinder
8. Connect the Pneumatic controls for Control of a double-acting cylinder with OR logic
9. Connect the Pneumatic controls for Control of a double-acting cylinder with AND logic
10. Connect pneumatic devices and control the speed of a Double acting Cylinder

Note: Exam should be conducted from the experiments in which student undergone training only as classes are conducted on rotation basis.

ME-510-PROJECT WORK

Course title:	Project work	Course Code:	ME-510
Semester:	V	Course group:	Practical
Teaching scheme in periods (L:T:P):	1:0:2	Credits:	1.5
Methodology	Lecturer+Assignment	Total contact periods	45
CIE:	60 Marks	SEE:	40 Marks

Course outcomes:

The student should be able to

1. Apply principles of Mechanical engineering and Knowledge to solve problems of component with mechanical bias.
2. Demonstrate the knowledge to assess safety, legal issues and consequent responsibilities
3. To function effectively as an individual and as a member in a team
4. To communicate effectively
5. To engage in lifelong learning in the context of technological changes

VI SEMESTER

Sl. No	Subject	Items	Max Marks
1	Project work	CIE	
		1. Mid - I: Abstract submission – (Marks awarded by the Guide)	20
		2. Mid – II: Content development/ literature survey, data collection/prototype etc. - (Marks awarded by the Guide)	20
		3.Internal evaluation - (Marks awarded by the Guide)	20
		SEE	
		4.a) Final report Submission b) Seminar /Viva Voce (Marks awarded by the External Examiner, Head of Section (i.e. Internal Examiner) and Guide).	20 20
		Total	

Note: The Project work carries 100 marks and pass marks are 50% and minimum of 50% in SEE. Internal assessment is done by guide and external assessment is conducted by guide, head of section and external examiner.

A candidate failing to secure the minimum marks has to reappear for the project.

COURSE CONTENT

- Identification and selection of a product with an aim to setup a small-scale industry.
- Conduct of detailed market survey.
- Preparation of production drawings.
- List of the raw materials, equipment and tools needed for manufacturing a specified quantity.
- Development of a prototype model of the product in workshop (if possible)
- with the available facilities in the Polytechnics.
- Exploration of the various financial arrangements to start the manufacturing of the product under technocrat scheme in small scale industrial sector.
- Detailed survey of requirements of the department of industry, municipal, health inspectorate of factories, electrical inspectorate, banks, other financial agencies etc., for starting an industry.
- Planning for type of organisation.
- Selection of site.
- Preparation of techno feasibility report consisting of production drawings, plant layout, building requirements, equipment requirement, list of raw materials and their availability, tools and other items, labour force requirement for production, ministerial staff requirement, material flow sheet, cash flow sheet, financial analysis etc.
- Working models, repairs, up gradation and maintenance of equipment.
- Product selection may be done by the Polytechnic in consultation with the local industries and other agencies.
- The student should submit techno feasibility report or model on a product selected with an aim to set up an industry in small scale sector.

Suggested learning outcomes

Upon completion of the course the student shall be able to

- **Prepare technical project report**
- Identify component with mechanical bias.
- Design and draw the production drawings.
- Prepare a project report with details of materials, processes etc.
- Develop a proto type/model of the product with the facilities available in polytechnic.
- **Conduct survey to establish a small scale unit**
- Identify and select a product with an aim to set up a small scale industry.

- Conduct a detailed market survey.
- List the raw materials, equipment and tools needed for the manufacture of a specified quantity.
- Explore the various financial arrangements to start the manufacture of a product under technocrat scheme in small scale industrial sector.
- Make a survey of requirements of the department of industries, municipal, health, inspectorate of factories for starting an industry.
- Plan for a type of organisation.
- Select a site.
- Prepare a techno feasibility report consisting of drawings, plant layouts, building requirements, machinery and equipment requirements, raw material, labour, production and administrative staff requirements, working capital, material flow sheet, cash flow sheet, financial analysis etc.
- Develop working models to show scientific and engineering principles studied in the curriculum and repair, up gradation and maintenance of equipment which are exist.

CO-PO Matrix

COURSE OUTCOMES	PROGRAM OUTCOMES						
	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	1	1		1	-	-	3
CO2	2	1	1	2	1	1	1
CO3	2	-	-	2	1	1	2
CO4	1	-	-	2	2	-	1
CO5	2	-	2	1	-	1	2

COURSE OUTCOMES		CL	Linked POs
CO1	Apply principles of Mechanical engineering and Knowledge to solve problems of component with mechanical bias.	R, U, A	1,2,4,7
CO2	Demonstrate the knowledge to assess safety, legal issues and consequent responsibilities	R, U, A	1,2,3,4,5,6,7
CO3	To function effectively as an individual and as a member in a team	R, U, A	1,4,5,6,7
CO4	To communicate effectively	U, A	1,4,5,7
CO5	To engage in lifelong learning in the context of technological changes	U, A	1,3,4,6,7

RUBRICS 1: Mid Sem - I

	GOOD	AVERAGE	ACCEPTABLE	UNACCEPTABLE
Identification of problem	Good explanation of the purpose and need of the project	average explanation of the purpose and need of the project	Moderate explanation of the purpose and need of the project	Minimal explanation of the purpose and need of the project
Study the existing systems	Collects a great deal of information and good study of the existing systems	Collects some basic information	Limited information	Incomplete information
Objectives and methodology	Good justification to the objectives	Incomplete justification to the objectives	Only some objectives of the proposed	Objectives of the proposed work are either not identified or not well

1. Identification of problem and explanation of the purpose and need of the project
2. Detailed study of the existing systems and feasibility of project proposal
3. Methodology and Abstract submission

RUBRICS2: Mid Sem II

	GOOD	AVERAGE	ACCEPTABLE	UNACCEPTABLE
Incorporation of suggestions	Changes are made as per modification	All changes are made as per modification	Few changes are made	Suggestions are not incorporated
Project demonstration	All defined objectives are achieved	All modules are achieved	Some of the defined objectives are achieved	Defined objectives are not achieved
Demonstration and presentation	Objectives achieved as per time frame	Objectives achieved as per time frame	Objectives achieved as per time frame	No Objectives achieved as per time frame

1. Changes are made as per modifications suggested and new innovations added
2. Complete explanation of the key concepts strong description of the technical requirements of the project
3. Objectives achieved as per time frame

ME-511-SKILL UPGRADATION

Course Title:	Skill Upgradation	Course Code:	ME-511
Semester:	V	Course group :	Practical
Teaching Scheme(L:T:P):	0:0:8	Credits:	2.5
Methodolgy :	Lecture + Assignment	Total contact periods:	120

ME-501

1. Prepare an organisational structure of institution
2. A Case study on principles of management.
3. Make a survey on marketing a product.
4. Prepare a list of ISO 9000 series as well as latest quality standards
5. Prepare sign boards representing safety measures.
6. Role play as an entrepreneur
7. A Case study on work study measurement.
8. Prepare job specifications and job description for a specific job.
9. Compare various job evaluation methods for a real example.
10. Calculate earnings of workers using various wage differentials
11. Prepare a cost statement using Excel sheet for real time problem.
12. Prepare an Excel sheet for fabrication data tables.

ME-502

1. Visit nearest outlet and list out Domestic Refrigerators manufacturers and
 - a. Know the capacity of the refrigerator and the refrigerant used in it.
 - b. Identify various tools and operations like swaging, flaring and brazing
 - c. Know the colour coding of refrigerant cylinders.
2. Make a report of Montreal and Kyoto protocols.
3. Assemble and disassemble the air cooler and know all the parts.
4. Clean an air cooler, replace pads of air cooler.
5. Visit a RAC workshop and watch the method of vaccumisation and charging of refrigerant.
6. Know the various operations in general servicing of Split AC like cleaning filters, cleaning of condenser coils, cooling coils and checking pressure of refrigerant
7. Perform one general servicing of AC
8. Visit a duct manufacturing unit and study how fabrication is done and submit a report.
9. Visit a site where ducting is being carried out.
10. Collect data sheet to find heating and cooling loads for an air conditioning system and study its contents.
11. Visit a site where split air conditioner is being installed.
12. Visit a central air conditioning plant.

ME-503

1. Visit a noted CAD center involved in commercial jobs and
 - a) Identify practically implemented CAD tools
 - b) Enquire opportunities for self employment in CAD / CAM industry
2. Visit nearby fabrication shop and identify one component and write CNC part programming by observing the geometrical shapes and dimensions and check by simulation

ME-584

1. Visit a nearby Automobile servicing centre observe following and present a seminar
 - a. Observe dismantling of parts
 - b. Various tools used for dismantling and assembly
 - c. Steps in general servicing of parts
 - d. Washing of outside and inside of vehicle

ME-585

1. Visit a nearby complete automation industry and observe following and present a seminar
 - a. How material is transported
 - b. How material is stored
 - c. How parts are inspected
 - d. How material is loaded onto machine
 - e. How material is loaded onto vehicles
 - f. Observe pick and place robots

C21_ Curriculum

DIPLOMA IN MECHANICAL ENGINEERING



OFFERED BY

STATE BOARD OF TECHNICAL EDUCATION & TRAINING,

TELANGANA: HYDERABAD

ME-601-INDUSTRIAL TRAINING

Course Title:	Industrial Training	Course Code	ME-601
Semester:	VI	Course Group	Practical
Teaching Scheme in Periods(L:T:P)	---	Credits	25
Methodology	Practical	Total Training Period	6 Months

Rationale: Industrial training is introduced in the VI semester for the students as a part of the program to make the passed out students industry ready thus saving the training and apprenticeship needs in the industry and also help in capacity building of the Telangana state and the country.

Course Objective:

To enable the students to

1. Acquaint with Industry environment and culture.
2. Develop professional skills
3. Enhance the usage skills of modern tools
4. Develop Communication and leadership skills.
5. Encourage entrepreneurship

Course Outcomes:

CO	Outcome
CO1	Appreciate the organizational setup and hierarchy
CO2	Practice the use of Resource optimization techniques
CO3	Develop core engineering skills
CO4	Develop an understanding of solutions for Environmental issues in the industry
CO5	Get acquainted to industry culture and professionalism

- **Evaluation and assessment of Industrial Training**, shall be done and marks be awarded in the following manner, provided the candidates concerned have put up minimum 90% attendance of Industrial Training.

Mid-I Industrial assessment at Industry : 300 marks
 Mid-II Industrial assessment at Industry : 300 marks
 Institutional Internal Evaluation : 300 marks
 Semester End Examination : 100 marks
 (Seminar/viva-voce at Institution)

TOTAL 1000 marks

Mid – I & II Industrial Assessment parameters at Industry:

Sl No	Learning Parameter	Assessment I (First Quarter)	Assessment II (Second Quarter)
1	Attendance and punctuality	20	20
2	Familiarity of tools and material	30	30
3	Engineering skills	50	50
4	Application of knowledge & Problem solving skills	50	50
5	Comprehension and observation	10	10
6	Professionalism/Professional ethics	20	20
7	Safety and environmental consciousness	10	10
8	Communication skills	20	20
9	Supervisory skills	50	50
10	General conduct during the period	40	40
Total marks for Industry Evaluation		300	300
		600 marks	

Institutional internal Assessment parameters

Institution Level Evaluation Scheme			
Sl No	Criteria	Marks	Time
1	1 st Report Submission	50	After 8 Weeks
2	Seminar-I	50	9 th to 10 th week
3	2 nd Report Submission	50	After 18 weeks
4	Log book	100	Before Viva-Voce
5	Seminar-II	50	Before Viva-Voce
	Institute Evaluation Total	300	
Semester End Examination			
1	Viva-Voce	50	After 24 weeks
2	Presentation/Demonstration of skills	50	
	Total	100	

- The assessment at the institute level will be done by a minimum of three members i.e. Internal Faculty, Industrial Experts/External Examiner and H.O.D. and the same shall be averaged.

Learning Outcomes

1.0 Observe Safety Precautions and rules of the industry

- 1.1. Know the importance of safety in industries
- 1.2. Understand the safety about personnel protection, equipment protection
- 1.3. Know the usage of various safety devices
- 1.4. Precautionary measures to be taken.

2.0 Appreciate organizational set up from top executive to workmen level

- 2.1. Acquaint with the function of each department/section
- 2.2. Comprehend the inter relationship among various department/sections.

3.0. Observe the end product, various Components/ materials used in the production and identify their source.

- 3.1. Identify the various stages involved in the assembly and production of end product.
- 3.2. List the final products, their composition and its commercial importance, uses and Applications.

4.0. Develop an Understanding of various stages involved in processing, sequential arrangement of different equipment.

- 4.1. Represent the whole process and each sub processes with a flow diagram
- 4.2. Observe and appreciate the resource optimization of space (the arrangement of various equipment and machinery in systematic manner in a less possible area of site), Electricity, Men machinery, money and Time.

5.0 Explain various analytical methods used in the quality control department

- 5.1. Practice the Testing methods for quality assurance and bench mark standards
- 5.2. Practice use of various tools, instruments used for quality checking.

6.0 Observe trouble shooting /servicing /maintenance techniques used during the production

- 6.1. Observe preventive precautions and maintenance of each equipment in the unit
- 6.2. Follow Starting and shutting down procedures for the equipment in the unit.

7.0 Identify the various pollutants emitted from the plant/Industry

- 7.1. State effects of pollutants.
- 7.2. Explain handling methods of E waste and pollutants disposal