	KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.	
	TEACHING AND EXAMINATION SCHEME FOR DIPLOMA COURSES.	
	PROGRAMME NAME: MECHANICAL ENGINEERING	PROGRAMME CODE: ME
	PATTERN: FULL TIME	DURATION OF PROGRAMME: 3 YEARS (6 SEMESTERS)
	SEMESTER: I	SCHEME: C-15

Sl.no	Course Name	Teaching Department	Course /QP code	Teaching Scheme — Contact Hours					Examination Scheme					
				TH	TU	PR	Total	Credit	Exam Paper Duration in Hrs	End Exam Max Marks	End Exam Min Marks	I A Marks	Total Marks	Min Marks for passing (including IA marks)
1	Communication Skills in English	Sc & Huma	15CP01E	4	-	-	4	4	3	100	35	25	125	45
2	Engineering Mathematics-I	Sc	15SC01M	4	-	-	4	4	3	100	35	25	125	45
3	Work Shop Technology	ME	15ME11T	4	-	-	4	4	3	100	35	25	125	45
4	Engineering Graphics-I	ME	15ME12D	-	2	4	6	3	4	100	35	25	125	45
5	Basic Computer Skills Lab	ME	15ME13P	-	2	4	6	3	3	50	25	25	75	35
6	Basic work Shop -I	ME	15ME14P		2	4	6	3	3	50	25	25	75	35
			Total	12	6	12	30	21		500	190	150	650	250

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KARNATAKA STATE BOARD OF TECHNICAL EXAMINATION, BENGALURU.	
TEACHING AND EXAMINATION SCHEME FOR DIPLOMA COURSES.	
PROGRAMME NAME: MECHANICAL ENGINEERING	PROGRAMME NAME: MECHANICAL ENGINEERING
PATTERN: FULL TIME	DURATION OF PROGRAMME: 3 YEARS (6 SEMESTERS)
SEMESTER: II	SCHEME: C-15

Sl.no	Subject Name	Teaching Department	Sub/QP code	Teaching Scheme Contact Hours					Examination Scheme					
				TH	TU	PR	Total	Credit	Exam Paper Duration in Hrs	End Exam		I A Marks	Total Marks	Min Marks for passing (including IA marks)
										Max Marks	Min Marks			
1	Engineering Mathematics - II	Sc	**15SC02M**	4			4	4	3	100	35	25	125	45
2	Applied science	Sc	**15SC03S**	4			4	4	3	100	35	25	125	45
3	Basic Electrical & Electronics Engineering	EE	**15EE01E**	4			4	4	3	100	35	25	125	45
4	Engineering Graphics-II(C)	ME	**15ME21D**	-	2	4	6	3	4	100	35	25	125	45
5	Applied Science Lab	Sc	**15SC04P**		2	4	6	3	3	50	25	25	75	35
6	Basic Electrical & Electronics Lab	EE	**15EE02P**		2	4	6	3	3	50	25	25	75	35
				12	6	12	30	21		500	190	150	650	240

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF STUDY AND EXAMINATION
CURRICULUM-2010-11
(III Semester)

Q P CODE	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations					
		Theory	Practical		Duration (hrs)	IA marks	End Exam Marks	Minimum passing Marks	Total Marks	Minimum passing marks with IA marks
THEORY SUBJECTS										
9ME31	Engineering Mechanics & Strength of Materials	4	-	64	3	25	100	35	125	45
9ME32	Fluid Mechanics & Machinery	4	-	64	3	25	100	35	125	45
9ME33	Manufacturing Technology-I	4	-	64	3	25	100	35	125	45
9ME34	Mechanical Measurements & Metrology	4	-	64	3	25	100	35	125	45
PRACTICAL SUBJECTS										
9ME35P	Mechanical Testing & Quality control Lab	-	6	96	3	25	100	50	125	60
9ME36P	Basic workshop practice-II	-	6	96	3	25	100	50	125	60
9ME37P	Machine shop-I	-	6	96	3	25	100	50	125	60
	Total	**16**	**18**	**470**	**-**	**700**	**100**	**290**	**875**	**360**

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF STUDY AND EXAMINATION
CURRICULUM-2010-11
(IV Semester)

Q P CODE	Name of the Subject	Instruction Periods/ Week		Total Periods Per Semester	Scheme Of Examinations					
		Theory	Practical		Duration (hrs)	IA marks	End Exam Marks	Minimum passing Marks	Total Marks	Minimum passing marks with IA marks
THEORY SUBJECTS										
9ME41	Theory of Machines	4	-	64	3	25	100	35	125	45
9ME42	Thermal Engineering-I	4	-	64	3	25	100	35	125	45
9ME43	Manufacturing Technology-II	4	-	64	3	25	100	35	125	45
9ME44	Fluid Power Engineering	4	-	64	3	25	100	35	125	45
PRACTICAL SUBJECTS										
9ME45P	Fluid Power Lab	-	6	96	3	25	100	50	125	60
9ME46P	Machine Shop-II	-	6	96	3	25	100	50	125	60
9ME47P	Parametric Solid Modeling Lab	-	6	96	3	25	100	50	125	60
	Total	**16**	**18**	**470**	**-**	**175**	**700**	**290**	**875**	**360**

GOVERNMENT OF KARNATAKA
DEPARTMENT OF TECHNICAL EDUCATION

DIPLOMA COURSE IN MECHANICAL ENGINEERING (General)
FIFTH SEMESTER
Tentative Scheme of study and Examination (W.E.F 2011-12)

Sl No.	Theory Subject		Contact Hours			Exam. Duration	Scheme of Examination		*I. A. Marks	Total Max. Marks	Min Marks for passing (with IA)
							End. Exam				
			Theory	Pract	Total		Max. Marks	Min. Marks for passing			
1	Basic Management Skills and Indian Constitution.	9ME51	4	-	4	3	100	35	25	125	45
2	Thermal Engineering-II	9ME52	4	-	4	3	100	35	25	125	45
3	Design of machine elements	9ME53	4	-	4	3	100	35	25	125	45
4	Mechatronics	9ME54	4	-	4	3	100	35	25	125	45
	Practical										
5	Mechatronics lab	9ME55P	-	6	6	3	100	50	25	125	60
6	C-Programming and MAT lab	9ME56P	-	6	6	3	100	50	25	125	60
7	CASP	9ME57P	-	6	6	3	50	25	75	125	60
8	Project Work and Industrial visit	9ME58P	-	3	3	**Examination will be at the end of 6th Semester**			25		
	Total		**16**	**21**	**37**		**650**		**250**	**875**	

GOVERNMENT OF KARNATAKA

DEPARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING (General)
SIXTH SEMESTER
Tentative Scheme of study and Examination (W.E.F 2011-12)

Sl No.	Theory Subject	Q P Code	Contact Hours			Exam. Duration	Scheme of Examination		I. A. Marks	Total Max. Marks	Min Marks for passing (with IA)
							End. Exam				
			Theory	Practical	Total		Max. Marks	Min. Marks for passing			
1	Estimating and costing	9ME61	4	-	4	3	100	35	25	125	45
2	Automobile Engineering	9ME62	4	-	4	3	100	35	25	125	45
3	Computer integrated manufacturing	9ME63	4	-	4	3	100	35	25	125	45
4	Elective (Opt Any One)										
	Metal Casting Science and Engineering	9ME64EA	4	-	4	3	100	35	25	125	45
	Refrigeration and Air-conditioning	9ME64EB									
	Power plant engineering	9ME64EC									
	Non conventional Energy resources	9ME64ED									
	Drawing /Practical										
5	Thermal Engineering lab	9ME65P	-	6	6	3	100	50	25	125	60
6	CNC and Casting Simulation lab	9ME66P	-	6	6	3	100	50	25	125	60
7	Project work (Continuation from 5th Semester)	9ME67P	-	3	3	3	100	50	25	125	60
	Total		**16**	**15**	**31**		**700**		**175**	**875**	

GOVERNMENT OF KARNATAKA
DEPARTMENT OF TECHNICAL EDUCATION
Board of Technical Examinations, Bengaluru

Course Title: **COMMUNICATION SKILLS IN ENGLISH**		Course Code	: **15CP01E**
Semester	: **I / II**	Course Group	: **Core**
Teaching Scheme (L:T:P)	: **4:0:0** (in hours)	Credits	: **4 Credits**
Type of course	: **Theory**	Total Contact Hours : **52**	
CIE	: **25 Marks**	SEE	: **100 Marks**

Pre-requisites:

- Basic Knowledge of Grammar.
- Listening, Speaking, Reading and Writing Skills as acquired in Secondary Education.

Course Objectives:

1. Learn to apply the basic grammar in day to day communication in English.
2. Comprehend the given ideas in a passage and be able to effectively express the same in English in written form.
3. Enrich their vocabulary through reading.
4. Face oral examinations and interviews.
5. Express their ideas creatively through (spoken/written) exercises.
6. Create awareness about the importance of English in the Engineering and Corporate fields, to enlighten its importance in the current global scenario.

Course Content:

UNIT I: CAREER PLANNING (09Hrs)

Glossary; Comprehension Exercises; **Vocabulary Exercises** – Spelling; **Grammar**- Parts of Speech; **Newspaper Reading and Comprehension**; **Descriptive Writing –** Describing Objects; **Listening/ Speaking Exercise** – Self Introduction.

UNIT-II: THE GREAT INDIAN PSYCHOTHERAPY (09Hrs)

Glossary; Comprehension Exercises; Vocabulary Exercises – Prefixes and Suffixes; **Grammar** – Articles and Prepositions; **Descriptive Writing** – Describing People; **Listening/ Speaking Exercises** – Listening to speeches and writing gist of it in one's own words.

UNIT III: GLOBAL WARMING   (08Hrs)

Glossary; Comprehension Exercises; Vocabulary Exercises – Synonyms and Antonyms; **Grammar** – Auxiliaries, Question Tags and Short-form Answers; **Descriptive Writing** – Describing Places; **Listening/ Speaking Exercises** – Narrating one's own experiences of different situations in their day- to-day life.

UNIT IV: RENDEZVOUS WITH A WOMAN CORPORATE GIANT   (09Hrs)

Glossary; Comprehension Exercises; Vocabulary Exercises – Homonyms, Homophones, Homographs; **Grammar** – Subject-Verb Agreement; **Descriptive Writing** – Describing Processes; **Listening/ Speaking Exercise**s – A short presentation on a given topic ;**Paraphrasing of Proverbs**; **Different kinds of Interviews**.

UNIT V: A UNIQUE PATIENT   (09 Hrs)

Glossary; Comprehension Exercises; **Vocabulary Exercises** – Compound words; **Grammar** –Tenses; **Descriptive Writing** – Describing Events (Eg: College Day, National Festivals, Etc.); **Comprehension of a paragraph**; **Quiz** – Questions on health and hygiene.

UNIT VI: A FARMER'S WIFE   (08 Hrs)

Glossary; Comprehension Exercises; Vocabulary Exercises – Formation of plurals; **Grammar** – Active and Passive Voices; **Descriptive Writing** – Describing one's goal and its attainment; **Developing hints into a paragraph; Comprehension of an unseen passage**.

Course Delivery:

The Course will be delivered through lectures, class room interactions, exercises and case studies

Total No. Of Hours: 52 Hours

Text	- 18 Hours
Grammar and Composition	- 34 Hours

Internal Assessment: Total 25 Marks

Internal Assessment Tests	- 20 Marks
Classroom Assignment for Spoken Skills	- 05 Marks

Text Book:

COMMUNICATION SKILLS IN ENGLISH FOR POLYTECHNICS – By ORIENT BLACKSWAN PUBLISHERS – Published By NITTTR CHENNAI

Reference Books:

1. **HIGH SCHOOL ENGLISH GRAMMAR AND COMPOSITION** BY WREN AND MARTIN (S.CHAND & CO.)
2. **THE KING'S GRAMMAR** BY SANJAY KUMAR SINHA (S.CHAND & CO.)
3. **STRENGTHEN YOUR WRITING** BY V.R. NARAYANA SWAMY (ORIENT BLACKSWAN)
4. **ESSENTIAL ENGLISH** BY E. SURESH KUMAR et.al (ORIENT BLACKSWAN)
5. **ENGLISH GRAMMAR &COMPOSITION AND EFFECTIVE BUSINESS COMMUNICATION** BY M.A.PINK AND THOMAS S.E. (S.CHAND & CO.)
6. **WHAT YOUNG INDIA WANTS: SELECTED ESSAYS AND COLUMNS** BY CHETAN BHAGAT (RUPA PUBLICATION, NEW DELHI)
7. **CHICKEN SOUP FOR THE INDIAN DOCTOR'S SOUL** BY JACK CANFIELD et.al (WESTLAND LIMITED PUBLISHERS)
8. **SOFT SKILLS** BY K. ALEX(S.CHAND AND COMPANY)
9. **"REFLECTIONS":** I PUC ENGLISH COURSE BOOK, PUBLISHED BY DEPT.OF PRE-UNIVERSITY EDUCATION, GOVT OF KARNATAKA
10. **A PRACTICAL COURSE FOR WRITING SKILLS IN ENGLISH**BY J.K.GANGAL. (PHI PUBLICATIONS)
11. **ENGLISH LANGUAGE LABORATORIES** – A COMPREHENSIVE MANUAL BY NIRAKONAR(PHI LEARNING)

Course outcomes:

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

1. Use the language correctly, concisely and effectively in both spoken and written format.
2. Comprehend Engineering subjects in English and perform their professional activities using English.
3. Participate in group discussion, presentation, reporting and documentation successfully using English.
4. Recognize their latent talents and choose their careers accordingly.
5. Develop their lateral thinking abilities and thus identify innovative methods in solving problems in their lives.
6. Sensitize themselves to various environmental issues and thus take care of the fragile ecology.

Mapping Course Outcomes with Program Outcomes:

COURSE OUTCOMES	PROGRAM OUTCOMES											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S									S		
2	S							S		S		
3	S							S		S		
4	S									S		
5	S							S		S		
6	S							S		S		

S: Strong relationship   M: Moderate relationship

Question Paper Blue Print:

Course: COMMUNICATION SKILLS IN ENGLISH
Course code: 15CP 01E

Sl. No.	Content	Knowledge	Comprehension	Application	Analysis	Total
1.	Lesson		24		15	39
2.	Grammar Parts of speech			4		4
3.	Auxiliaries: Primary and Modals			3		3
4.	Articles			3		3
5.	Identification of tenses			4		4
6.	Active and Passive voice			4		4
7.	Prepositions	4				4
8.	Question tags			3		3
9.	Short form answers			2		2
10.	Prefixes and Suffixes	2				2
11.	Homonyms/Homophones/ Homographs	4				4

12.	Synonyms and Antonyms	4				4
13.	Agreement of the Verb with its Subject	4				4
14.	Descriptive writing – Describing objects, people and places.		5			5
15.	Descriptive writing – Describing processes, events.		5			5
16.	Comprehension of an unseen passage		10			10
	Total	23	44	23	10	100

Question Paper Pattern:

Sl. No.	Source	Question	Type	Marks
1.	Textual Units	Answer any twelve of the following questions in one or two sentences each	15 questions to be asked from 6 Textual Units	12 x 2 = 24
2.	Textual Units	Write short notes on any three of the following	5 questions to be asked from 6 Textual Units	5 x 3 = 15
3.	Grammar	Identify the parts of speech of the underlined words	4 sentences are to be given and word to be identified is underlined	4 x 1= 4
4.	Grammar	Fill in the blanks using suitable Auxiliaries	3 sentences are to be given.	3 x 1= 3
5.	Grammar	Fill in the blanks using suitable Articles	3 sentences are to be given	3 x 1=3
6.	Grammar	Identification of Tenses	4 sentences are to be given	4 x 1= 4
7.	Grammar	Active and Passive Voice: Change the voice of the verb in the following sentences	4 sentences are to be given for changing the voice of the verb	4 x 1= 4

8.	Grammar	Prepositions: Fill in the blanks with appropriate prepositions	4 sentences are to be given	4 x 1= 4
9.	Grammar	Question Tags: Add question tags	3 sentences are to be given	3 x 1= 3
10.	Grammar	Short form answers: Give short form answers	2 sentences are to be given	2 x 1= 2
11.	Grammar	Prefixes and Suffixes: Add Prefixes/Suffixes to the stem words	2 stem words are to be given	2 x 1= 2
12.	Grammar	Homonyms, Homophones and Homographs: Use the following words in your own sentences.	4 words are to be given	4 x 1= 4
13.	Grammar	Synonyms / Antonyms: Give the Synonyms/Antonyms for the following words	2 words each are to be given	2 x 1= 2
14.	Grammar	Agreement of the Verb with its Subject: Fill in the blanks with verbs that agree with their subjects	4 sentences are to be given	4 x 1= 4
15.	Composition	Descriptive Writing: Describe objects, people, places and processes	2 questions are to be given	5 x 2=10
16.	Composition	Comprehension of an unseen passage: Read the following passage and answer the questions that follow	Questions to be set for 10 marks	10
	Total	-	-	100

Guidelines for Question Paper Setting:

1. The question paper must be prepared based on the blue print without changing the weightage of marks fixed for each category.(As per model question paper)
2. The question paper pattern provided should be adhered to.
3. Care must be taken so that there is only one possible answer for all 'fill in the blanks' questions.

Course Assessment and Evaluation:

		What	To Whom	Frequency	Max Marks	Evidence Collected	Course Outcomes
Direct Assessment	**CIE (Continuous Internal Evaluation)**	I A Tests	Students	Three tests (average of three tests will be computed)	20	Blue Books	1 to 6
		Class room Assignments		Any one Activity(*)	05	Log of Activity	1 and 3
				TOTAL	**25**		
	SEE (Semester End Examination)	End Exam	Students	End Of the Course	100	Answer Scripts at BTE	1 to 6
Indirect Assessment	Student Feedback on course			Middle Of The Course	Feedback forms		1 to 3 delivery of the course
	End Of Course Survey		Students	End Of The Course	Questionnaire		1 to 6 Effectiveness of delivery of instructions and assessment

Note: I.A. test shall be conducted for 20 marks. Any decimals shall be rounded off to the next higher digit.

* Class room Assignments:

Evaluated for any one activity:

1. Introducing oneself
2. Discussion about weather
3. Discussion about hobbies
4. Discussing holiday plans
5. Telephonic conversation
6. Talking about favorite sports, movie, TV shows etc.
7. Description about one's goal and its attainment.

Composition of Educational Components:

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's Taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)
1	Remembering and Understanding	20
2	Applying the knowledge acquired from the course	40
3	Analysis	15
4	Evaluation	05
5	Creating new knowledge	20

Tutorial Exercise:

Suggested list of Tutorial Exercises leading to the development of speaking skills:

1. Introducing one self
2. Introduction about family
3. Discussion about weather
4. Seeking permission to do something
5. Description of hobbies
6. Seeking information at bus/railways/air stations
7. Conversation with friends/bank staff/ doctors/ advocates/ superiors/ industrialist etc..,
8. Discussing holiday plans
9. Asking about products and placing orders.
10. Telephonic conversation.
11. Talk about favorite sport/ movie/ actor/ TV show etc.
12. Greeting a friend on his/her birthday, etc.
13. Description about one's goal and its attainment.

Sources:

UNIT 1: CAREER PLANNING: **SOFT SKILLS**-BY DR. K. ALEX

UNIT 2: THE GREAT INDIAN PSYCHOTHERAPY: **WHAT YOUNG INDIA WANTS: SELECTED ESSAYS AND COLUMNS**- BY CHETAN BHAGAT

UNIT 3: GLOBAL WARMING: AN ESSAY BY DR. B.M.RAVINDRA, RETD. DY. DIR., DEPT. OF MINES AND GEOLOGY

UNIT 4: RENDEZVOUS WITH A WOMAN CORPORATE GIANT**: ESSENTIAL ENGLISH** BY E. SURESH KUMAR et.al

UNIT 5: A UNIQUE PATIENT: **CHICKEN SOUP FOR THE INDIAN DOCTOR'S SOUL -** BY JACK CANFIELD et.al

UNIT 6: A FARMER'S WIFE: **REFLECTIONS:** I PUC ENGLISH COURSE BOOK, PUBLISHED- BY DEPT. OF PU   EDUCATION, GOVT OF KARNATAKA

Government of Karnataka
Department of Technical Education, Bengaluru

Course: COMMUNICATION SKILLS IN ENGLISH

Course code: 15CP 01E

Curriculum Drafting Committee 2015-16

	Name	Designation	Institution
1	Mrs. Geetha K.	Selection Grade Lecturer	GRICP, Bengaluru
2	Mr. C.V. Inamdar	Selection Grade Lecturer	Govt. Polytechnic, Belagavi
3	Mrs. BharathiNaik	Selection Grade Lecturer	Women's Polytechnic, Mangaluru
4	Mrs. RajyashreeSrikant	Selection Grade Lecturer	Govt. Polytechnic, Bagepalli
5	Mrs. Sunitha M.N.	Selection Grade Lecturer	HMS Polytechnic, Tumakuru
6	Mr. Deepak Dongre	Selection Grade Lecturer	Govt. Residential Women's Polytechnic, Shivamogga.

Review committee

	Name	Designation	Institution
1	Mrs. Rajyashree Srikant	Selection Grade Lecturer	Govt. Polytechnic, Bagepalli
2	Mrs. Shailaja D.	Lecturer	Women's Polytechnic, Bengaluru

Code: **15CP 01E**

I / II Semester Diploma Examination

COMMUNICATION SKILLS IN ENGLISH

(Common to all Diploma programmes)

Time: 3 Hours]   **[Max. Marks: 100**

Note:

(i)   Answer all the questions as directed.

(ii)   Spelling and grammatical errors shall be penalized.

(iii)   Answers to Question No. I and II are based on the prescribed text.

I.   Answer any TWELVE of the following in one or two sentences each: 2 x 12=24

1.   What do you mean by career?
2.   Define 'Career Planning'?
3.   What should be the major focus of career planning?
4.   What are the questions often asked by the young?
5.   What are the three traits as identified by the author?
6.   How have the content of our films changed?
7.   What is Global Warming?
8.   How does Global Warming occur?
9.   What are the major causes for Global Warming?
10. What was the usual talk when the parents of the children met?
11. What ambition did Nooyi's mother have for her daughter?
12. Who is the sinner according to the poem?
13. Why did the farmer commit suicide?
14. Explain in your own words the reason for the farmer's visit to the clinic.
15. Describe how the doctor fixed the bull's tooth.

II. Write short notes on any THREE of the following: 5 x 3=15
1. How does career planning play a major role in making career choices?
2. How does our environment contribute to our numbness to injustice?
3. Explain in your own words the traditional and modern views of one or two facts expressed in the interview?
4. Explain in your own words the reason for the farmer's visit to the clinic.
5. Why does the farmer's wife resolve to live?

III.GRAMMAR:
1. Identify the parts of speech of the underlined words:4 x 1=4
a. **All** spoke in his favour.
b. Let us **even** the ground.

c. I can **shift** for myself.

d. She lives in **luxury.**

2. **Fill in the blanks with suitable auxiliaries:3 x 1=3**

   a. You _____ not use calculators in the exam hall.

   b. _____I come in sir?

   c. _____ you lend me your scooter?

3. **Fill in the blanks with suitable articles:**   **3 x 1=3**

   a. Charlie is ___ European.

   b. She is ____untidy girl.

   c. What is ____matter?

4. **Identify the tense of the verbs in the following sentences:**   **4 x 1=4**

   a. I am writing a letter.

   b. Sun rises in the east.

   c. I have done my homework.

   d. She has been learning western music.

5. **Change the voice of the verb in the following sentences:**   **4 x 1 = 4**

   a. Who did this?

   b. The money was lost.

   c. The cat is chasing the mouse.

   d. He was made the king.

6. **Fill in the blanks with appropriate prepositions:**   **4 x 1=4**

   a. Caesar was killed ____Brutus____ a dagger.

   b. We arrived____ Belagavi_____6 o' clock.

7. **Add suitable question tag:3 x 1=3**

   a. You were late this morning,_____?

   b. I did not hurt you, _____?

   c. Your father is a doctor, _____?

8. **Give short form answers for the following:**   **2 x 1=2**

   a. Does your father smoke? (Negative)

   b. Have you read today's newspaper? (Affirmative)

9. **Add Suffix and Prefix to the following:**   **2 x 1=2**

   a. _____ nation_____

10. **Frame sentences using each word to bring out the difference in meaning clearly:**   **4 x 1 = 4**

a. (i) Sight   (ii) Site

b. (i) Present   (ii) Present

11. Give Synonyms to the following words: **2 x 1=2**
   a. Teach
   b. Agree

12. Give Antonyms to the following words: **2 x 1 = 2**
   a. War
   b. Happy

13. Fill in the blanks with verbs to agree with their subjects: **4 x 1=4**
   a. Twenty kilometers _____ not a long distance.
   b. Either you or I _____ mistake.
   c. Gold and Silver _____ precious metals
   d. The captain with his team _____ arrived.

IV. COMPOSITION:
   1. Describe your favorite tourist place.   5
   2. Describe the process of preparing tea.   5

V. COMPREHENSION:
Read the following passage and answer the questions that follow:

She was all of one-and-a-half years old. Two nurses were holding her down while a third was trying to insert a syringe into a vein to get a blood sample. She was crying loudly, but I was crying even louder. We had no option. It was the fifth day and the fever had not broken; it was imperative that we run the test to rule out typhoid. They finally asked me to leave the room, not just because they were embarrassed at a grown-up crying, but because they thought it would be easier and quicker for the child if the mother was not in the room. They got her out within a few minutes. She jumped into my arms and gave a few more loud wails. Fresh tears streamed down my eyes as we made our way out of the wretched pathology lab. Her paediatrician was getting into the building just then. Between sobs I told him how my daughter had flung the syringe and the lab had to have three attendants on her to collect the sample. As I was talking, my voice broke. To my surprise, Dr. Patel handed me his briefcase and stethoscope, took my girl in his arms and went to the store just a few paces away. He bought her a Cadbury bar and my daughter's face lit up like a million bucks. Gone were the tears, the memory of the syringe, smell of antiseptic, cotton …everything receded to the background as she unwrapped the big bar with her tiny fingers and dug into it with all her heart. I smiled as the angelic doctor handed me my princess.

Meanings of difficult words:

1. **Imperative:** absolutely essential
2. **Wretched:** miserable; unpleasant
3. **Pathology lab:** where the causes and effects of diseases are studied
4. **Receded:** moved back gradually
5. **Paediatrician:** children's doctor
6. **Flung:** (past tense of fling) an act of throwing violently
7. **Attendants:** one who attends

Questions:

1. How old was the child?   1
2. What did the nurses have to do to get a blood sample?   2
3. Why was the mother asked to leave the room?   2
4. Why does the mother called the pathology lab 'wretched'? 2
5. How did Dr. Patel calm down the little girl?   2
6. Suggest a suitable title for this passage.   1

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Model Question Bank:

Course Title :**COMMUNICATION SKILLS IN ENGLISH**	Course Code: **15CP01E**

I. ANSWER IN ONE OR TWO SENTENCES EACH:

1. What do you mean by career?
2. Define 'Career Planning'?
3. What should be the major focus of career planning?
4. List out the benefits of career planning?
5. Identify the guidelines for choosing a career?
6. What are the frequently asked questions about career fields?
7. How do connections help in searching for a suitable job?
8. What are the sample questions asked about a particular job title?
9. What is the role of a career counselor in charting out a career path?
10. List out the factors influencing career decisions?
11. What has startled global experts?
12. What are the questions often asked by the young?
13. What are the three traits as identified by the author?
14. How have the content of our films changed?
15. In what way have we been exposed to corruption from our childhood?
16. How can we contribute to India's progress?
17. What is global warming?

18. How does global warming occur?
19. What are the major causes for Global Warming?
20. What is the quantity of fossil fuel burnt each year?
21. How does the concentration of carbon dioxide in the air increase?
22. Define Greenhouse effect?
23. By burning forests around the world, how much carbon dioxide is added to the atmosphere?
24. What are the steps to be taken to save our environment?
25. What is the possible problem of global warming and its result?
26. What is the effect of global warming?
27. What was the usual talk when the parents of the children met?
28. What ambition did Nooyi's mother have for her daughter?
29. How did Nooyi's mother threaten Nooyi?
30. What good news did Indra Nooyi want to share with her mother?
31. What did Nooyi's mother say when she was told the good news?
32. What lesson did Nooyi learn from her mother?
33. Why does Nooyi's mother take full credit for Nooyi's success?
34. What does Indra Nooyi discover about the language of business in the U.S?
35. What does Indra Nooyi think about herself as a mother?
36. What is the secret of Indra Nooyi's success?
37. How does Indra Nooyi manage time?
38. What is Indra Nooyi's passion?
39. Describe the farmer who visited the dentist's clinic.
41. What was the curious act of the farmer?
42. What request did the farmer make?
43. Why did the doctor almost 'faint in shock'?
44. What did the farmer say when he came back to the clinic?
45. Who do 'you' and 'I' in the poem refer to?
46. Who is the sinner according to the poem?
47. Why did the farmer commit suicide?
48. Explain the meaning of the phrase 'you crossed over'.
49. What are the contrasts depicted by the writer between the farmer's wife and her husband?
50. What memories of her husband trouble her now?

II. ANSWER IN A PARAGRAPH OF NOT MORE THAN 100 WORDS EACH:

1. Write a short note on Guidelines for Choosing a Career.
2. How does career planning play a major role in making career choices?
3. Explain in your own words the first trait of our psyche.
4. How does our environment contribute to our numbness to injustice?
5. Describe the divisiveness that the author talks about.
6. What are the causes and effects of global warming?

7. How does deforestation affect our environment?
8. What information do you gather about Indra Nooyi after going through the interview with Nandan Nilekani?
9. How did Indra Nooyi's mother try to teach her the role of a woman in a family? Do you agree with her?
10. How do you think Indra Nooyi's mother and her husband contribute to her success?
11. What does Indra Nooyi mean when she says "I have to decide every moment in time whether I am going be a mother or a wife or an executive"?
12. Explain in your own words the traditional and modern views of one or two facts expressed in the interview?
13. Explain in your own words the reason for the farmer's visit to the clinic.
14. Describe how the doctor fixed the bull's tooth.
15. Describe the lament of the farmer's wife on her husband's death?

III.GRAMMAR:

1. **Write the plurals of:**

   a. Cow   b. Dish   c. Tax   d. Cargo   e. Army
   f. Loaf   g. Scarf   h. Goose   i. Son–in- law j. Formula

2. Fill in the blanks with suitable articles:
   a. Dr. Sanjay is ___ dentist.
   b. My friend is ___ MLA.
   c. Have you ever visited___ Himalayas?
   d. Please bring me ___ cup of coffee.
   e. He is ___untidy boy.
   f. She is __backbone of her organization.
   g. He is ___ honour to his profession.
   h. Raghu is going to___ mall.
   i. ____world is ___happy place.
   j. I met___ European at ___ party in ___ friend's house.

3. Fill in the blanks with suitable prepositions:
   a. She works __ a big shop __ Jayanagar.
   b. There is a book ___ the floor. Put it __ the table.
   c. I often see Mrs. Dixit __ the station, waiting __ her train.
   d. Mangalore is __ the coast __ the south __ India.
   e. My daughter isn't __ work today because she isn't feeling well.
   f. There were several people __ the bus stop.
   g. Mr. and Mrs. Sharma were __ the shop talking __ the assistant.

h. Yesterday we spent the day __ the country.

i. We had lunch __ a pretty little village.

j. When I was __ the bus stop this morning; I saw two boys __ the church roof.

4. **Add appropriate prefixes to form new words:**
   a. form   b. regular   c. literate   d. accurate   e. operate
   f. pure   g. fix   h. technic   i. tone   j. national

5. **Add appropriate suffixes to form new words:**
   a. rich   b. love   c. start   d. beauty   e. differ
   f. use   g. cheer   h. attract   i. save   j. slow

6. **Give the synonyms of the following:**
   a. release   b. arrive   c. trap   d. happinesse.   e. large
   f. teach   g. change   h. confusion   i. discover   j. charge

7. **Give the antonyms for the following:**
   a. rise   b. increase   c. smile   d. stricte.   e.sadness
   f. full   g. host   h. success   i. discover   j. charge

8. **Add the correct question tags to the following statements:**
   a. It is cold,_____?
   b. But it isn't as cold as yesterday, ____?
   c. It was very cold yesterday,_____?
   d. It hasn't been so cold for a long time, ____?
   e. It is snowing in the north, ____?
   f. It often snows there, ____?

9. **Give short form answers for the following:**
   a. Does Renu work hard?_____._____.
   b. Can you swim?_____._____.
   c. Are you angry with me?_____._____.
   d. Do you like watching movies?_____._____.
   e. Have you met our Prime Minister?_____._____.

10. **Fill in the blanks with appropriate words from the brackets:**
    a. His father-in-law owns a _____ farm. (dairy/diary)
    b. Diabetics must take extra care of their _____. (feat/feet)
    c. Rekha is a popular ____ of Bollywood.(heroin/heroine)
    d. The country was prosperous during the _____ of Krishnadevaraya.(rein/reign/rain)
    e. You should be_____ in the class. (quite/quiet)

11. Differentiate between the following pairs of words by using each of them in a sentence of your own:

   a. Wrong, rung   b. Principal, principle   c. Hair, hare

   d. Gate, gaite.   e. Sea, see   f. Fair, fare

   g. Some, sumh.   h. Sell, cell   i. Weather, whether

   j. Birth, berth   k. Vacation, vocation   l. Bear, bare

12. Fill in the blanks with verbs to agree with their subjects:

   a. Every seat in the bus _____ taken.

   b. All the seats in this bus _____ reserved.

   c. One of my friends _____ visiting me this week end.

   d. Neither Gopal nor Deepak _____ come today.

   e. The Captain of Indian team as well as his players _____ staying here.

   f. Intelligence and hard work _____ required to get good marks.

   g. Mathematics _____ my favourite subject.

   h. _____ your father and mother at home?

13. Identify the tense of the verbs in the following in the sentences.

   a. He was listening to her attentively.

   b. Raghu denies stealing my purse.

   c. She has bought a flat near my house.

   d. Kiran fought bravely.

   e. The teachers are discussing the details of the annual day function.

   f. I am not trying to copy you.

   g. Sushma was cooking pasta.

   h. The students have been waiting eagerly for the results.

   i. Risheeba speaks Tamil very fluently.

   j. I have been waiting for her for over an hour.

14. Change the voice:

   a. Ramu was making a kite.

   b. Close the door.

   c. Cable wires have been cut.

   d. We prohibit smoking.

   e. Everyone loves him.

   f. My watch was lost.

   g. He was refused admission.

   h. Do not insult the poor.

   i. Without effort nothing can be gained.

   j. They made him captain.

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Course Title:**ENGINEERING MATHEMATICS – I**		Course Code	: **15SC01M**
Semester	: **I**	Core / Elective	: **Core**
Teaching Scheme in Hrs (L:T:P) : **4:0:0**		Credits	: **4 Credits**
Type of course	: **Lecture + Assignments**	Total Contact Hours : **52**	
CIE	: **25 Marks**	SEE	: **100 Marks**
Programmes: **Common to all Engineering Diploma Programmes**			

Pre-requisites:

Basics in Algebra, Trigonometry and Coordinate Geometry in Secondary Education.

Course Objectives:

1. Apply the concept of matrices and determinants and their applications to solve the linear equation in engineering field.
2. Apply the vector algebra in solving the problems of statics and mechanics.
3. Analyse the civil engineering problems using concepts of probability.
4. Evaluate the advanced engineering mathematical problems using logarithms.
5. Apply and evaluate trigonometric concept in vector engineering field.
6. Create the basic concept of calculus.

Course Content:

Topic and Contents	Hours	Marks
LINEAR ALGEBRA		
UNIT-1: MATRICES AND DETERMINANTS	10	31
(a) Matrices: Basic concepts of matrices: Definition, types of matrices and mathematical operations on matrices (addition, subtraction and multiplication of matrices).	02	
(b) Determinant: Definition, problems on finding the determinant value of 2nd and 3rd order. Problems on finding unknown quantity in a 2nd and 3rd order determinants using expansion. Solving simultaneous linear equations using determinant method (Cramer's rule up to 3rd order).	04	

(c) Inverse and applications of matrices: Minors and Cofactors of elements of matrix. Adjoint and Inverse of matrices of order 2nd and 3rd order. Elementary row and column operations on matrices. Characteristic equation and characteristic roots (eigen values) of 2x2 matrix. Statement of Cayley-Hamilton theorem and its verification for 2x2 matrix. Solution of system of linear equations using Gauss Elimination method (for 3 unknowns only).	04	

ALGEBRA

UNITS-2: VECTORS	08	27
Definition of vector. Representation of vector as a directed line segment. Magnitude of a vector. Types of vectors. Position vector. Expression of vector by means of position vectors. Addition and subtraction of vectors in terms of line segment. Vector in plane and vector in a space in terms of unit vector i, j and k respectively. Product of vectors. Scalar product and vector product of two vectors. Geometrical meaning of scalar and vector product. Applications of dot (scalar) and cross (vector) products. Projection of a vector on another vector. Area of parallelogram and area of triangle. Work done by force and moment of force.		
UNITS-3: PROBABILITY AND LOGARITHMS	08	14
(a) **Probability:** Introduction. Random experiments: outcomes and sample space. Event: Definition, occurrence of an event, types of events. Algebra of events- complementary event, the events A or B, A and B, A but not B, mutually exclusive events, exhaustive events, defining probability of an event. Addition rule of probability. Conditional probability: definition, properties of conditional probability, simple problems.	06	
(b) **Logarithms:** Definition of common and natural logarithms. Laws of logarithms (no proof). Simple problems on laws of logarithms.	02	

TRIGONOMETRY		
UNIT-4: ALLIED ANGLES AND COMPOUND ANGLES.	16	47
(a) Recapitulation of angle measurement, trigonometric ratios and standard angles. **Allied angles:** Meaning of allied angle. Signs of trigonometric ratios. Trigonometric ratios of allied angles in terms of θ. Problems on allied angles. (b) **Compound angles:** Geometrical proof of sin(A+B) and cos(A+B) and hence deduce tan(A+B). Write the formulae for sin(A-B), cos(A-B) and tan(A-B), problems. Multiple and submultiple angle formulae for 2A and 3A. Simple problems. Transformation formulae. Expression for sum or difference of sine and cosine of angles into product form. Expression for product of sine and cosine of angles into sum or differences form.	02 06 08	
UNIT-5:COMPLEX NUMBERS	04	09
Meaning of imaginary number i and its value. Definition of complex number in the form of $a + ib$. Argand diagram of complex number $a + ib$ (Cartesian system). Equality of complex numbers. Conjugate of complex number. Algebra of complex numbers, modulus of complex number, principal value of argument of complex number, polar form: $Z = r(cos\theta + i\,sin\theta)$ and exponential form $Z = re^{i\theta}$ of complex number, where r is modulus and θ is principal value of argument of complex number.		
UNIT-6: INTRODUCTION TO CALCULUS	06	17
Limits: Constants and variables. Definition of function. Types of functions: Explicit and implicit function, odd and even functions(definition with example). Concept of $x \to a$. Definition of limit of a function. Indeterminate forms. Evaluation of limit of functions by factorization, rationalization. Algebraic limits. Statement of $\lim\limits_{x \to a} \dfrac{x^n - a^n}{x - a} = na^{n-1}$ where n is any rational number. Proof of $\lim\limits_{\theta \to 0} \dfrac{sin\,\theta}{\theta} = 1$ where θ is in radian. Related problems. Standard limit (statement only) 1. $\lim\limits_{x \to 0} \dfrac{a^x - 1}{x} = \log_e a,$ 2. $\lim\limits_{x \to 0} \dfrac{e^x - 1}{x} = 1$ 3. $\lim\limits_{n \to \infty} \left(1 + \dfrac{1}{n}\right)^n = e,$ 4. $\lim\limits_{n \to 0}(1 + n)^{\frac{1}{n}} = e$ Simple problems on standard limits.		
TOTAL	**52**	**145**

Course outcomes:

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

1. Find the product of matrices, value of determinants, and inverse of matrix and solve the simultaneous linear equation.
2. Find the product of vectors and their geometrical applications in finding moment of force, work done.
3. Determine probability of various types of events.
4. Solve the problems related to logarithms.
5. Solve the problems on trigonometric functions with angle of any magnitude.
6. Evaluate the limiting value of algebraic and trigonometric functions.
7. Prepare for further study in theoretical courses such as differential and difference equations.
8. Enable students to use linear algebra use for numerical solvability of many problems.
9. Apply linear algebra to many practical applications in fields like computer science, physics and engineering.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S	S										
2	S	S										
3	S	S										
4	S	S										
5	S	S										
6	S	S										M
7	S	S										M
8	S	S										M
9	S	S										M

S: Strong relationship   M: Moderate relationship

Reference:

1. NCERT Mathematics Text books of class XI and XII.
2. Karnataka State PUC mathematics Text Books of I & II PUC by H.K. Dass and Dr.Ramaverma published by S.Chand & Co.Pvt.Ltd.
3. CBSE Class Xi & XII by Khattar&Khattar published PHI Learning Pvt. ltd.,
4. First and Second PUC mathematics Text Books of different authors.
5. www.freebookcentre.net/mathematics/introductory-mathematics -books.html

Course Assessment and Evaluation:

The Course will be delivered through lectures, class room interaction, exercises and self-study cases.

Method		What	To whom	When/where (Frequency in the course)	Max Marks	Evidence collected	Contributing to course outcomes
DIRECT ASSMENT	*CIE	Internal Assessment Tests	Student	Three tests (Average of Three tests will be computed).	20	Blue books	1 to 9
		Assignments		Two Assignments (Average of Two Assignments will be computed)	5	Log of record	1 to 6
				Total	25		
	*SEE	Semester End Examination		End of the course	100	Answer scripts at BTE	1 to 9
INDIRECT ASSESSMENT		Student feedback	Students	Middle of the course	-NA-	Feedback forms	1 to 4, delivery of the course
		End of Course survey		End of course		Questionnaire	1 to 9, Effectiveness of delivery of instructions and assessment methods

***CIE** – Continuous Internal Evaluation   ***SEE** – Semester End Examination

Note: I.A. test shall be conducted for 20 marks. Any decimals shall be rounded off to the next higher digit.

Composition of Educational Components:

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)
1	Remembering and Understanding	35
2	Applying the knowledge acquired from the course	25
3	Analysis and Evaluation	40

Model Question Paper:

<div align="right">**Code: 15SC01M**</div>

<div align="center">

I Semester Diploma Examination
ENGINEERING MATHEMATICS –I
(Common to All Engineering Diploma Programmes)

</div>

Time: 3 Hours.][Max marks: 100

Note:

    (i)   Answer any **Ten** questions from **section-A,** any **Eight** questions from **section-B** and any **Five** questions from **section-C.**

    (ii)   Each question carries **3** marks in **section-A**.

    (iii)   Each question carries **5** marks in **section-B**.

    (iv)   Each question carries **6** marks in **section-C**.

<div align="center">

SECTION – A

</div>

1. Find the product of $A = \begin{bmatrix} 2 & 3 & 1 \\ 0 & -1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 4 \\ -1 \\ 5 \end{bmatrix}$

2. If $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & 1 \\ 0 & -3 \end{bmatrix}$ find adj(AB).

3. If $A + B = \begin{bmatrix} 3 & -7 \\ 0 & 2 \end{bmatrix}$, $A - B = \begin{bmatrix} 1 & 5 \\ 4 & -6 \end{bmatrix}$ find A.

4. If $\vec{a} = i + 2j - 3k, \vec{b} = 3i - 5j + 2k$. Find the magnitude of $2\vec{a} + 3\vec{b}$.

5. If $\vec{A}$=(3,-4), $\vec{B}$= (-5,6) find position vector of A and B and also find $\left| \overrightarrow{AB} \right|$

6. Three coins are tossed simultaneously. List the sample space for event.

7. If $\sin \theta = -\dfrac{8}{17}$ and $\pi < \theta < \dfrac{3\pi}{2}$ find the value of $4tan\theta + 3sec\theta$.

8. Find the value of $\sin 75^o$ using standard angles.

9. Show that $\dfrac{cosec(180-A)\cos(-A)}{sec(180+A)\cos(90+A)} = cot^2 A$

10. Prove that $\sin(A + B) \sin(A - B) = \sin^2 A - \sin^2 B$.

11. Prove that $\dfrac{\sin 3A}{\sin A} - \dfrac{\cos 3A}{\cos A} = 2$.

12. Express the product $(1 + i)(1 + 2i)$ in $a + ib$ form and hence find its modulus.

13. Evaluate : $\lim\limits_{x \to 3} \left[\dfrac{x-1}{2x^2-7x+5} \right]$

14. Evaluate: $\lim\limits_{x \to \infty} \left[\dfrac{3x^2+4x+7}{4x^2+7x-1} \right]$

SECTION – B

1. Find the value of x if $\begin{vmatrix} 1 & x & 0 \\ 2 & -1 & 3 \\ -2 & 1 & 4 \end{vmatrix} = 0$.

2. Find the characteristic equation and its roots of a square matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$

3. Find the $sine$ of the angle between the vectors $2i - j + 3k \; and \; i - 2j + 2k$.

4. If vector $\vec{a} = i + j + 2k, \vec{b} = 2i - j + k$ show that $\vec{a} + \vec{b}$ perpendicular $\vec{a} - \vec{b}$.

5. Find the projection of $\vec{a} = 2i + j - k$ on $\vec{b} = 2i - 3i + 4k$.

6. Prove that $\dfrac{1}{\log_a abc} + \dfrac{1}{\log_b abc} + \dfrac{1}{\log_c abc} = 1$

7. Find the numerical value of $\sin\left(\frac{\pi}{3}\right).\cos\left(-\frac{\pi}{3}\right) - \cos\left(\frac{\pi}{4}\right).\sin\left(-\frac{3\pi}{4}\right)$

8. Prove that $\sin(A + B) = \sin A \cos B + \cos A \sin B$ geometrically

9. If $A + B + C = \frac{\pi}{2}$, prove that $\tan A \tan B + \tan B \tan C + \tan C \tan A = 1$.

10. Show that $\dfrac{\sin 56^o - \sin 44^o}{\cos 56^o + \cos 44^o} = \cot 82^o$

11. Evaluate: $\lim\limits_{x \to 0} \left[\dfrac{\sqrt{1+x+x^2}-1}{x}\right]$

SECTION – C

1. Solve for x, y & z using determinant method

$x + y = 0, y + z = 1 \& z + x = 3$.

2. Solve the equation $x + y + z = 6, 2x - 3y + z = 1 \& x + 3y - 2z = 7$ using Gauss elimination method.

3. A force $\vec{F} = 2i + j + k$ is acting at the point (-3,2,1). Find the magnitude of the moment of force $\vec{F}$ about the point (2,1,2).

4. A die is thrown twice and the sum of the numbers appearing is absorbed tobe. What is the conditional probability that the number 5 has appeared at least once?

5. Prove that $\dfrac{\cos\left(\frac{5\pi}{2}-\theta\right)}{\sin(4\pi+\theta)} + \dfrac{\tan(-\theta)}{\cot(\pi-\theta)} = sec^2\theta$

6. Prove that $\cos 80^o \cos 60^o \cos 40^o \cos 20^o = \frac{1}{16}$

7. Find the modulus and argument of the complex number $z = -\sqrt{3} + i$ and hence represent in argand diagram.

8. Prove that $\lim\limits_{\theta \to 0} \left(\dfrac{\sin \theta}{\theta}\right) = 1$ where θ is in radian.

Question Paper Blue Print:

Course: **ENGINEERING MATHEMATICS – I**   Course Code: **15SC01M**

UNIT NO		HOURS	Questions to be set (3 Marks) Section - A	Questions to be set in two sub-divisions(5 Marks) Section - B	Questions to be set in two sub division (6 Marks) Section- C	Weightage of Marks
1	a	2	2	-	-	31
	b	4	-	1	1	
	c	4	1	1	1	
2		8	2	3	1	27
3	a	6	1	-	1	14
	b	2	-	1	-	
4	a	8	1	1	1	47
	b	8	4	3	1	
5		4	1	-	1	9
6		6	2	1	1	17
TOTAL		52	14	11	08	145
Questions to be answered			10	08	05	100

Guidelines for Question Paper Setting:

1. The question paper must be prepared based on the blue print without changing the weigh age of model fixed for each unit.

2. The question paper pattern provided should be adhered to

   Section-A: 10 questions to be answered out of 14 questions each carrying 03 marks

   Section-B: 08 questions to be answered out of 11 questions each carrying 05 marks.

   Section-C: 05 questions to be answered out of 08 questions each carrying 06 marks.

3. Questions should not be set from the recapitulation topics.

4. Questions should not be set from the recapitulation topics.

Course Title:**ENGINEERING MATHEMATICS – I**	Course Code: **15SC01M**

UNIT-1: MATRICES AND DETERMINANTS

3 MARK QUESTIONS

1. If $A = \begin{bmatrix} 3 & -9 \\ -4 & 7 \end{bmatrix}$, find $A + A'$.

2. If $A = \begin{bmatrix} 2 & -1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 5 & -2 \\ 3 & 1 \\ 2 & 4 \end{bmatrix}$, find AB matrix.

3. If matrix $A = \begin{bmatrix} 2 & -1 & 3 \\ 5 & 1 & 0 \\ 1 & 0 & x \end{bmatrix}$ is a singular matrix, then find the value of x.

4. Find the adjoint of the matrix $A = \begin{bmatrix} 4 & -5 \\ 3 & -2 \end{bmatrix}$.

5. If $A = \begin{bmatrix} 3 & -1 \\ 0 & -2 \end{bmatrix}$ find the characteristic equation.

5 MARK QUESTIONS

1. Solve the equations $x + y = 3, 2x + 3y = 8$ by Cramer's rule.

2. Solve for x, if $\begin{vmatrix} 1 & 5 & 7 \\ 2 & x & 14 \\ 3 & 1 & 2 \end{vmatrix} = 0$

3. Verify Cayley-Hamilton theorem if $A = \begin{bmatrix} 1 & 3 \\ 2 & -4 \end{bmatrix}$.

4. Verify $A(AdjA) = |A|. I.$ if $A = \begin{bmatrix} 5 & -2 \\ 3 & 1 \end{bmatrix}$.

5. Find the adjoint of the matrix $A = \begin{bmatrix} 3 & -1 & 2 \\ 2 & -3 & 1 \\ 0 & 4 & 2 \end{bmatrix}$

6 MARK QUESTIONS

1. Solve for x &y from the equations $4x + y = 7, 3y + 4z = 5, 5x + 3z = 2$ by Cramer's rule.

2. Find the inverse of the matrix $\begin{bmatrix} 1 & 2 & 2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$

3. Prove that adj(AB)=(adjB).(adjA) if $A = \begin{bmatrix} -1 & 0 \\ 5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 \\ 2 & 4 \end{bmatrix}$

4. Find the characteristic roots of a matrix $\begin{bmatrix} 1 & -1 \\ -6 & -2 \end{bmatrix}$.

5. Solve the equations by Gauss elimination method $3x - y + z = 0, x + 2y - 2z = 3, 3x + z = 4$.

UNIT-2: VECTORS

3 MARK QUESTIONS

1. Find the magnitude of vector 2i +3j – 6k
2. If $\vec{a} = i + 2j - 3k, \vec{b} = 3i - 5j + 2k$ find magnitude of $\overrightarrow{3a} - \overrightarrow{2b}$
3. Show that $\cos\theta i - \sin\theta j$ is unit vector
4. Show that the vectors $2i + 5j - 6k$,and $7i + 2j + 4k$ orthogonal vectors.
5. If $\vec{a} = 5i + 2j - 4k$, and $\vec{b} = 2i - 5j + 3k$ find $\vec{a}X\vec{b}$.

5 MARK QUESTIONS

1. Find cosine of the angle between the vectors $4i - 2j - 3k$ and $2i - 3j + 4k$.
2. Find the projection of $\vec{b}$ on $\vec{a}$ if $\vec{a} = 5i + 2j - 4k$ and $\vec{b} = 2i - 5j + 6k$.
3. If $\vec{a} = 3i + 2j - 4k$ and $\vec{b} = i - 2j + 5k$ are two sides of a triangle, find its area.
4. Simplify $(\vec{a} + \vec{b}).(\vec{a} - \vec{b})$ and $(\vec{a} + \vec{b})X(\vec{a} - \vec{b})$.
5. Find the magnitude of moment of force $4i - 2j + 5k$ about (2,5,-7) acting at (4,7,0)

6 MARK QUESTIONS

1. If A=(2,5,7), B=(3,9,4) and C=(-2,5,7) are three vertices of parallelogram find its area.
2. If a force $4i + 6j + 2k$ acting on a body displaces it from (2,7,-8) to (3,9,4). Find the work done by the force.
3. Find the sine of the angle between the vectors $4i - 2j - 3k$ and $2i - 3j + 4k$.
4. Find the unit vector in the direction perpendicular to both vector $2i - 5j + k$ and $5i + j + 7k$.
5. Show that the points whose position vectors are $i - 3j - 5k$, $2i - j + k$ and $3i - 4j - 4k$ form a right angled triangle.

UNIT-3: PROBABILITY AND LOGARITHMS

3 MARK QUESTIONS

1. Define equally likely events, Independent event, and mutually exclusive event.
2. Define probability of an event.
3. A coin is tossed twice. What is the probability that at least one head occurs.
4. A die is thrown once, what is the probability an odd number appears.
5. If E and F are events such that P(E)=0.6, P(F)=0.3 and P(E∩F)= 0.2. Find P(E/F).

5 MARK QUESTIONS

1. Prove that $\dfrac{1}{1+\log_c ab} + \dfrac{1}{1+\log_a bc} + \dfrac{1}{1+\log_b ca} = 1$

2. If $x = \log_c ab$, $y = \log_b bc$, $z = \log_a ca$,
   Prove that $xyz = x + y + z + 2$

3. If $x = \log_{2a} a$, $y = \log_{3a} 2a$, $z = \log_{4a} 3a$, prove that $xyz + 1 = 2yz$

4. If $a^2 + b^2 = 7ab$, prove that $\log\left(\frac{a+b}{3}\right) = \frac{1}{2}(\log a + \log b)$

5. Solve for x given that $(\log_2 x)^2 + (\log_2 x) - 20 = 0$

6 MARK QUESTIONS

1. An integer is chosen at random from the numbers ranging from 1 to 50 . What is the probability that the integer chosen is a multiple of 3 or 10 ?

2. Two unbiased dice are thrown once . Find the probability of getting the sum of the numbers obtained on the two dice is neither a multiple of 2 nor a multiple of 4 .

3. One card is drawn from a well shuffled pack of 52 cards. If E is the event "the card drawn is a king or an ace" and F is the event " the card drawn is an ace or a jack " then find the conditional probability of the event E, when the event F has already occurred .

4. A pair of dice is thrown once. If the two numbers appearing on them are different, find the probability that the sum of the numbers is 6.

5. A family has two children. What is the probability that both the children are boys given that (i) the youngest is a boy. (ii) at least one is a boy ?

UNIT-4: ALLIED ANGLES AND COMPOUND ANGLES

ALLIED ANGLES

3 MARKS QUESTIONS

1. Find the value of $\cos ec(-1110^0)$

2. Find the value of $\dfrac{\cos ec(180^0 - A)\cos A}{\sec(180^0 + A)\cos(90^0 + A)}$

3. 3.If $\sin\theta = \dfrac{1}{2}$ and $\dfrac{\pi}{2} \subset \theta \subset \pi$, find $\cos\theta$

4. 4. If A+B+C $=180^0$ Prove that $\cot\left(\dfrac{A+B}{2}\right) = \tan c/2$

5. 5.find the value of $\tan\left(\dfrac{7\pi}{3}\right)$

5 MARKS QUESTIONS

1. Prove that $\dfrac{\sin(180^0 - A)COS(360^0 - A)\tan(180^0 + A)}{COS(270 + A)\sin(90 + A)\cot(270 - A)} = 1$

2. If secx = 13/5 and $270^0 \subset x \subset 360^0$, Find the value of $\dfrac{3\sin x - 2\cos x}{9\cos x + 4\sin x}$

3. Find the value of $\cos 570^0 \sin 510^0 - \sin 330^0 \cos 390^0$

4. Evaluate $\dfrac{\sin(-\alpha)}{\sin(90^0 + \alpha)} - \dfrac{\cos(-\alpha)}{\cos(90 - \alpha)} - \dfrac{\sec(90^0 - \alpha)}{\cos(180^0 + \alpha)}$

5. Show that $\tan 225^0 \times \cot 405^0 + \tan 765^0 \times \cot 675^0 + \csc 135^0 \times \sec 315^0 = 0$

6 MARK QUESTIONS

1. Evaluate $\tan 315^0 \times \cot 405^0 + \tan 765^0 \times \cot 675^0 + \csc 135^0 \times \sec 315^0$

2. Find x if $\dfrac{x \sin^2 300^0 \sec^2 240^0}{\cos 225^0 \csc^2 240^0} = \cot^2 315^0 \tan^2 300^0$

3. If $\sin \theta = \dfrac{-1}{4} \ and \pi \subset \theta \subset \dfrac{3\pi}{2}$, find the value of $\dfrac{\cos \theta + \tan \theta}{\cot \theta + \sec \theta}$

4. Evaluate $\dfrac{\sin(2\pi - A)}{\sin(\pi - A)} - \dfrac{\tan\left(\dfrac{\pi}{2} + A\right)}{\cot(2\pi + A)} + \dfrac{\csc(-A)}{\sec\left(\dfrac{\pi}{2} + A\right)}$

5. Show that $\tan^2(315^0)\cot(-405^0) + \cot(495^0)\tan(-585^0) = 0$

COMPOUND ANGLES

3 MARKS QUESTIONS

1. Find the value of $\sin 15^0$

2. Show that $\tan(45^0 + \theta) = \dfrac{1 + \tan \theta}{1 - \tan \theta}$

3. Prove that $\dfrac{\sin(A - B)}{\cos A \cos B} + \dfrac{\sin(B - C)}{\cos B \cos C} + \dfrac{\sin(C - A)}{\cos C \cos A} = 0$

4. Using tan(A+B), prove that $\cot(A+B) = \dfrac{\cot A \cot B - 1}{\cot A + \cot B}$

5. Prove that $\dfrac{\sin 2A}{\sin A} - \dfrac{\cos 2A}{\cos A} = \sin A$

5 MARKS QUESTIONS

1. Prove that $\cos(A-B)\cos(A+B) = \cos^2 A - \sin^2 B$

2. Show that $\sin\left(A+\dfrac{\pi}{4}\right) + \cos\left(A+\dfrac{\pi}{4}\right) = \sqrt{2}\cos A$

3. If $\sin A = \dfrac{1}{\sqrt{10}}$, $\sin B = \dfrac{1}{\sqrt{5}}$ $prove\,that\,A+B = 45^0$

4. Prove that $\tan 3\theta - \tan 2\theta - \tan\theta = \tan\theta\tan 2\theta\tan 3\theta$

5. If $A+B = \dfrac{\pi}{4}$, $prove\,that\,(1+\tan A)(1+\tan B)) = 2$

TRASFORMATION FORMULAE

3 MARKS QUESTIONS

1   P.T $\dfrac{\cos A + \cos B}{\sin A + \sin B} = \cot\left(\dfrac{A+B}{2}\right)$

2   P.T $\dfrac{\sin 68° + \sin 52°}{\cos 68° + \cos 52°} = \sqrt{3}$

3   Show that $\cos 40° - \cos 50° = \sqrt{2}\ \sin 5°$

4   Show that $\sin 47° + \cos 77° = \cos 17°$

5   Show that $\cos 80° + \cos 40° - \cos 20° = 0$

MARKS QUESTIONS

1   P.T $\dfrac{\sin\theta + \sin 3\theta + \sin 5\theta}{\cos\theta + \cos 3\theta + \cos 5\theta} = \tan 3\theta$

2   In and triangle ABC prove that tanA + tanB +tanC = tanAtanBtanC

3   Show that $\dfrac{\sin 9° + \cos 9°}{\cos 9° - \sin 9°} = \tan 54°$

4   Prove that $\cos 55° + \cos 65° + \cos 175° = 0$

5   Prove that $\sin 20° \times \sin 40° \times \sin 80° = \dfrac{\sqrt{3}}{8}$

MARKS QUESTIONS

1   Prove that $\cos 20^0 x\cos 40^0 x\cos 80^0 x\cos 60^0 = 1/16$

2   In any triangle ABC prove that sinA+sinB+sinC=4Cos(A/2)cos(B/2)cos(C/2)

3   Show that $\dfrac{\cos x + \cos 2x - \cos 3x - \cos 4x}{\sin x + \sin 2x + \sin 3x + \sin 4x} = \tan x$

4   If $A+B+C = 180^0$ prove that $\cos^2 A + \cos^2 B + \cos^2 C = 1 - 2\cos A\cos B\cos C$

5 If A+B+C = 180^0 prove that sin2A-sin2B+sin2C=4cosAcosCsinB

UNIT-5: COMPLEX NUMBERS

3 MARK QUESTIONS

1. Evaluate i^{-999}
2. Find the complex conjugate of $(1 + 2i)(3i - 4)$
3. Express $(3 + 4i)^{-1}$ in the form a+ib
4. Find the real part and imaginary part of $\frac{1}{\sqrt{2}+i}$
5. $if\, x + iy = \cos\theta + i\sin\theta$ show that $x + \frac{1}{x} = 2\cos\theta$

5 MARK QUESTIONS

1. Evaluate $\left(i^{19} + \left(\frac{1}{i}\right)^{25}\right)^2$
2. Find the modulus and amplitude of $\left(1 - i\sqrt{3}\right)$
3. Express in a + ib form: $\frac{(2+3i)}{(1+3i).(2+i)}$
4. Express the complex number $1 + i$ in the polar form.
5. Find the amplitude of $\sqrt{3} + i$ and represent in Argand diagram.

UNIT-6: INTRODUCTION TO CALCULUS

3 MARK QUESTIONS

1. Evaluate: $\lim\limits_{x\to-3} \frac{x^2-9}{x+3}$

2. Evaluate: $\lim\limits_{\theta\to0} \left(\frac{\tan m\theta}{\sin n\theta}\right)$

3. Evaluate: $\lim\limits_{n\to\infty} \left(\frac{n+1}{n}\right)^n$.

4. Evaluate: $\lim\limits_{x\to\infty} \left(\frac{3x^2-2x+1}{2x^2+5x-1}\right)$
5. Evaluate: $\lim\limits_{x\to0} \left(\frac{1-\cos 2x}{x^2}\right)$

5 MARK QUESTIONS

1. Evaluate: $\lim\limits_{x\to1} \frac{x^2+x-2}{x^2-1}$.

2. Evaluate: $\lim\limits_{x\to0} \left(\frac{\sqrt{a+x}-\sqrt{a-x}}{3x}\right)$

3. Evaluate: $\lim\limits_{x\to1} \left(\frac{x^m-1}{x^n-1}\right)$

4. Evaluate: $\lim_{\theta \to 0} \left(\frac{1-\cos x + \tan^2 x}{x \sin x} \right)$

5. Evaluate: $\lim_{x \to 0} \left(\frac{e^{ax} - e^{bx}}{x} \right)$.

6 MARK QUESTIONS

1. Prove that $\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1$, if θ is in "radian".

2. Evaluate: $\lim_{x \to 0} \left(\frac{\sin \pi x}{x-1} \right)$

3. Evaluate: $\lim_{n \to \infty} \left(\frac{(5-n^2)(n-2)}{(2n-3)(n+3)(5-n)} \right)$.

4. Evaluate: $\lim_{x \to 1} \frac{x^2 - 5x + 4}{x^2 - 12x + 11}$.

5. Evaluate: $\lim_{x \to 2} \left(\frac{x^2 - 4}{\sqrt{x+2} - \sqrt{3x-2}} \right)$

Course: ENGINEERING MATHEMATICS - I

Course code: 15SC01M

Curriculum Drafting Committee 2015-16

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1	Dr. D.S. Prakash	Asst. Director (LRDC)	DTE, Bengaluru
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3	Sri.Sathyanaraya Dixit,	Lecturer (Selection Grade /Science)	PVP Polytechnic, Bengaluru
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Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

	Course Title: **WORK SHOP TECHNOLOGY**	Course Code: **15ME11T**
	Credits (L:T:P) : **4:0:0**	Core/Elective: **Core**
	Type of course: **Lecture**	Total Contact Hours: **52**
	CIE : **25** Marks	SEE : **100** Marks

Prerequisites: Enthusiasm to learn the subject.

<div style="background:#F5A623">**COURSE OBJECTIVES**</div>

1. Appreciate the various materials available for manufacturing.
2. Gain the knowledge about manufacturing process for particular application.
3. Powder metallurgy application for various types of cutting tools.

<div style="background:#F5A623">**COURSE OUTCOMES**</div>

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

1. Identify the various materials for manufacturing process for a particular application
2. Identify the manufacturing process for a particular application
3. Select the various types of Fabrication Process for Mechanical applications.
4. Understand the Metal casting Techniques and basic structure of products.
5. Understand the various Sheet metal works in practice for production.
6. To know the application of powder metallurgy techniques in Engineering and specially in cutting tools area

<div style="background:#F5A623">**CONTENTS**</div>

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Unit No	Unit Name	Hour	Questions to be set for (5marks) PART - A	Questions to be set for (10marks) PART - B
I	Materials for Manufacturing	10	02	02
II	Basic Manufacturing process	08	02	02
III	Basic Fabrication Process	10	02	02
IV	Metal casting processes	10	01	02
V	Sheet metal processes	06	01	01
VI	Powder metallurgy	08	01	01
	Total	**52**	**09(45marks)**	**10(100 marks)**

UNIT: I	MATERIALS FOR MANUFACTURING	CONTACT HOURS: 10 Hours

Introduction of Engineering Materials- Classification, mechanical Properties of metals and uses of Ferrous Metals-Pig Iron, Cast Iron, Wrought Iron, steel, Classification of Steels according to Carbon content, Introduction to High speed Steels-18-4-1 HSS & uses. Introduction, Purposes and methods of Heat treatment -Annealing-Normalizing-Hardening-Tempering and Case Hardening-Properties and uses of Nonferrous metals- Aluminum, Copper,Lead,Tin,zinc,Magnesium,Nickel, Properties and uses of Plastics- Thermo plastics & Thermosetting-Properties and Uses of Ceramics , Composite Materials and uses.

UNIT: II	BASIC MANUFACTURING PROCESS	CONTACT HOURS: 08 Hours

Introduction to manufacturing processes- Mechanical working of metal – Introduction to Hot working and cold working of metals. - Hot Rolling and types-Three High, Four high rolls. Principle of Drawing, Deep drawing. Principle of Extrusion, Direct, Indirect and tube Extrusion. Introduction to Forging, Smith forging operations. .

UNIT: III	BASIC FABRICATION PROCESS	CONTACT HOURS:10 Hours

Introduction to Welding-Classification of welding- Principle of Arc welding, Gas welding. Types of Arc welding-MIG Welding, TIG Welding, Submerged arc welding. Principle of resistance welding – Spot, butt, seam Welding. -Welding Defects and remedies. Comparison of welding, soldering and Brazing.

UNIT: IV	METAL CASTING PROCESSES	CONTACT HOURS: 10 Hours

Introduction to metal castings, Use of patterns, Pattern materials, types of Patterns-single, Split, loose Piece, Sweep, Skeleton, gated Patterns - allowances – Types of Moulding sand and Properties. Concept of Cope, Drag, Runner, Riser & core. Permanent mould casting – Die casting, Slush Casting, Centrifugal casting, Name and brief explanation of Defects in Castings

UNIT: V	SHEET METAL PROCESSES	CONTACT HOURS:06 Hours

Introduction to Sheet Metal Work and Applications, metals used for Sheet Metal work, Standard Gauge numbers. Sheet metal operations-shearing, cutting off, Parting, blanking, Punching, notching, slitting, Lancing, Bending, Drawing and squeezing. Introduction to Press working- Types of presses- Power press and Ball or Fly press. Applications of presses.

UNIT:VI	POWDER METALLURGY	CONTACT HOURS: 08 Hours

Introduction to Powder Metallurgy –Manufacture of Metal Powders by Different Methods-Automization, reduction, Electrolysis and Shotting.Powder Metallurgy Process, Secondary Operations. Products of Powder Metallurgy. Advantages and Limitations of powder metallurgy.

TOTAL CONTACT HOURS:52

TEXT BOOKS:

1. *Elements of Workshop Technology* Vol-I Manufacturing Process edition-By Hajra Choudry

Reference:

1. *Manufacturing Technology -1* By P.C Sharma of S.CHAND Publications.
2. *Engineering Materials* by Er.R.K.RAJPUT of S.CHAND Publications
3. *Work shop technology* By R.S KHURMI & J.K GUPTA of S.CHAND & Co.Ltd

Course Delivery: The course will be delivered through lectures and presentations, suitable Videos

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S	S										
2	S	S										
3	S	S								M		
4	S	S								M		
5	S	S					M					
6	S	S					M					

S: Strong Relationship   M: Moderate Relationship

Course Assessment and Evaluation Scheme:

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE*	IA	Students	Three tests (Average of three tests will be computed)	20	Blue books	1,2,3,4,5,6
				Assignment	05	Assignment books	1,2,3,4,5,6
				Total	**25**		
	SEE*	End Exam		**End of the course**	**100**	Answer scripts at BTE	1,2,3,4,5
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2,3,4,5,6 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,5&6 Effectiveness of Delivery of instructions & Assessment Methods

***CIE** – Continuous Internal Evaluation   ***SEE** – Semester End Examination

Note: I.A. test shall be conducted for 20 marks. Any decimals shall be rounded off to the next higher digit.

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

1. Remembering and Understanding :   - 30% weightage
2. Applying the knowledge acquired from the course :   - 50 % weightage
3. Analysis :   - 10% weightage
4. Evaluation :   - 5% weightage
5. Creating new knowledge :   - 5% weightage

<div style="background:yellow">**MODEL QUESTION PAPER**</div>

Diploma in Mechanical Engineering

1 Semester
Course Title: WORK SHOP TECHNOLOGY

Time: 3 hrs   Max marks:100

    1 Answer any SIX question from Part A
    2. Answer any SEVEN full questions From Part B

Section A

1) Classify the engineering Materials with Examples.   05
2) Explain Annealing process in heat treatment.   05
3) State the properties and uses of Nickel   05
4) Explain hot working and cold working of metal.   05
5) State the Differences between Arc welding & Gas welding.   05
6) Explain with neat sketch TIG welding.   05
7) State the properties of moulding sands.   05
8) Name different metals used for sheet metal work.   05
9) State any five advantages of powder metallurgy   05

Section B

1)   a) Differentiate between Pig Iron And Cast Iron.   06
       b) Indicate any four uses of Cast Iron.   04
2)   a) Explain uses of composite materials in engineering.   04
       b) State the five properties and uses of Ceramics   06
3)   Explain with neat sketch following Rolling operations
       a) Three High Rolling   05
       b) Four High Rolling   05

4) a) Explain with a neat sketch Tube Extrusion. 06
  b) Describe the uses of hot working & cold working 04
5) a) List Three uses of Gas welding. 03
  b) Explain with neat sketch Gas welding. 07
6) Explain briefly with sketches
  a) Spot welding 05
  b) Seam welding 05
7) a) State the Ingredients of Foundry Sand 03
  b) Explain with neat sketch die casting 07
8) a) explain casting defects. 04
  b) Explain briefly with sketch centrifugal casting 06

9) Explain with sketch the following sheet metal operations
  a) Bending 05
  b) Drawing 05
10) a) Name the different products of powder metallurgy. 04
  b) State the advantages & limitations of powder metallurgy 06

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<div style="text-align:center">**MODEL QUESTION BANK**</div>

Diploma in Mechanical Engineering

1St Semester

Course Title: WORK SHOP TECHNOLOGY

UNIT 1:

05 Marks Questions

1. Define Engineering Materials? Write any four important applications of them.
2. Classify the engineering Materials with Examples.
3. Explain briefly Ductility & Malleability property of metal
4. State plasticity & Elasticity of metals.
5. Indicate Five Properties and uses of Pig Iron.
6. List any five properties and uses of Cast Iron.
7. Indicate five uses and Properties of Wrought Iron.
8. Define Heat treatment? And Indicate Any Four purpose
9. Name the Different Heat treatment Process?
10. Explain Annealing process in heat treatment.
11. Explain Normalizing Process.
12. Explain Hardening Process of heat treatment.
13. Explain Tempering Process of Heat treatment.
14. Explain Case Hardening Process of heat treatment.
15. Define Non Ferrous metal and Name any four Non ferrous metals.

16. Indicate any five properties of Non ferrous metals.
17. State any five uses of Non ferrous metals.
18. State any five properties and uses of aluminium.
19. State any five properties and uses of copper.
20. State any five uses of Nickle.
21. State any five properties and uses of Plastics.
22. Explain Thermo plastics & thermosetting.
23. Indicate any five uses & properties of Ceramics.
24. Define composite materials. Indicate any four uses of them.

10 Marks Questions

1. a).Differentiate between Pig Iron And Cast Iron.	05
b) Indicate any five uses of Cast Iron.	05
2. a) Distinguish wrought Iron With steel	06
b) State any four uses of wrought Iron	04

3. Explain the following processes of heat treatment with applications   10
     a) Annealing   b) hardening

4. Explain the following processes of heat treatment with applications
     a) Normalizing .   b) Tempering.   10

5.a) state the Differences between Ferrous & Non Ferrous Metals.	06
b) Indicate any four Examples for ferrous & non ferrous metals	04
6.a) Compare thermoplastics and thermosetting	04
b) State the five properties and uses of plastics.	06
7. a) Explain use of composite materials in engineering.	05
b) State the five properties and uses of Ceramics	05

UNIT 2:

05 Marks Questions

1) Explain hot working and cold working of metals.
2) Define Forging. List the common forging operations.
3) Define Rolling operation. List the types of rolling
4) Explain with a neat sketch three high rolling.
5) Explain with a neat sketch four high rolling.
6) Explain the Principle of wire drawing operation.
7) Define Extrusion. State the uses of it.
8) Explain with a neat sketch Direct Extrusion.
9) Explain with a neat sketch Indirect Extrusion.
10) Explain with neat sketch Tube Extrusion.

10 Marks Questions

1) a) Compare hot working with cold working.	06
b) State the uses of manufacturing process.	04
2) a) Explain with a neat sketch Tube Extrusion.	06
b) Describe the uses of hot working & cold working.	04
4) Explain with neat sketch the following extrusions	
a) Direct Extrusion.	05

b) Indirect Extrusion.   05
5) Explain with neat sketch following Rolling operations
    a) Three high Rolling   05
    b) Four High Rolling   05
6) Explain with neat sketch
    a) Indirect Extrusion   05
    b) Three high rolling   05

UNIT 3
05 Marks Questions

1) Define Welding and Classify.
2) State the Differences between Arc welding & Gas welding.
3) List the welding defects.
4) Explain with neat sketch MIG welding.
5) Explain with neat sketch TIG welding.
6) Differentiate between welding & Soldering.
7) Differentiate between Brazing & Soldering.

10 Marks Questions

1) a) State three uses of Arc welding   03
    b) Explain with sketch arc welding.   07
2) a) List any three uses of Gas welding.   03
    b) Explain with neat sketch Gas welding.   07
3) a) Name the different types of Resistance Welding.   03
    b) Explain with neat sketch Spot welding.   07
4) Explain briefly with sketches
    a) Spot welding   05
    b) Seam welding   05
5) a) Explain with neat sketch butt welding.   06
    b) Compare welding with soldering.
6) a) Explain with neat sketch Submerged arc welding.   07
    b) Explain briefly Soldering.   03
7) a) Explain with neat sketch MIG welding.   06
    b) Compare MIG welding & TIG Welding.   04
8) a) Explain with neat sketch TIG welding.   06
    b) List the equipments used for Arc welding.   04

UNIT 4

05 Marks Questions

1) Explain metal Casting process.
2) Define Pattern. List the materials used for Pattern.
3) Name the different types of patterns.
4) State the properties of moulding sand.
5) Explain with sketch Split pattern.

6) Explain with sketch loose pattern.
7) Explain with sketch gated pattern.
8) Explain with sketch sweep pattern.
9) Explain with sketch slush Casting.
10) State the uses of metal casting.
11) Explain briefly with a neat sketch centrifugal casting.
12) Explain briefly Runner and Raiser used in casting process.
13) Explain briefly any five defects in casting
14) Explain briefly Cope, Drag and Core used in casting process

10 Marks Questions

1 a) state the importance of metal casting.	04
b) Explain with sketch slush Casting.	06
2) a) State the Ingredients of Foundry Sand	03
b) Explain with neat sketch centrifugal casting	07
3) Explain with neat sketch	
a) Split pattern	05
b) Gated pattern	05
4) a) Explain pattern making materials	04
b) Explain with neat sketch die casting	06
5 a) Explain casting allowance	05
b) List the differences between Sand casting and Die casting.	05

UNIT 5
05 Marks Questions

1) State the uses of sheet metal in Engineering
2) Explain properties and Gauges of sheet metal.
3) Name different metals used for sheet metal work.
4) Explain shearing and bending operation of sheet metals.
5) Explain briefly with sketch drawing operation of sheet metal.
6) Explain briefly squeezing and blanking operation of sheet metal.

10 Marks Questions

1) Explain with necessary sketches of different Shearing operations in sheet metals.	10
2) Explain with sketch the following sheet metal operations	
a) Bending b) Drawing	10
3) a) State any Four applications of sheet metals	04
b) Explain following shearing operation in sheet metal	
a) Cutting off b) Blanking	06
4) a) State any three applications of presses	03
b) Explain Power press with a neat sketch	07
5) a) State any three applications of presses	03
b) Explain Ball or fly press with a neat sketch	07

UNIT 6
05 Marks Questions

1). Explain the uses of powder metallurgy in engineering.
2) State any five Limitations of powder metallurgy.
3) State any five advantages of powder metallurgy.
4) Define metal powder. And name the different methods of manufacture.
5) Explain briefly manufacture of metal powder by mechanical method.
6) Explain briefly manufacture of metal powder by Automization method.
7) Explain briefly manufacture of metal powder by Reduction method.
8) Explain briefly manufacture of metal powder by Electrolysis method.
9) Explain briefly manufacture of metal powder by shotting method.

10 Marks Questions

1)	a) Explain with neat sketch powder metallurgy process	07
	b) State limitation of powder metallurgy.	03
2)	a) Explain secondary operations of powder metallurgy process.	06
	b) Indicate the advantages of powder metallurgy.	04
3)	Explain the following metal powder manufacturing methods.	
	a) Mechanical method b) Automization	10
4)	Explain the following metal powder manufacturing methods.	
	a) Reduction method b) Electrolysis	10
5)	a) Name the different products of powder metallurgy.	04
	b) State the advantages & limitations of powder metallurgy.	06

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Department of Technical Education
Board of Technical Examinations, Bengaluru

	Course Title: **ENGINEERING GRAPHICS-I**	
	Semester : **I**	Course Code: **15ME12D**
	Credits (L:T:P) : **0:2:4**	Core/Elective: **Core**
	Type of course: **Lectures, Practice**	Total Contact Hours: **78**

(*** (**Common to all Mechanical /AE/MTT/Chemical Programme**) ***

Prerequisite: Knowledge in Secondary Education and Zeal to learn the course.

COURSE OBJECTIVES

1. The course is aimed at developing Basic Graphic skills.
2. Develop Skills In Preparation Of Basic Drawings.
3. Skills in Reading and Interpretation of Engineering Drawings.

COURSE OUTCOMES

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

1. Use the drawing instruments effectively and able to dimension the given figures
2. Appreciate the usage of engineering curves in tracing the paths of simple machine components
3. Understand the concept of projection and acquire visualization skills
4. Draw the basic views related to projections of points, Lines, Planes

CONTENTS

UNIT:I	DIMENSIONING	CONTACT HOURS: 12 Hours

Introduction to Engineering Drawing-Drawing Instruments – Standard Sizes of Drawing sheets-Layout of drawing sheets-Types of lines and their applications-Conventions for various materials-Introduction to Dimensioning-Elements of Dimensioning–Systems of Dimensioning-Methods of arrangements of Dimensioning- Dimensioning of common features like diameters,radii,arcs and chords - Dimensioning of counter sunk and counter bore-Introduction to Scale- Definition of R.F- Concept of reducing, enlarging and full size scale.

UNIT:II	CONIC SECTIONS AND SPECIAL CURVES	CONTACT HOURS: 18 Hours

Introduction to conic sections - Division of a line into equal number of parts- Types of conic section- Eccentricity- Construction of conic sections(Parabola, Ellipse and Hyperbola) when eccentricity and distance of the focus from the directrix is given-Construction of ellipse by Intersecting lines method(Rectangular and parallelogram methods)and Concentric circles method - Construction of parabola by rectangle method, parallelogram method and a tangent method-Construction of Rectangular/Equilateral Hyperbola-Construction of Involutes of a circle and to draw tangent and normal at any point on the curve- Construction of Cycloid and to draw a tangent and normal at any point on the curve.

UNIT III	ORTHOGRAPHIC PROJECTION AND PROJECTION OF POINTS	CONTACT HOURS: 12 Hours

Introduction to orthographic projection- Principal planes of projection- Four Quadrants- Concept of First angle & Third angle projection methods- Projection of points in all the four quadrants.

UNIT:IV	PROJECTION OF LINES	CONTACT HOURS: 18 Hours

Projection of lines – Line Parallel to both HP and VP – Line parallel to one plane and Perpendicular to other- Line parallel to one plane and Inclined to the other- Line inclined to both HP and VP. (**First angle projection should be followed).**

UNIT:V	PROJECTION OF PLANE SURFACES	CONTACT HOURS: 18 Hours

Construction of polygons-Projection of plane Surfaces – Plane surface parallel to one plane and Perpendicular to other two – Plane surface Perpendicular to one plane and inclined to the other- Plane surface inclined to both HP and VP.

TOTAL CONTACT HOURS :78

TEXT BOOK

1. K.R.Gopalakrishna"Fundamentalsof Drawing" Subhas Publications, 2010.
2. K.R.Gopalakrishna"Engineering Drawing" (Vol. I & II), Subhas Publications, 2014.

REFERENCES

1. R.K. Dhawan, "A text book of Engineering Drawing", S.ChandPublishers, Delhi, 2010.
2. G.S. Phull and H.S.Sandhu, "Engineering Graphics", Wiley Publications, 2014.
3. K.Venugopal and V.Prabhu Raja, "Engineering Graphics", New Age International PrivateLimited, 2008.
4. M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson Education, 2005.
5. DhananjayA.Jolhe, "Engineering Drawing with an Introduction to AutoCAD", Tata McGrawHill Publishing Company Limited, 2008.
6. BasantAgarwal and Agarwal.C.M., "Engineering Drawing", Tata McGraw Hill PublishingCompany Limited, New Delhi, 2008.

Mapping Course Outcomes with Program Outcomes

Course Outcomes	Program Outcomes (PO's)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S	S								S		
2	S	S								S		
3	S	S								S		
4	S	S								S		

S: Strong Relationship   M: Moderate Relationship

Course Assessment and Evaluation Scheme:

	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment method	CIE *	IA	Students	Graded Exercises (Average of Marks allotted for each Graded exercise)	25	Drawing Sheets	1,2,3,4
	SEE *	End Exam		End of the course	100	BTE Answer scripts	1,2,3,4
Indirect Assessment method	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4,Effectiveness of Delivery of instructions & Assessment Methods

***CIE** – Continuous Internal Evaluation   ***SEE** – Semester End Examination

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

Sl. No.	Educational Component	Weightage (%)
1	Remembering and Understanding	30
2	Applying the knowledge acquired from the course	65
3	Analysis	01
4	Evaluation	01
5	Creating new knowledge	03

Weightage of Marks

Unit No	Unit Name	Hour	Questions to be set for (10marks) PART – A	Questions to be set for (15marks) PART – B
I	DIMENSIONING	12	01	---
II	CONIC SECTIONS AND SPECIAL CURVES	18	----	03
III	ORTHOGRAPHIC PROJECTION AND PROJECTION OF POINTS	12	----	01
IV	PROJECTION OF LINES	18	----	02
V	PROJECTIONS OF PLANE SURFACES	18	----	03
	TOTAL	**78**	01(10)(compulsory)	09 (135) (any six)

MODEL QUESTION PAPER

Course Code: 15ME12D

1st semester Diploma in Mechanical Engineering

ENGINEERING GRAPHICS – I
(Conventional)

Time: 4 Hours][Max. Marks: 100

Note: Part –A is compulsory. Answer ANY TWO full questions from Part-B,C& D

PART –A

1. (a)List the standard sizes of the drawing sheets.   -- 05
    (b)Mention the types of lines and their applications.   --05

PART –B

2. Draw an ellipse when the distance of focus from the directrix is 40 and Eccentricity is ¾..

                                                                                                                    ---15

3. A Stone   thrown from the ground level reaches a maximum height of 45 meter and
    falls on the ground at a distance of 100metre from the point of projection.   Trace the path
    of the stone in space. Select a scale of 1:1000   --- 15

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4. Drawthe involute of a circle of diameter 50mm. Also draw a tangent and normal at any point on the curve.   ---15

PART- C

5. Draw the projections of the following points on a common reference line:
   a. Point P is 25mm above the HP and 40mm behind the VP
   b. Point Q is 30mm below the HP and 40mm behind the VP
   c. Point R is 25mm above the HP and in the VP.
   d. Point S is 30mm below the HP and in the VP
   e. Point T is 35mm in front of the VP and in the HP.   --- 15

6. A line AB measuring 70mm has its end A is 15mm in front of VP and 20mm above HP. And the other end B is 60mm in front of VP and 50mm above HP. Draw the projections of the line and find the Inclinations of the line with both the reference planes of projection.   --- 15

7. A line PQ has its end P 15mm above HP and 10mm in front of VP. The end Q is 55mm above HP and the line is inclined at 30° to HP. The distance between the end projectors of the line.Whenmeasured parallel to the line of intersection of HP and VP is 50mm. Draw the Projections of line and find its inclination with VP.   .
                                            ---15

PART-D

8. A pentagonal plane lamina of edges 20mm is resting on HP with one ofits corners touching it such that the plane surface makes an angle of 60° with HP. The two of the base edges containing the corner on which the lamina rests make equal inclination with HP If the edge opposite to this corner makes an angle of 45° with the VP. Draw the top and front views of the plane lamina in this position.   --15

9. An equilateral triangular lamina of 30mm side lies with one of its edges on HP such that the surface of the lamina is inclined to the HPat 60°.   The edge on which it rests is inclined to the VP at 60°. Draw the projections.   **--15**

10. A circular lamina of 60mm diameter rests on HP such that the surface of the lamina is inclined at   30° to HP. The diameter through which the point on which the lamina rests on HP appears to be inclined at 30° to VP in the top view. Obtain its projections.   --15

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1st semester Diploma in Mechanical Engineering

ENGINEERING GRAPHICS-I
(Conventional)

UNIT-I

**10 Marks Questions(Each sub questions carries 5 marks)**

1. (a)List the standard sizes of drawing sheets.
   (b)Mention the types of lines and their applications.
2. a) Illustrate the elements of dimensioning with the help of a sketch.
   b) Illustrate the dimensioning of given common features: diameter, radius, chord, Arcand angle.
3. a)Mention the uses of the following drawing instruments.
   i) T-square ii) Set square   iii)Bowcompass iv) Clinograph   v)Minidrafterb)
   Mention the uses of the following drawing instruments.
   i) Frenchcurves ii) Protractor   iii)Clips.iv)Erasing Shield   v)Drafting machine
4. a) Define RF. Mention the types of scales based on RF.
   b) Give the conventional representation for the following materials.
   i) Cast iron   ii) Lead   iii)Bronze   iv)Glass   v)Wood
5. a) Illustrate the dimensioning of counter sunk and counter bore
   b)Draw the standard layout of aA2 size drawing sheet.
6. List the standard sizes of drawing sheets.
7. Mention the types of lines and their applications.
8. Illustrate the elements of dimensioning with the help of a sketch.
9. Illustrate the dimensioning of given common features: diameter, radius, chord, Arc and angle.
10. Mention the uses of the following drawing instruments.
    i) T-square ii) Set square   iii) Bow compass iv) Clinograph   v) Minidrafter
11. Mention the uses of the following drawing instruments.
    i) French curves ii) Protractor   iii) Clips iv) Erasing Shield   v) Drafting machine
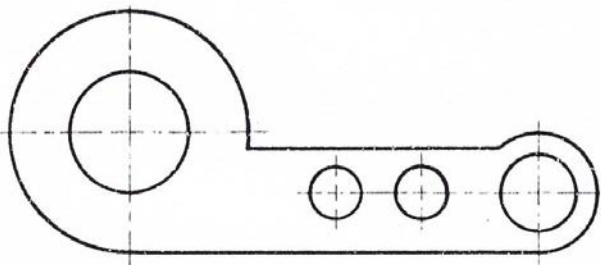12. Draw the standard layout of a A2 size drawing sheet.

13. Copy the given sketch to 1:1 scale and dimension adopting aligned system with parallel dimensioning method.
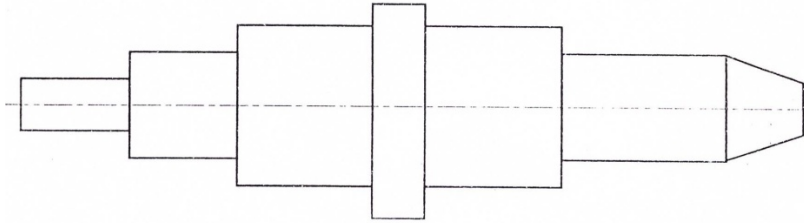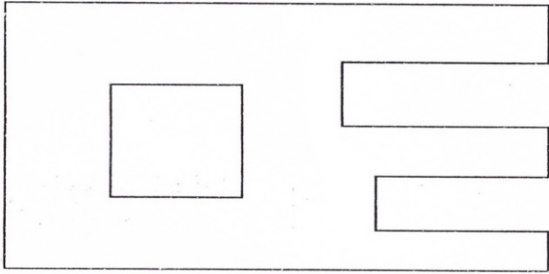

14. Copy the given sketch to 1:1 scale and dimension adopting aligned system with progressive dimensioning method.
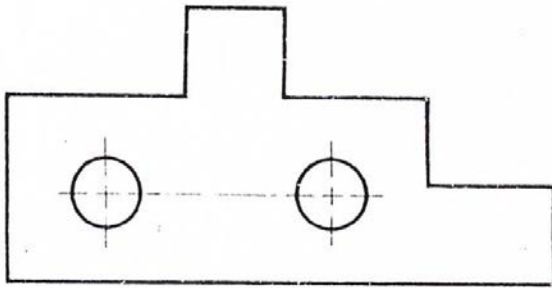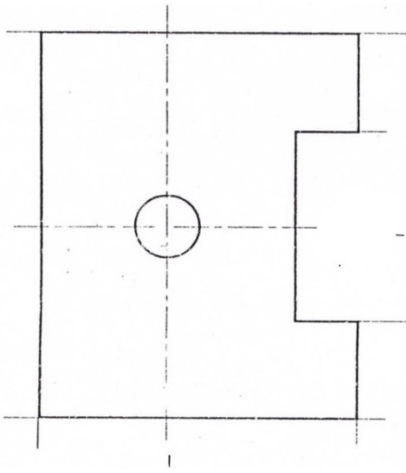

15. Copy the given sketch to 1:1 scale and dimension adopting unidirectional system with chain dimensioning method.
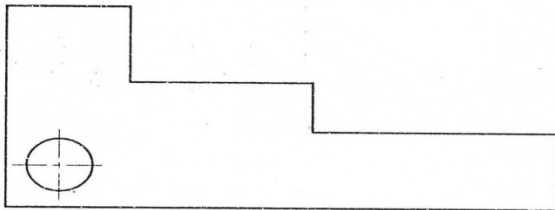
16. Copy the given sketch to 1:1 scale and dimension adopting unidirectional system with combined dimensioning method.

17. Copy the given sketch to 1:1 scale and dimension adopting unidirectional system with parallel dimensioning method.

18. Copy the given sketch to 1:1 scale and dimension adopting aligned system with chain dimensioning method.

UNIT – II

15 Marks Questions

1. Draw an ellipse when the distance of focus from the directrix is 40 mm &eccentricity is ¾.
2. An ellipse has the major axis and minor axis in the ratio 3:2. Draw the ellipse when the major is axis is 135mm by concentric circles Method.
3. Inscribe an ellipse in a rectangle of 130x80mm by intersecting lines method.
4. A parallelogram has sides 130mm and 80mm at an included angle of 60°. Inscribe an ellipse In the parallelogram. Find the major and minor axes of the ellipse.
5. Draw a parabola when the distance of the focus from the directrix is 30mm.
6. A Stone thrown from the ground level reaches a maximum height of 45 meter and falls on the ground at a distance of 100metre from the point of projection. Trace the path of the stone in space. Select a scale of 1:1000
7. Construct a Parabola in a parallelogram of the sides 100mmx45mm and with an included angle of 75°.
8. A shot is discharged from the ground level at an inclination of 55° to the ground which is assumed to be horizontal. The shot returns to the ground at a point 75metre distant from the point of discharge. Trace the path of the shot. Scale 1:1000. Use tangent method only.
9. Construct a hyperbola when the distance of focus from the directrix is 35 mm and eccentricity is 4/3.
10. Construct a rectangular hyperbola given a point P on it at a distance of 20 mm and 15 mm from the two asymptotes.
11. Draw the involute of a circle of diameter 40 mm. Also draw a tangent and normal at any point on the curve.
12. A circle of 50 mm diameter rolls on a line. A point on the circumference of the circle is in Contact with the line in the beginning and after one complete revolution. Draw the cycloidal path of the point. Draw a tangent and normal at any point on the curve.

UNIT – III

(15 Marks Questions)

1. a) Draw the symbolic representation of First angle projection method.
   b) Draw the projections of the following points:
       i) P is 25mm below the HP and in the VP
      ii) Q is 40mm behind the VP and in the HP
     iii) R is 30mm below the HP and 30mm in front of the VP
      iv) S is 25mm above the HP and 25mm behind the VP

2. a) Draw the symbolic representation of Third angle projection method.
   b) Draw the projections of the following points:
     i) T is 25mm above the HP and 30mm in front of the VP.
     ii) U is in both the VP and HP
     iii) V is 35mm below the HP and 30mmm behind the VP
     iv) W is 30mm above the HP and 35mm behind the VP
3. a) Draw the projections of the following points:
     i) A is 25mm above the HP and 35mm in front of the VP
     ii) B is 25mm above the HP and 40mm behind the VP
     iii) C is 30mm below the HP and 40mm behind the VP
     iv) D is 30mm below the HP and 35mm in front of the VP
     v) E is 25mm above the HP and in the VP.
     vi) F is 30mm below the HP and in the VP
     vii) G is 35mm in front of the VP and in the HP
     viii) H is 40mm behind the VP and in the HP
     ix) M lies in all the three principal planes
4. a) A point P is 40 mm in front of VP; 50 mm above HP and 30 mm in front of left PP.
   Draw the three principal views of the point.
   b) A point P is 30 mm above HP, 50 mm behind VP and 45 mm in front of left PP. Draw
   the three principal views of the point
5. **a)** Draw the three principal views of a point P lying 40 mm behind VP, 60 mm below HP
   and 30 mm behind the right PP
   b)Draw the three principal views of a point P lying 60 mm below HP, 50 mm in front of
   VP and 45 mm in front of the left PP.

UNIT IV

(15 Marks Questions)

1. **a)** Draw the three principal views of a line 80 mm long placed parallel to VP and
   perpendicular to HP. The line is 70mm in front of VP and 60mm in front of right PP. The
   lower end of the line is 30mm above HP.
   b) Draw the three principal views of a line 80 mm long when it is placed parallel to both
   HP & VP. One of the ends of the line is 70 mm above HP, 60 mm in front of VP and
   30mm in front of the right PP.
2. **a**) A line AB 80 mm long is inclined at 30° to HP and parallel to VP. The line is 90 mm
   in front of VP. The lower end A is 35 mm above HP,110 mm in front of the right PP and
   is away from it than the higher end. Draw the three principal views of the line.
   b) A line AB 80 mm long is inclined at 45° to VP and parallel to HP. The end nearer to
   VP is 30mm in front of VP, 60 mm above HP and 100 mm in front of right PP. Draw the
   three principal views of the line.

3. **a)** Draw the projections of a line AB, 80 mm long inclined at 30° to HP and parallel to VP. The line is 40 mm in front of VP. The lower end A is 20 mm above HP.
   b) The length of a line is 100 mm long and is inclined at 45° to VP and parallel to HP.The line is 15 mm above HP and one end of the line is 10 mm in front of VP. Draw the projections of the line and measure top and front views.
4. **a)** The length of top view of a line which is parallel to VP and inclined at 45° to HP is 50 mm. One end of the line is 12 mm above HP and 25 mm in front of 45° to VP. Draw the projections of the line and determine its true length.
   b) Draw the projections of a line 70 mm long lying in VP and inclined at 45° to HP. The lower end of the line is 10 mm above HP.
5. A straight line AB, 80 mm long makes an angle of 45° to HP and 30° to VP. The end A is 10 mm in front of VP and is on HP. Draw the projections of the line.
6. A line AB 60 mm long has one of its extremities 20 mm in front of VP and 15 mm above HP. The line is inclined at 30° to HP and 45° to VP. Draw its top and front views.
7. A line AB is 75 mm long. The end A is touching VP and 10 mm above HP. The end B is 50 mm in front of VP and 30 mm above HP. Draw the top view of the line AB and finds the true inclinations of the line AB with HP & VP.
8. A line AB measuring 70 mm has its end A 15 mm in front of VP and 20 mm above HP. The other end B is 60 mm in front of VP and 50 mm above HP. Draw the projections of the line with HP & VP.
9. A line PQ has its end P 15 mm above HP and mmin frontof VP. The end Q is 55 mm above HP and the line is inclined at 30° to HP. The distance between the end projectors of the line when measured parallel to the line of intersection of HP & VP is 50 mm. Draw the projections of the line and find its inclinations with VP.
10. The distance between the end projectors passing through the end points of a line AB is 40 mm. The end A is 20 mm above HP and 15 mm in front of VP. The line AB appears as 65 mm long in the front view. Complete the projections. Find the true length of the line and its inclinations with HP & VP.
11. The top view of a line PQ, 75 mm long measures 50 mm. The end P is 50 mm in front of VP and 15 mm above HP. The end Q is 15 mm in front of VP. Draw the projections of the line PQ and fine its inclinations with HP & VP.
12. The front view of a line is 80 mm in length and makes 40° with XY line. One of its ends is 10 mm in front of VP and 15 mm above HP. The other end is 50 mm in front of VP. Draw the top and front views of the line. Determine the true length and inclinations of the line with HP & VP.
13. The front view of a line AB, 125 mm long, is 75 mm and its top view is 100 mm long. Its end A is 30 mm from both the planes of projection. Draw the projections and find the inclinations of the line with the reference planes of projection.

14. Line measuring 75 mmlong has one of its ends 50mm in front of VP and 15mm above HP. The top view of the line is 50mm long. The other end is 15mm in front of VP and above HP. Draw the projections of the line and find the true inclination.

UNIT-V

(15 Marks Questions)

1. An equilateral triangular lamina of side 40mm rests with one its sides on HP so that the surface of the lamina is inclined at 30° to HP. The side on which the lamina rests is inclined at 45° to VP. Draw the projections of the lamina.
2. An equilateral triangular lamina of sides 30mm is resting with one of its corners on HP, The surface of the lamina is inclined at 45° to HP and the side opposite to the corner on which the lamina rests is inclined at 45° to VP. Draw the projections of the lamina.
3. A square lamina of 40mm side rests with one of its sides on HP so that the surface of the lamina is inclined at 30° to HP. The side on which the lamina rests is inclined at 45° to VP. Draw the top and front views of the square lamina in this position.
4. A square lamina of 40mm sides rests with one of its corner on HP. The diagonal passing through this corner is inclined at 45° to HP and appears to be inclined at 45° to VP. Draw its projections.
5. A square lamina of side 40mm rests with one of its corner on HP. The diagonal passing through this corner is inclined at 45° to HP and 30° to VP. Draw its projections.
6. A regular pentagonal lamina has its sides as 30mm. It is resting with one of its corners on HP so that the side opposite to this corner touches VP. The plane surface of the lamina is inclined at 30° to HP.
7. A hexagonal lamina of sides 30mm rests on one of its sides on HP so that the surface of the lamina is inclined at 45° to HP. The side parallel to the side on which the lamina rests is inclined at 45° to VP. Draw the top and front views of the lamina.
8. A hexagonal lamina of side 30mm is resting with one of its corner on HP so that the diagonal passing through that corner is inclined at an angle of 45° and appears to be inclined at 30° to VP. Draw the top and front views of the lamina.
9. A square lamina of ABCD of 30mm side rests on the corner C such that diagonal AC appears as at 30° to the VP in the top view. The two sides BC and CD containing the corner C make equal inclinations with the HP. The surface of the lamina makes 45° with HP. Draw its top and front views.
10. A pentagonal plane lamina of edges 20mm is resting on HP with one of its corner touching it such that plane surface makes an angle of 60° with HP. The two of the base edges containing the corner on which the lamina rests make equal inclinations with HP. If the edge opposite to this corner makes an angle of 45° with the VP. Draw the top and front views of the plane lamina in this position.

11. A hexagonal lamina of 30mm sides rests on HP on one of its sides. The side which is on HP is perpendicular to VP and the surface of the lamina is inclined to HP at 45°.
The lamina is then rotated through 90° such that the side on HP is parallel to the VP, while the surface is still inclined to HP at 45°. Draw the front view and the top view of the lamina in its final position.

12. A circular lamina of 60mm diameter rests on HP such that the surface of the lamina is inclined at 30° to HP. The diameter through the point on which the lamina rests on HP appears to be inclined at 30° to the VP in the top view. Obtain its projections.

	Course Title: **Basic Computer Skills Lab**	Course Code: 15ME13P
	Credits (L:T:P) : **0:2:4**	Core/ Elective: **Core**
	Type of course: **Tutorial, Practice**	Total Contact Hours: **78**

Prerequisites: Knowledge of English comprehension.

<div style="background:gold">**COURSE OBJECTIVES**</div>

Will learn and understand the Basics of Computers and apply the application tools like word processor, spread sheet and presentation.

<div style="background:gold">**COURSE OUTCOMES**</div>

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

1. Understand the basic organisation of the computer.
2. Use the different tools and utilities of the operating system.
3. Demonstrate skills using a) Word Processor b) spreadsheet c) presentation.
4. Construct the concepts learned through a mini project.

<div style="background:gold">**COURSE CONTENTS**</div>

Tutorials and Practice

Unit – I

Introduction to computer hardware and software
1. Identify and understand the models of Computers, Identify and understand front panel and back panel connections of a Computer system, Identify and understand the physical components of a Computer.
2. Conduct computer system connection and understand the booting process.
3. Familiarization of GUI based Operating System environment.
4. Practice creating Icons and Folders, Creating/Opening of file, Editing and saving the document, Copy, Cut and Paste operations, in-built utilities of OS like – Text editors, paint, calculator, etc.
5. Practice browsing of different sites using search engine.
6. Practice Creating E-Mail accounts, E-Mail Group, Sending, and Receiving of E-Mails.

Unit –II

Word Processing
1. Create a Business Letter and Personal Letter.
2. Create a Company Letterhead.
3. Create a Simple Newsletter with minimum three columns. Insert a Clip art in the newsletter.
4. Create a Resume for a Job Application.
5. Create the cover page of a Project Report (use Word Art, insert Picture Image).
6. Prepare the class time table for your class.

Spreadsheet
1. Create a worksheet with five columns. Enter ten records and find the sum of all columns using auto sum feature.
2. You have a monthly income of Rs.11000. Your monthly expenditures are Rent- Rs 3500, Food- Rs. 1500, Electricity- Rs.110, Phone- Rs. 160, and Cable TV-Rs. 300. Prepare a worksheet with the Monthly Income, the Monthly Expenditures listed and summed, monthly savings amount (what's left over each month) calculated, and the amount saved per day (assuming 30 days in a month).
3. Create a worksheet containing the pay details(containing Basic pay, DA, HRA ,Other Allowance , Deductions- PF,PT, Insurance, Gross and Net salary) of the employees using formulas.
4. Create a Simple Bar Chart to highlight the sales of a company for three different periods.
5. Create a Pie Chart for a sample data and give legends.

Presentation
1. Using presentation tool, Create a simple Presentation consisting of 4-5 slides about Input and Output Devices.
2. Create a presentation about a book containing Title, Author, Publisher and Contents.
3. Create an automated (with timings & animation) Presentation with five slides about different Models of Computers. Use Presentation tool.

Mini-project [CIE- 05 Marks]
1. Prepare a mini project using the above concepts of Unit-I and/or Unit-II.
   - Repair and Overhauling of PC of laboratory
   - Formatting of PC
   - Servicing of UPS
   - Prepare a report using the learned skills on Unit 1 to Unit II

Course Delivery:
The course will be delivered through tutorials of two hours and four hours of hands on practice per week

References:
1. Computer Fundamentals Concepts, Systems, Application, D.P.Nagapal, S.Chand Publication, RP-2014, ISBN: 81-219-2388-3
2. http://www.tutorialsforopenoffice.org/
3. http://www.libreoffice.org/get-help/documentation/
4. http:// www.kingsoftstore.com/

S/W Tools: Any open source tool or equivalent proprietary tools

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S	S			M							
2	S	S			M							
3	S									M	M	
4	S	S			M					M	M	

S: Strong Relationship   M: Moderate Relationship

Course Assessment and Evaluation Scheme:

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	**CIE** (Continuous Internal Evaluation)	**IA** Tests	Students	Two Tests (Average of two tests to be computed)	10	Blue books	1,2,3,4
				Record Writing (Average marks of each exercise to be computed)	10	Record Book	1,2,3,4
				Mini Project	05	Report	1,2,3,4
				TOTAL	25		
	SEE (Semester End Examination)	End Exam		End of the course	50	Answer scripts at BTE	1,2,3,4
INDIRECT ASSESSMENT	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2,3,4 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3, 4 Effectiveness of Delivery of instructions & Assessment Methods

Note: I.A. test shall be conducted as per SEE scheme of valuation. However the obtained marks shall be reduced to 10 marks. (Any decimals shall be rounded off to next higher digit).

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

1. Remembering and Understanding :   - 20% weightage
2. Applying the knowledge acquired from the course :   - 70 % weightage
3. Analysis :   - 1% weightage
4. Evaluation :   - 1% weightage
5. Creating new knowledge :   - 8% weightage

Scheme of Evaluation for End Exam

SN	Scheme	Max. Marks
2	Testing skills/ abilities from Unit - I	05
3	One question on Word or Power point 05M), one question from spread sheet(10M) from UNIT-II	15
4	Execution of Word or Power point	10
5	Execution of spread sheet	10
6	Viva voce	10
Total		**50**

Note:
1. Candidate shall submit Lab Record for the Examination.
2. Student should be allowed to execute directly even if she / he unable to write the procedure
3. In case of change in experiment or no write up, marks will not be awarded for writing procedure/steps.

Resource requirements for Basic Computer Skills Lab
(for an Intake of 60 Students [3 Batches])

Hardware requirement

Sl. No.	Equipment	Quantity
1	PC systems (latest configurations with speakers)	20
2	Laser Printers	03
3	Networking (Structured) with cat 6e / wireless 24 Port switches / Wireless Router I/O Boxes for networking(as required)	03
4	Broad Band Connection	01

Software Requirement: Linux, Libre Office / Open Office / Kingsoft Office / any equivalent software.

Note:

1. Students: Computers ratio in the Lab should be strictly 1:1 for a batch of twenty Students.

FOR PRACTICE AND FINAL EAXM

Note: *One Question from Unit-I and Unit-II*

UNIT-I

1. Identify Physical components of a Computer System.
2. Demonstrate the basic formatting features in Text Editors.
3. Create two file in a folder and place the shortcut of these files on the desktop.
4. Demonstrate how search engine may be used in browsing Internet.
5. Create an email account
6. Create and Send an email with a picture attachment.
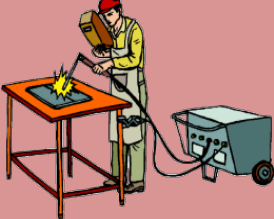7. Demonstrate how documents can be downloaded using Internet.

UNIT-II

1. Using Word Processor Application create a Business Letter.
2. Using Word Processor Application create a Personal Letter.
3. Using Word Processor Application create a letter head for company.
4. Using Word Processor Application create a Simple Newsletter with minimum of three columns. Insert a Clip art in the newsletter.
5. Using Word Processor Application create a Resume for a Job application.
6. Using Word Processor Application create the cover page of a Project Report (use Word Art, insert Picture Image).
7. Prepare the class time table for your class using Word Processor Application.
8. Using Spreadsheet Application, create a worksheet with five columns. Enter ten records and find the sum of all columns using auto sum feature.
9. You have a monthly income of Rs.11000. Your monthly expenditures are Rent- Rs 3500, Food- Rs. 1500, Electricity- Rs.110, Phone- Rs. 160, and Cable TV-Rs. 300. Prepare a worksheet with the Monthly Income, the Monthly Expenditures listed and summed, monthly savings amount (what's left over each month) calculated, and the amount saved per day (assuming 30 days in a month). Use Spreadsheet Application.

10. Using Spreadsheet Application, create a worksheet containing the pay details(containing Basic pay, DA, HRA ,Other Allowance , Deductions- PF,PT, Insurance, Gross and Net salary) of the employees using formulas.

11. Using Spreadsheet Application, create a Simple Bar Chart to highlight the sales of a company for three different periods.

12. Using Spreadsheet Application, create a Pie Chart for a sample data and give legends.

13. Using presentation tool, Create a simple Presentation consisting of 4-5 slides about Input and Output Devices.

14. Create a presentation about a book containing Title, Author, Publisher and Contents.

15. Create an automated (timings & animation) Presentation with five slides about different Models of Computers. Use Presentation tool.

	Course Title: **BASIC WORK SHOP PRACTICE-I**	Course Code: **15ME14P**
	Credits (L:T:P) : **0:2:4**	Core/ Elective: **Core**
	Type of course: **Demonstration & Practice**	Total Contact Hours: **78**

Prerequisites: NIL

COURSE OBJECTIVES

1. Students able to understand different tool &equipment for work shop practice.
2. Students acquire skills for the preparation of different Carpentry/fitting/welding models.
3. Students able to understand the safety precaution in the workshop
4. Studentacquires skills of Application orientated tasks.

COURSE OUTCOMES

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

1. Ability to prepare simple wooden joints using wood working tools
2. Ability to Produce Fitting jobs as per specified dimensions
3. Ability to prepare simple lap, butt, T-, jointand Corner joints using arc welding equipment.

COURSE CONTENTS

UNIT:I	CARPENTRY PRACTICE	CONTACT HOURS:22 Hours

Study of the joints in roofs, doors, windows and furniture available in Polytechnic

Hands-on-exercise:
1. Demonstration of different wood working machines/ Power Tools
of different wood working process, like planning, marking, Chiseling, Grooving, turning of wood etc.
2. Exercise on One simple Wood work joints like Mortise and tennon, dovetail joint by sawing, planning and cutting.

UNIT:II	FITTING SHOP	CONTACT HOURS:28 Hours

Hands-on-exercise
 1. Demonstration of different fitting tools and drilling machines and power tool
 2. Demonstration of different operations like chipping, filing, drilling, tapping, cutting etc.
 3. Exercise on One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc.

UNIT:III	WELDING PRACTICE	CONTACT HOURS:28 Hours

Hands-on-exercise

Study of the tools used in Arc and Gas welding practice.

1. Demonstration of different welding tools / machines.
2. Demonstration on Arc Welding, Gas Welding, gas cutting and rebuilding of broken partswith welding.
3. Exercise on One simple job involving butt, lap,Teeandcorner joint.

NOTE: FOR PRACTICAL CLASSES BATCH STRENGTH IS LIMITED TO 15 TO 20.

REFERENCES

1. Ramesh Babu.V., "Engineering Practices Laboratory Manual", VRB Publishers Private Limited, Chennai, Revised Edition, 2013 – 2014.
2. Jeyachandran.K.,Natarajan.S. andBalasubramanian.S., "A Primer on Engineering PracticesLaboratory", Anuradha Publications, 2007.
3. Bawa.H.S., "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2007.
4. RajendraPrasad.A. andSarma.P.M.M.S., "Workshop Practice", SreeSai Publication, 2002.
5. Kannaiah.P. andNarayana.K.L., "Manual on Workshop Practice", Scitech Publications, 1999.

SCHEME OF VALUATION

Sl. no.	Performance	Fitting/ carpentry	Welding	Max. Marks
1	Listing of tools and operations.	05	05	10
2	Planning and marking	05	---	05
3	Performing of basic operations.	10	10	20
4	Dimensional accuracy	10	-----	10
5	Oral	-----	-----	05
	TOTAL	**30**	**15**	**50**

Note: Questions for the Semester End Exam will consist of
      i.   One Welding Model. - **15 marks**
     ii.   Any One Model from Fitting / Carpentry- **30 marks**

Mapping course outcomes with program outcomes

Course Outcomes	Program Outcomes (PO's)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S											
2		S	M	S	S							
3		S	M	S	S	S						
4		S	M	S								

S: Strong Relationship   M:Moderate Relationship

Course Assessment and Evaluation

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
DIRECT ASSESSMENT	CIE (Continuous Internal Evaluation)	Models	Students	Graded Exercises. (Average of marks allotted to each graded exercises)	20	Models	1,2,3.
				Work shop Record	05	Work shop dairy	1,2,3
				TOTAL	25		
	SEE (Semester End Examination)	End Exam		End of the course	50	Answer scripts at BTE/End Examination Models	1,2,3
INDIRECT ASSESSMENT	Student Feedback on course		Students	Middle of the course		Feedback forms	1,2,3,Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3 Effectiveness of Demonstrations& Assessment Methods

Questions for CIE and SEE will be designed to evaluate the various educational components such as:

1. Remembering and Understanding : - 20% weightage
2. Applying the Skill acquired from the course : - 70 % weightage
3. Analysis : - 1% weightage
4. Evaluation : - 1% weightage
5. Creating new knowledge : - 8% weightage

Tools-Fitter Section

Sl. No.	Name of equipment(Fitting shop)	Numbers Required as per norms
1.	Flat file 14″ rough bastard file	20
2.	Try square 6″	20
3.	Triangular file 10″ rough	20
4.	Half round file 10″ rough	20
5.	Hack saw frame solid 12″	20
6.	Center punch	20
7.	Ball peen hammer 11/2 Lbs	20
8.	Flat chisel 6″	20
9.	Smooth file 10″ flat	20
10.	Bench vice 8″	20
11.	Leg vice 6″	10
12.	Power hack saw	01
13.	Bench grinding	01
14.	Bench drilling machine up to 12mm cap	01
15.	Drill bit up to 12mm straight shunk	04
16.	Tap set and die set up to 1″	01

17.	Vernier caliper	10
18.	Spring divider	20
19.	Steel scale	20
20.	Vernier height gauge	01
21.	Surface plate 2x3 feet	02
22.	Number punch	01
23.	Anvil	20
24.	V block	02

CarpentryTools required for –

Sl. No	Name of equipment(Carpentry shop)	Numbers Required as per Norms
1.	Carpenter bench vice	20
2.	G or C clamp 6″	20
3.	Marking gauge	20
4.	Try square 19mmx4″	20
5.	Wooden mallet	20
6.	Firmer chisel 2″	20
7.	Firmer chisel 3/4″	20
8.	Mortise chisel 1/2″	20
9.	Metal jack plane 9″	20
10.	Beveled square 6″	20
11.	Hand saw or cross cut saw	20
12.	Steel scale 12″	20

Tools- welding

Sl. No.	Name of equipment(Welding shop)	Numbers Required as per norms
1.	Arc welding transformer up to 300Amps	03
2.	Welding shield	20
3.	Ball peen Hammer 11/2 Lbs	10
4.	Chipping Hammer	10
5.	Wire brush	10
6.	Anvil	01
7.	Hand Gloves	05
8.	Flat tongs	10
9.	Steel scale	10
10.	Flat file 14″ rough bastard file	10
11.	Oxygen cylinder	01
12.	Acetylene cylinder	01
13.	Gas welding torch	05
14.	Spark lighter	05
15.	Gas welding goggles	10
16.	Gas cutting torch	02
17.	Try square 6″	10

DEPARTMENT OF MECHANIACL ENGG.

COURSE TITTLE:**BASIC WORKSHOP PRACTICE-1**

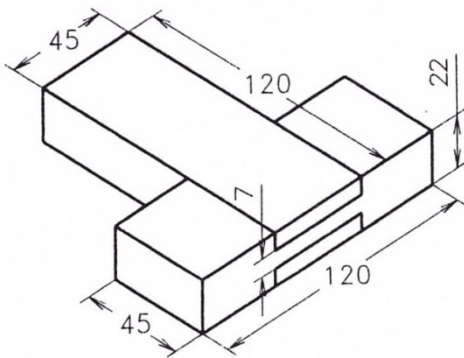TIME: 3 HOURS   MARKS:50

One Welding Model is compulsory and any one   Model from Fitting/ carpentry

(Out of two models 30 marks for Fitting/ carpentry and 15 marks for welding)
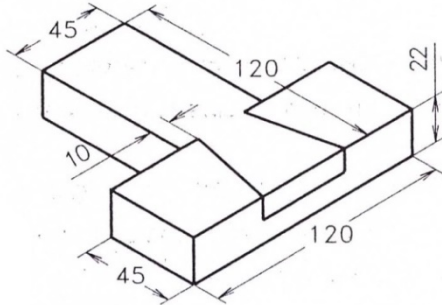
FOR CARPENTRY SHOP

1.

Figure   shows drawing of a bridle joint. Copy the figure and make the joint using the given wooden piece.
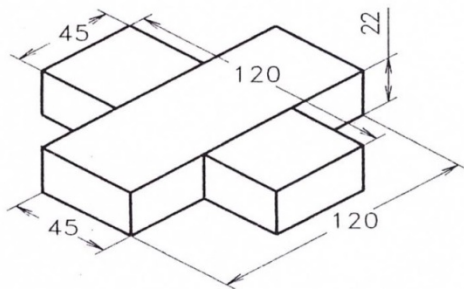
2.

Make the following models, the allotted time is 3 hours:

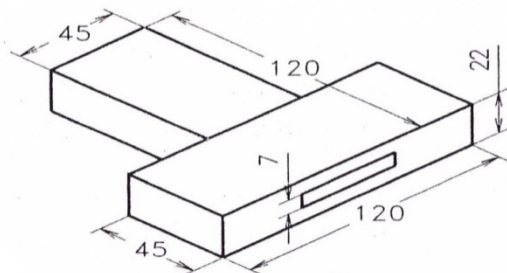Figure shows drawing of a dove-tail (halved) joint. Copy the figure and make the joint using the given wooden piece.

3.

Copy the sketch of the cross (halved) joint given in Figure ˋ and then make the joint using the given wooden piece.
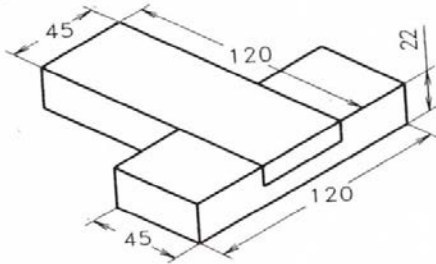

4.

Make a mortise and tenon joint of size shown in Figure using the given wooden piece. Also prepare a dimensioned neat sketch of the joint.

5.

Example

Make a Tee (halved) joint of the dimensions given in Figure   using the given wood piece. The time allotted is 3 hours.

FORFITTING SHOP

1.

Example

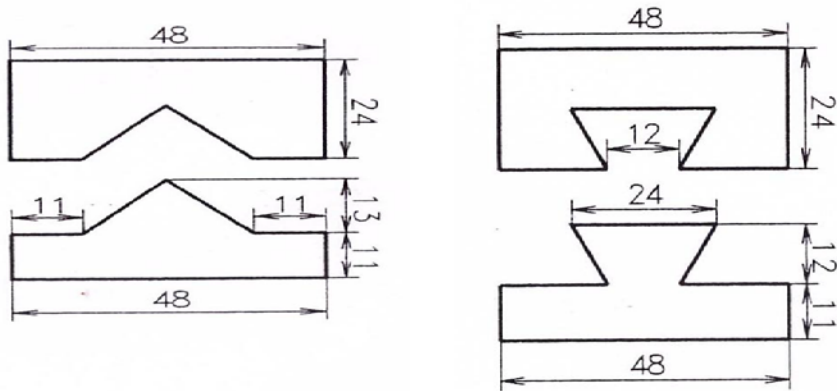*Make a square joint of the dimensions given in Figure   using the given MS flat. The time alloted is 3 hours.*
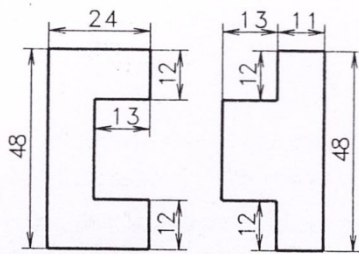
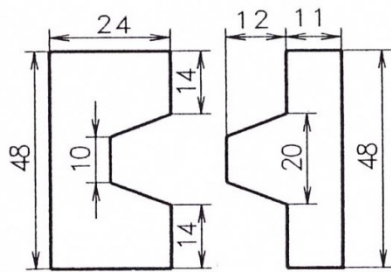2.   3.
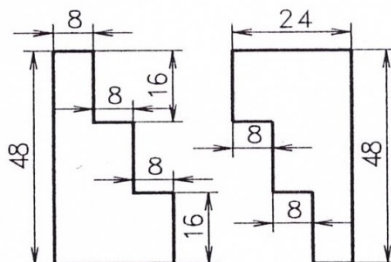

4.

Figure   gives drawing of a trapezoidal joint. Copy the figure and make the model using the given MS flat piece.

5.

Copy the sketch of the stepped joint given in Figure   Then make the joint using the given MS flat piece.

FOR WELDING SHOP

Copy the given sketch of the joint ,then make the joint using the given MS flat piece.
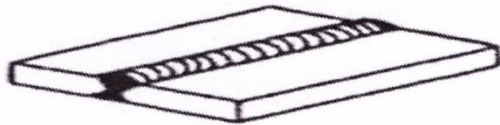
A. BUTT JOINT
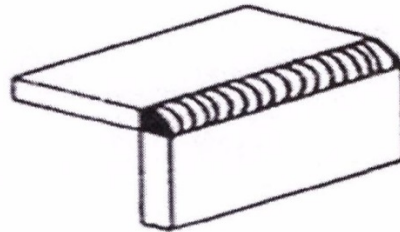
B. CORNER JOINT
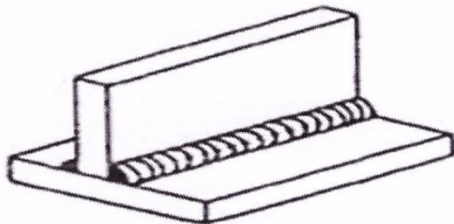
C. TEE JOINT

D. LAP JOINT

MODEL QUESTIONS FOR VIVA VOCE

CARPENTRY SHOP

1. Differentiate between soft wood and hard wood.
2. Give the list of the common names of timber suitable for carpentry work.
3. Describe the term plywood. How it is obtained as large size sheets.
4. What are the marking tools used in wood working.
5. What is meant by marking gauge? How it is used for marking.
6. Give a list of the saws used for cutting wood.
7. What is cross cut saw and tenon saw.
8. What are the types of chisels used for wood working?
9. What is meant by mallet? What is the use of mallet?
10. Give the list of the plaining tools used in carpentry shops.
11. Describe briefly the construction of use of a wooden jack plane.
12. Name the types of work holding devices used for carpentry work.
13. Explain the use of bench vice.

14. Describe the working principle of band saw and circular saw.
15. What are the common defects in timber?
16. Mention the important carpentry tools.
17. What are the marking and measuring tools used in carpentry?
18. Mention the different types of saws and explain.
19. What is spokeshave?
20. What is boringtools?And its uses.
21. What are the striking tools and its uses?
22. What are the holding tools and its uses?
23. What is uses of the Rasps and Pincer
24. What are the carpentry processes used in wooden construction.
25. Mention the types carpentry joints

FITTING SHOP
1. Give a list of types of tools used in fitting operations.
2. Explain the types of work holding devices used in fitting.
3. Describe briefly the types of files used in fitting.
4. Explain the construction of a hack saw.
5. What are the types of cold chisels and for what purposes they are used.
6. Describe briefly the types of hammers used.
7. Define the term twist drill; distinguish a drill from a reamer.
8. What is a surface plate? For what purpose it is used.
9. What are the types of tools used for marking?
10. Explain the use of steel rule and a vernier caliper.
11. Explain the use of the different types of inside and outside calipers.
12. What is the use of combination set?
13. Describe how a micrometer is used for measuring a size.
14. Mention the commonly used in bench and fitting work.
15. Name the parts of a hand hammer.
16. What are the classifications of hammers?
17. What is the use of the flat, cross-cut, half round, diamond point, side chisels.
18. What is chipping?
19. Name the different parts of a file.
20. What is single cut and double cut of a file.
21. Mention the most commonly used shapes in files.
22. What is filing and mention the method of filing.
23. What is cross filing, straight filing and draw filing
24. What is a scraper and mention types of scraper.
25. What is the use of hacksaw and mention its types.
26. Mention the tools used for making.
27. What are the uses of Surface plate, Scriber, Punch, V-block, Angle plate, andtrysquare?

WELDING SHOP
1. What is welding
2. How u classify welding.
3. What is arc welding

4. What is an arc
5. Whatis the equipment used for arc welding.
6. How you set the voltage in arc welding
7. What is normal temperature for arc welding?
8. What are latest techniques used in arc welding.
9. What is an edge preparation?
10. Which type of electrode used in arc welding?
11. What is gas welding?
12. Name the different gases used in gas welding.
13. What are the applications of gas welding?
14. Whatis the equipment used in gas welding.
15. What is a flame?
16. Name the different types of flames.
17. What are the differences between Arc & Gas welding?
18. Which type of welding is used for sheet metals?
19. What are the defects in welding?
20. What are the precautions to be taken for welding?
21. Name the different safety devices used in welding
22. Name the different joints in welding.
23. What is a torch? Which welding used the torch?
24. What is Nozzle?
25. What is filler material in welding?
26. What are differences between welding & soldering?

Course Title:**ENGINEERING MATHEMATICS – II**		Course Code	: **15SC02M**
Semester	: **II**	Course Group	: **Core**
Teaching Scheme (L:T:P)	: **4:0:0**(in hours)	Credits	: **4 Credits**
Type of course	: **Lecture + Assignments**	Total Contact Hours : **52**	
CIE	: **25 Marks**	SEE	: **100 Marks**
Programmes: **Common to all Engineering Diploma Programmes**			

Pre-requisites:

Engineering Mathematics-I in First Semester Diploma curriculum.

Course Objectives:

1. Apply the concept of straight line and conic section in engineering field.
2. Determine derivatives of functions involving two variables.
3. Apply the concepts of differentiation in physics and engineering courses.
4. Evaluate the integrals of functions of two variables.
5. Apply the concepts of definite integrals and its application over a region.
6. Solve the ODE of first degree, first order in engineering field.

Course Contents:

Topic and Contents	Hours	Marks
Unit-1: COORDINATE GEOMETRY	08hr	23
a. **Straight lines:** Differentforms of equations of straight lines: $y = mx + c,$ $y - y_1 = m(x - x_1),$ $y - y_1 = \left(\frac{y_2-y_1}{x_2-x_1}\right)(x - x_1).$ General equation of a line$ax + by + c = o$ (graphical representation and statements) and problems on above equations. Equation of lines through a point and parallel or perpendicular to a given line. Problems.	04 hr	
b. **Conic Section:** Definition of conic section.Definition of axis, vertex, eccentricity, focus and length of latus rectum. Geometrical representation of parabola, ellipse and hyperbola: Equations of parabola$y^2 = 4ax,$	04hr	

Equation of ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and Equation of hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ (without proof of above 3 equations). Equations of parabola, ellipse and hyperbola with respect to x-axis as axis of conic. Finding axes, vertices, eccentricity, foci and length of lattice rectum of conics. Problems on finding the above said equations with direct substitution.		
UNIT – 2: DIFFERENTIAL CALCULUS	15hr	39
Differentiation. Definition of increment and increment ratio. Definition of derivative of a function. Derivatives of functions of x^n, $\sin x$, $\cos x$ and $\tan x$ with respect to 'x' from first principle method. List of standard derivatives of $cosecx, secx, cotx, \log_e x, a^x, e^x$......etc. Rules of differentiation: Sum, product, quotient rule and problems on rules. Derivatives of function of a function (Chain rule) and problems. Inverse trigonometric functions and their derivatives. Derivative of Hyperbolic functions, Implicit functions, Parametric functions and problems. Logarithmic differentiation of functions of the type u^v, where u and v are functions of x. Problems. Successive differentiation up to second order and problems on all the above types of functions.		
UNIT – 3: APPLICATIONS OF DIFFERENTIATION.	07hr	17
Geometrical meaning of derivative. Derivative as slope. Equations of tangent and normal to the curve y = f(x) at a given point- (statement only). Derivative as a rate measure i.e. to find the rate of change of displacement, velocity, radius, area, volume using differentiation. Definition of increasing and decreasing function. Maxima and minima of a function.		
UNIT-4: INTEGRAL CALCULUS.	12hr	30
Definition of Integration. List of standard integrals. Rules of integration (only statement) $1. \int kf(x)dx = k \int f(x)dx.$ $2. \int \{f(x) \pm g(x)\}dx = \int f(x)dx \pm \int g(x)dx$ problems. Integration by substitution method. Problems.		

Standard integrals of the type

$$1. \int \frac{dx}{x^2 + a^2} = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) + c \qquad\qquad 2. \int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1}\left(\frac{x}{a}\right) + c.$$

$$3. \int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a} \sec^{-1}\left(\frac{x}{a}\right) + c \qquad\qquad \text{(1 to 3 with proof)}$$

$$4. \int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \log\left(\frac{x - a}{x + a}\right) + c \quad \text{if } x > a > 0.$$

$$5. \int \frac{dx}{a^2 - x^2} = \frac{1}{2a} \log\left(\frac{a + x}{a - x}\right) + c \quad \text{if } a > x > 0. \qquad \text{(4 \& 5 without proof)}$$

and problems on above results Integration by parts of the type $\int x^n e^x dx$,$\int x\sin x dx$, $\int x\cos x dx$, $\int x\log x dx$, $\int \log x dx$, $\int \tan^{-1} x \, dx$, $\int x \sin^2 x \, dx$, $\int x \cos^2 x \, dx$ where n=1, 2. Rule of integration by parts. Problems

UNIT – 5: DEFINITE INTEGRALS AND ITS APPLICATIONS	05 hr	22
Definition of Definite integral. Problems on all types of integration methods. Area, volume, centres of gravity and moment of inertia by integration method. Simple problems.		
UNIT – 6: DIFFERENTIAL EQUATIONS.	05 hr	14
Definition, example, order and degree of differential equation with examples. Formation of differential equation by eliminating arbitrary constants up to second order. Solution of O. D. E of first degree and first order by variable separable method. Linear differential equations and its solution using integrating factor.		
Total	52	145

Course Delivery:

The Course will be delivered through lectures, class room interaction, exercises, assignments and self-study cases.

Course outcome:

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

1. Formulate the equation of straight lines and conic sections in different forms.
2. Determine the derivatives of different types of functions.
3. Evaluate the successive derivative of functions and its application in tangent, normal, rate measure, maxima and minima.
4. Evaluate the integrations of algebraic, trigonometric and exponential function.
5. Calculate the area under the curve, volume by revolution, centre of gravity and radius of gyration using definite integration.
6. Form and solve ordinary differential equations by variable separable method and linear differential equations.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S	S										M
2	S	S										M
3	S	S										M
4	S	S										M
5	S	S										M
6	S	S										M

S: Strong relationship   **M:** Moderate relationship

Reference Books:

1. NCERT Mathematics Text books of class XI and XII.
2. Higher Engineering Mathematics by B.S Grewal, Khanna publishers, New Delhi.
3. Karnataka State PUC mathematics Text Books of I & II PUC by H.K. Dass and Dr. Ramaverma published by S.Chand & Co.Pvt. ltd.
4. CBSE Class Xi & XII by Khattar & Khattar published PHI Learning Pvt. ltd.,
5. First and Second PUC mathematics Text Books of different authors.
6. E-books:www.mathebook.net
7. www.freebookcentre.net/mathematics/ introductory-mathematics -books.html

Course Assessment and Evaluation:

Method		What	To whom	When/where (Frequency in the course)	Max Marks	Evidence collected	Contributing to course outcomes
DIRECT ASSMENT	*CIE	Internal Assessment Tests	Student	Three tests (Average of Three tests to be computed).	20	Blue books	1 to 6
		Assignments		Two Assignments (Average of Two assignments to be computed)	5	Log of record	1 to 4
				Total	25		
	*SEE	Semester End Examination		End of the course	100	Answer scripts at BTE	1 to 6
INDIRECT ASSESSMENT		Student feedback	Students	Middle of the course	-NA-	Feedback forms	1 to 3, delivery of the course
		End of Course survey		End of course		Questionnaire	1 to 6, Effectiveness of delivery of instructions and assessment methods

***CIE** – Continuous Internal Evaluation   ***SEE** – Semester End Examination
Note: I.A. test shall be conducted for 20 marks. Any decimals shall be rounded off to the next higher digit.

Composition of Educational Components:

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)
1	Remembering and Understanding	35
2	Applying the knowledge acquired from the course	25
3	Analysis&Evaluation	40

Model Question Paper:

II Semester Diploma Examination
ENGINEERING MATHEMATICS –II
(For All Engineering Diploma Programmes)

Time: 3 Hours][Max. Marks: 100

*NOTE:*i)Answer any 10 questions from section A, 8 questions from section B and 5 questions from
section-C
ii) Each question carries 3 marks in section A.
 ii) Each question carries 5 marks in section B.
iii) Each question carries 6 marks in section C.

SECTION-A

1. Find the equation of the line passing through the point (2,-3) with slope 1/3.
2. Find the equation of parabola with vertex (2,0) and focus (5,0)
3. Differentiate: $(3x + 8)^7$ with respect to x.
4. If $y = \cos^{-1} x$ show that $\frac{dy}{dx} = \frac{-1}{\sqrt{1-x^2}}$.
5. If $y = x^x$, find $\frac{dy}{dx}$.
6. If $y = \frac{1+\sin x}{1-\sin x}$ find $\frac{dy}{dx}$.
7. Find the equation to the tangent to the curve $2x^3 + 5y - 4 = 0$ at (-2,4).
8. The volume of the sphere is increasing at the rate of 6cc/sec. Find the rate of
change of radius when the radius is 3 cm.
9. Integrate: $(2x + 1)(x + 5)$ with respect to x
10. Evaluate: $\int \tan^2 x dx$
11. Evaluate: $\int \frac{\cos x}{1+\sin x} dx$
12. Evaluate: $\int_0^{\pi/4}(\sec^2 x + 1)dx$.
13. Find area bounded by the line $x + 2y = 0$, x- axis, and ordinates $x = 0, and x = 4$ by
integration.
14. Form differential equation for curve $y^2 = 4ax$

SECTION – B

1. Find the equation of line passing through the point (2,5) and (-3,2).
2. Differentiate $\sqrt{x} + \log x + \sin^{-1} x + e^{\tan x} - a^x$ with respect to x.
3. Differentiate $\tan x$ with respect to x using first principal method.
4. If $y = \sinh 3x \cosh 2x$ then find $\frac{dy}{dx}$.
5. If $S = t^3 - t^2 + 9t + 8$, where S is distance travelled by particle in t seconds. Find the
velocity and acceleration at t = 2 sec.
6. Integrate: $\frac{1}{x} - \tan x + e^{-3x} + \frac{1}{1+x^2} + 5$ with respect to x.
7. Evaluate: $\int \frac{(1+\log x)^2}{x} dx$
8. Evaluate: $\int x \sin x dx$

9. Evaluate: $\int_0^{\pi/2} \cos 5x \cos 3x \, dx$

10. Evaluate: $\int_0^{\pi/2} \cos^3 x \, dx$

11. Solve the differential equation $\sin^2 y \, dx - \cos^2 x \, dy = 0$

SECTION – C

1. Find the equation of median through B in a triangle with vertices A(-1 ,3), B(-3, 5)   and C(7,-9)

2. Find the equation of hyperbola, given that vertices are $(\pm 7, 0)$ and eccentricity, e=4/3

3. If $x^y = a^x$, show that $\frac{dy}{dx} = \frac{x \log_e a - y}{x \log_e x}$.

4. If $y = e^{\tan^{-1} x}$ then show that $(1 + x^2)\frac{d^2 y}{dx^2} + (2x - 1)\frac{dy}{dx} = 0$.

5. Find the maximum and minimum values of the function
$f(x) = 2x^3 - 21x^2 + 36x - 20$.

6. Evaluate: $\int \tan^{-1} x \, dx$

7. Find the volume of solid generated by revolving the curve
$y = \sqrt{x^2 + 5x}$ between x=1 & x=2.

8. Solve the differential equation $x\frac{dy}{dx} - 2y = 2x$

****

Question Paper Blue Print:

Course: **ENGINEERING MATHEMATICS – II** Course Code**: 15SC02M**

UNIT NO		HOURS	Questions to be set (3 Marks) Section - A	Question to be set in two sub division (5 Marks) Section - B	Question to be set in two sub division (6 Marks) Section- C	Weightage of Marks
1	a	4	01	01	01	23
	b	4	01	--	01	
2		15	04	03	02	39
3		07	02	01	01	17
4		12	03	03	01	30
5		05	02	02	01	22
6		05	01	01	01	14
	TOTAL	52	14	11	08	145
Questions to be answered			**10**	**08**	**05**	**100**

Guidelines to Question Paper Setting:

1. The question paper must be prepared based on the blue print without changing the weight age of model fixed for each unit.
2. The question paper pattern provided should be adhered to
   Section-A: 10 questions to be answered out of 14 questions each carrying 03 marks.
   Section-B: 08 questions to be answered out of 11 questions each carrying 05 marks.
   Section-C: 05 questions to be answered out of 08 questions each carrying 06 marks.
3. Questions should not be set from the recapitulation topics.

Model Question Bank:

Course Title: **ENGINEERING MATHEMATICS – II**	Course Code: **15SC02M**

UNIT-1: STRAIGHT LINES AND CONIC SECTION:

3 MARK QUESTIONS

1. Find the equation of the straight line passing through (2,3) and having slope 5.
2. Find the slope and x-intercept and y-intercepts of the line $2x + 3y - 11 = 0$.
3. Find the vertex and focus of the parabola $(y - 2)^2 = 8x$.
4. Show that the lines 3x-2y+2=0, 2x+3y+7=0 are perpendicular.
5. Find the eccentricity of the ellipse $\frac{x^2}{64} + \frac{y^2}{9} = 1$

5 MARK QUESTIONS

1. Find the equation to the line passing through the point (6,-4) and perpendicular to the line 7x-6y+3=0.
2. Find the equation to the line passing through the point (2,3) parallel to the line joining the points (-8,-6) & (2,-4).
3. Find the equation of straight line inclined at 135o to the x-axis having y-intercept 2/3.
4. Find the equation of straight line joining the points (2,3) & (-4,6).
5. Find the equation of the line passes through (-3,-2) which is perpendicular to x-axis.

6 MARK QUESTIONS

1. Find the equation to the median of the triangle through the vertex A with vertices A(-1,3), B(-3,5) &C(7,-9).
2. The vertices of a quadrilateral taken in order are A(1,2), B(2,1),C(3,4) & D(-1,-2). Find the equation to the diagonal BD.

3. Obtain the equation of the hyperbola in the form $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$, whose eccentricity is 8 and distance between the foci is 12.
4. Find the equation of the ellipse with length of major axis is 8 and minor axis is 3.
5. Find the equation to the line passing through point (3,-2) and perpendicular to the line joining points (5,2) &(7,-6).

UNIT-2: DIFFERENTIATION:

3 MARK QUESTIONS

1. Find $\frac{dy}{dx}$, if $y = 2x^2 - 3x + 1$.

2. Differentiate $x\tan x$ with respect to x.

3. Find $\frac{dy}{dx}$, if $x^2 + y^2 = 25$

4. Find $\frac{dy}{dx}$ if $x = ct, y = \frac{c}{t}$,

5. If $y = 4ax$, find $\frac{d^2y}{dx^2}$.

5 MARK QUESTIONS:

1. Differentiate the function x^n by method of first principle.
2. Find $\frac{dy}{dx}$ if $y = 6x^3 - 3\cos x + 4\cot x + 2e^{-x} - \frac{5}{x}$.
3. Find $\frac{dy}{dx}$ if $y = \frac{\cos x + \sin x}{\cos x - \sin x}$
4. Find $\frac{dy}{dx}$ if $y = (\cos x)^{\sin x}$
5. If $y = \tan^{-1} x$, prove that $(1 + x^2)y_2 + 2xy_1 = 0$

6 MARK QUESTIONS:

1. Find $\frac{dy}{dx}$ if $y = \frac{x\log x}{1 + \sin x}$

2. Find $\frac{dy}{dx}$ if $x = a\cos^3\theta, y = a\sin^3\theta$ at $\theta = \frac{\pi}{4}$.

3. Find $\frac{dy}{dx}$ if $y = x^{x^{x^{x^{x^{\cdot^{\cdot^{\infty}}}}}}}$.

4. If $y = \tan^{-1}\left(\frac{1+x}{1-x}\right)$, find $\frac{dy}{dx}$.

5. If $y = e^{m\sin^{-1}x}$, prove that $(1 - x^2)y_2 - xy_1 - m^2y = 0$

UNIT-3 APPLICATIONS OF DIFFERENTIATION

3 MARK QUESTIONS

1. Find the slope of the tangent to the curve $x^2 + 2y^2 = 9$ at a point $(1, 2)$ on it.
2. Find the slope of the normal to the curve $y = 2 - 3x + x^2$ at $(1, 0)$.
3. The law of motion of a moving particle is $S = 5t^2 + 6t + 3$ where 'S' is the distance in metres and 't' time in seconds. Find the velocity when t=2.
4. Find the rate of change of area of a circle with respect to its radius.
5. Show that the curve $2x^3 - y = 0$ is increasing at the point $(1, 2)$.

5 MARK QUESTIONS

1. For a moving body vertically upwards, the equation of motion is given by $S = 98t - 4.9t^2$. When does the velocity vanish?
2. Find the equation to the tangent to the curve $y = 2x^2 - 3x - 1$ at $(1,-2)$.
3. A circular patch of oil spreads on water and increases its area at the rate of 2 sq.cm/min. find the rate of change of radius when radius when radius is 4 cm.
4. The volume of the spherical ball is increasing at the rate of 36π cc/sec. Find the rate at which the radius is increasing. When the radius of the ball is 2cm.
5. Find the max value of the function $y = x^3 - 3x + 4$.

6 MARK QUESTIONS

1. Find the max & min values of the function $y = x^5 - 5x^4 + 5x^3 - 1$.
2. Find the equation of normal to the curve $y = x^2 + 2x + 1$ at $(1,1)$.
3. If S is the equation of motion where $S = t^3 - 2t^2$ find its acceleration when velocity is 0.
4. The volume of sphere is increasing at 3c.c per second. Find the rate of increase of the radius, when the radius is 2cm.
5. Water is flowing into a right circular cylindrical tank of radius 50 cms at the rate of 500π cc/min. Find how fast is the level of water going up.

UNIT-4: INTEGRATION

3 MARK QUESTIONS

1. Evaluate: $\int (x^2 + x + 1)\, dx$.
2. Evaluate: $\int \cot^2 x\, dx$
3. Evaluate: $\int e^{5x+8}\, dx$
4. Evaluate: $\int \frac{1}{2x+5}\, dx$
5. Evaluate: $\int \sin^5 x \cos x\, dx$

5 MARK QUESTIONS

1. Evaluate $\int \left(x^4 - \frac{1}{x} + \cosec^2 x - e^{-2x} + \cos x\right) dx$.
2. Evaluate: $\int \cos^3 x \, dx$
3. Evaluate: $\int \sin 6x \cos 2x \, dx$
4. Evaluate: $\int \log x \, dx$
5. Evaluate: $\int \frac{(\tan^{-1} x)^3}{1+x^2} dx$

6 MARK QUESTIONS

1. Evaluate: $\int (\tan x + \cot x)^2 dx$.
2. Evaluate: $\int (x+1)(x-2)(x-3) dx$
3. Evaluate: $\int x^2 \cos x \, dx$

4. Prove that $\int \frac{dx}{x^2 + a^2} = \frac{1}{a} \tan^{-1}\left(\frac{x}{a}\right) + c$

5. Evaluate: $\int \frac{1}{9\sin^2 x + 4\cos^2 x} dx$

UNIT-5: DEFINITE INTEGRATION AND ITS APPLICAITON.

3 MARK QUESTIONS

1. Evaluate: $\int_2^3 (2x+1) \, dx$.
2. Evaluate: $\int_0^{\pi/4} \sec^2 x \, dx$.
3. Evaluate: $\int_0^2 e^x \, dx$
4. Evaluate: $\int_0^1 \frac{(\sin^{-1} x)^2}{\sqrt{1-x^2}} dx$.
5. Evaluate: $\int_0^{\pi/2} \cos x \, dx$.

5 MARK QUESTIONS

1. Evaluate: $\int_0^{\pi/2} \sin 3x \cos x \, dx$.
2. Evaluate: $\int_0^{\pi} \frac{\cos x}{1+\sin^2 x} dx$.
3. Evaluate: $\int_0^1 x(x-1)(x-2) \, dx$.
4. Find the area bounded by the curve $y = x^2 + 1$ the x-axis and ordinates $x = 1, x = 3$.
5. Find the volume of the solid generated by the revolving of the curve $y^2 = x^2 + 5x$ between the ordinates x=1, x=2 about x-axis.

6 MARK QUESTIONS

1. Evaluate: $\int_0^1 \frac{\cos(\tan^{-1} x)}{1+x^2} dx$.
2. Find the area between the curves $y = x^2 + 5$ and $y = 2x^2 + 1$.
3. Find the volume of ellipsoid generated by revolving $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ between the ordinates $x = \pm a$ about x-axis.
4. Find the centre of gravity of a solid hemisphere.
5. Determine the moment of inertia of a uniform rod of length 2l, Cross-sectional area "a" about an axis perpendicular to the rod and passing through the mid-point of the rod.

UNIT-6: INTEGRATION

3 MARK QUESTIONS

1. Write the order and degree of the differential equation $\left(\frac{dy}{dx}\right)^8 + 3\frac{d^2y}{dx^2} - ye^x = 0$.
2. Form the differential equation by eliminating arbitrary constants in $y = m\, e^{2x}$.
3. Solve $xdx + ydy = 0$.
4. Solve $\frac{dy}{1+y^2} = \frac{dx}{1+x^2}$.
5. Solve $e^x dx + dy = 0$.

5 MARK QUESTIONS

1. Form the differential equation by eliminating arbitrary constants A and B in$y = Ae^x + Be^{-x}$.
2. Form the differential equation by eliminating arbitrary constants in$y = a\cos mx + b\sin mx$.
3. Solve $(1 + y)dx + (1 + x)dy = 0$.
4. Solve$\frac{dy}{dx} + 3y = e^{2x}$.
5. Solve $\frac{dy}{dx} + y\tan x = \cos x$

6 MARK QUESTIONS

1. Solve $x(1 + y^2)dx + y(1 + x^2)dy = 0$.
2. Solve $\sec^2 x \tan y\, dx + \sec^2 y \tan x\, dy = 0$.
3. Solve $x\frac{dy}{dx} + y = x^3$
4. Solve$\frac{dy}{dx} + 3y = e^{2x}$.
5. Solve $\frac{dy}{dx} + 2y\cot x + \sin 2x = 0$

Course: ENGINEERING MATHEMATICS - II

Course code: 15SC02M

Curriculum Drafting Committee 2015-16

	Name	Designation	Institution
1	Dr. D.S. Prakash	Asst. Director (LRDC)	DTE, Bengaluru
2	Dr.MokaShekhu	Lecturer (Selection Grade /Science)	Government Polytechnic, Channasandra, Bengaluru
3	Sri.Sathyanaraya Dixit	Lecturer (Selection Grade /Science)	PVP Polytechnic, Bengaluru
4	Sri. Guruprasad V	Lecturer (Selection Grade /Science)	APS Polytechnic, Somanahalli
5	Dr.RajasekharHeera	Lecturer/Science,	Government Polytechnic, Gulbarga.

CurriculumReview committee

	Name	Designation	Institution
1	Dr.MokaShekhu	Lecturer (Selection Grade /Science)	Government Polytechnic, Channasandra, Bengaluru
2	Sri.Sathyanaraya Dixit	Lecturer (Selection Grade /Science)	PVP Polytechnic, Bengaluru

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title	:**APPLIED SCIENCE**	Course Code	: **15SC03S**
Semester	: **I / II**	Course Group	: **Core**
Teaching Scheme in Hrs (L:T:P)	: **4:0:0**	Credits	: **4 Credits**
Type of course	: **Lecture &Assignments**	Total Contact Hours	: **52**
CIE	: **25 Marks**	SEE	: **100 Marks**
Programme: **Common to all Engineering Diploma Programmes**			

Prerequisite:

Dynamics, Heat, Sound, Matter, recent trends in Physics, Basic chemistry in Secondary Education.

Course Objective:

1. Learn concepts of Units, Laws of vectors, parallel forces, moment of force, couple.
2. Learn the fundamentals of properties and behavior of the materials
3. Learn the concepts of heat and thermodynamics.
4. Enhance theoretical and practical principles with applications of sound wave.
5. Understand different types of communication systems.
6. Develop awarenessabout corrosion, materials, and energy sources in engineering field.

Course Content:

UNIT I:MECHANICS   (08 Hrs)

Units and Measurements: Definition of unit, types of unit (fundamental and derived)
SI units: Definition, Basic and supplementary units, advantages.
Measuring Instruments: Vernier calipers, principle and least count, diagram of vernier calipers with labeling the parts. Screw gauge(pitch, ZE, ZC), principle and least count, diagram of screw gauge with labeling the parts, simple problems.

Scalars and Vectors: Definition of scalar and vector with examples, representation of a vector, definition of resultant, equilibrium and equilibrant. Laws of vectors: Statement of law of parallelogram of forces, Converse law of triangle of forces, Lami's theorem. Deriving an expression for magnitude and direction of resultant of two vectors acting at a point.Resolution of vectors, mentioning rectangular component of resolution of

vector.Experimental verification of law of parallelogram of forces, Converse law of triangle of forces, Lami's theorem. Simple problems on laws of vectors

Parallel forces. Types of parallel forces, Moment of force: definition, S.I unit, types and examples. Couple: definition with examples. Moment of a couple. Conditions of equilibrium of coplanar parallel forces, applications. Experimental verification of Conditions of equilibrium of coplanar parallel forces using moment bar and simple problems.

UNIT-2: PROPERTIES OF SOLIDS AND LIQUIDS: (10 Hrs)

Properties of solids: Definitions of deforming force, elasticity and plasticity, examples for elasticity and plasticity, definition of stress and its types with examples and its S.I unit, definition of strain and its types with examples, elastic limit, Hooke's law, stress - strain graph with explanation. Modulie of elasticity and its types, derivation of an expression for Young's modulus of a material. Definition of Compressibility and factor of safety. Simple problems on stress, strain and Young's modulus.

Properties of liquids: Definition of thrust and pressure with S.I units. Derivation of expression for pressure at a point inside the liquid at rest, simple problems.

Energy of liquid in motion: Kinetic, Potential energies and Pressure energy in moving liquid. Bernoulli's theorem: statement and expression (No derivation). Cohesive and adhesive forces, angle of contact.

Surface Tension: Definition of surface tension and its S.I unit, factors affecting surface tension, applications of surface tension, capillarity and its applications.

Viscosity: Types of flow of liquid, definition of stream line flow and turbulent flow, definition of viscosity, expression for coefficient of viscosity, experimental determination of coefficient of viscosity of water, effect of temperature on viscosity. List of applications of viscosity. Simple problems.

UNIT III: HEAT AND PROPERTIES OF GASES. (07Hrs)

Concept of heat & temperature: Definitions of heat and temperature with S.I units, definition of Specific heat of substance with S I unit, equation for specific heat of a substance (no derivation).

Transmission of heat: Definitions of conduction, convection and radiation with examples, definition of thermal conductivity, derivation of co-efficient of thermal conductivity(K) and its S.I unit. Applications of conduction, convection and radiation, simple problems on K.

Gas laws: Statement ofBoyle's law, Charle's law, Gay-Lussac's law, derive the relation between them (PV=nRT), definition of C_p and C_v ,relation between them (Mayer's equation no derivation), simple problems on Boyle's law and Charle's law.

Thermodynamics: Definition of thermodynamics, Laws of thermodynamics: Zeroth law, I^{st} law and IInd law (only statement), types of thermodynamics process: isothermalprocess, adiabatic process.

UNIT IV: WAVE MOTION   (10Hrs)

Simple Harmonic Motion: Definition of periodic motion with example, definition of Simple Harmonic Motion, representation of S.H.M with respect to particle in circular motion, derivation of displacement of a particle executing S.H.M. Definitions of period, frequency, amplitude, in case of vibrating particle.
Wave: Definition of wave, wave period(T), wave frequency (n or f), wave amplitude (a),
wave length(λ) and wave velocity (v) in case of wave motion. Derive the relationbetween v, n and λ. simple problems.
Types of waves: Mechanical and Non mechanical waves with examples. Definition of longitudinal and transversewaves, differences.
Propagation of sound waves in air: Newton's formula for the velocity of sound in air and Laplace's correction to it, various factors affecting velocity of sound in air. Simpleproblems.
Vibrations: Free vibrations, Forced vibration, Damped vibrations and Un-damped vibrations with examples. Resonance with examples.Laws of transverse vibrations of stretched string, derivation of equation for fundamental frequency of vibrations of stretched string. Simple problems.
Experiment to determine the unknown frequency of a given tuning fork by absolute and comparison methods using sonometer.
Stationary waves: Formation of stationary waves and their characteristics. Experimental determination of velocity of sound in air by using resonance air column apparatus.
Beats: Formation of Beats, definition of beat frequency, its applications.

UNIT V:MODERN PHYSICS   (07Hrs)

Electromagnetic waves: Definition, generation ofelectromagneticwaves and their properties.

Electromagnetic spectrum:Definition, classification and its applications.

Lasers: Principle and   listing the types of Laser, properties of Laser, applications.
Nano-Technology: Definition of Nano-Technology, advantages and dis-advantages of nano-Technology.

Advance Communication Systems: Basic elements of communication systems with block diagram, List commonly used terms in electronic communication systems.

Satellite communication: Introduction, advantages and disadvantages,
Optical fiber: principleand applications.

UNIT VI: INDUSTRIAL CHEMISTRY   (10 Hrs)

Electrolysis: Definition of electrolyte, types of electrolytes with examples,definition of electrolysis.Arrhenius theory of electrolytic dissociation.Mechanism of Electrolysis.Faradays laws of Electrolysis: state and explain.
Corrosion: Definition, necessary conditions for corrosion, electrochemical theory of corrosion, list the preventive methods of corrosion.
Batteries: Basic concept, classification and applications of batteries.
Fuel cells: Definition, mentioning the types and advantages.
Metallurgy: Definitions of minerals, ore, flux, slag, alloys. Purpose of making alloys, composition and uses of alloys.
Polymers: Definition and classification of polymers, methods of polymerization and applications.
Composite materials: Definition, types, advantages and dis-advantages of composite materials.
Solutions: Definition of solute, solvent, solutions. Saturated and unsaturated solutions,concentration of solutions: normal, molar and molal solutions, simple problems on concentration of solution.
pH Value: Hydrogen ion concentration and concept of pH,definition of pH of solution, pH scale, applications of pH in different fields.

Course Delivery:

The Course will be delivered through lectures, class room interaction and exercises.

Course Outcome:

On successful completion of the course, the student will be able to-

1. Determine the dimensions of objects using measuring instruments and analyze vector in mechanics.
2. Create knowledge of properties of matter applicable to engineering.
3. Apply the concepts of thermal properties of matter and gas laws related to engineering.
4. Analyse the different concepts of waves and vibration in the field of engineering.
5. Analyse the recent trends in physics related to engineering.
6. Apply the basic concepts of chemistry in the field of engineering.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S	M		M								
2	S	M										
3	S	S								M		
4	S	S								M		
5	S	S					M					
6	S	S					M					

S: Strong relationship   **M: Moderate relationship**

Reference Books:

1. Principle of physicsfor class XI and XII by V.K.Mehata and Rohit Mehta, as per Karnataka state PUC syllabusS.Chand and Company, New Delhi
2. Engineering chemistry for Diploma by Ranjan Kumar Mahapatra (PHI Learning Pvt. Ltd., New Delhi)
3. Basic Physics by KongbamChandramaniSingh (PHI Learning Pvt. Ltd., New Delhi)
4. Principle of physics by P.V.Naik (PHI Learning Pvt. Ltd. New Delhi)

Website:

1. www.rsc.org/Education/Teachers/resources/Inspirational/…/4.3.1.pdf
2. www.nanogloss.com/nanotechnology/advantages and disadvantages
3. www.freebookcentre.net/physics/ introductory-physics-books.html

e-books:

1. Introduction to physics – II, Robert P Johnson.
2. Lecture notes physics university of Rochester.
3. Text book of Physics poynting J.H Thomson sir J.J.

Course Assessment and Evaluation:

	What		To Whom	Frequency	Max Marks	Evidence Collected	Course Outcomes
Direct Assessment	**CIE (Continuous Internal Evaluation)**	I A Tests	Students	Three tests (average of three tests will be computed)	20	Blue Books	1 to 6
		Class room Assignments		Two Assignments (Average of Two Assignments will be computed)	05	Log of Activity	1 and 5
				TOTAL	25		
	SEE (Semester End Examination)	End Exam	Students	End Of the Course	100	Answer Scripts at BTE	1 to 6
Indirect Assessment	Student Feedback on course		Students	Middle Of The Course	Feedback forms		1 to 3 delivery of the course
	End Of Course Survey			End Of The Course	Questionnaire		1 to 6 Effectiveness of delivery of instructions and assessment

Note: I.A. test shall be conducted for 20 marks. Any decimals shall be rounded off to the next higher digit.

Composition of Educational Components:

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)
1	Remembering and Understanding	20
2	Applying the knowledge acquired from the course	30
3	Analysis	30
4	Evaluation	15
5	Creating new knowledge	05

Question Paper Blue Print:

Course Title	:**APPLIED SCIENCE**	Course Code	: **15SC03S**

Name and Unit No.	Allotted Hours	Questions to be set for (2marks) PART - A	Questions to be set for (5marks) PART - B	Questions to be set for (6marks) PART - C
Mechanics **I**	08	04	02	01
Properties of Solids and Liquids **II**	10	03	03	01
Heat and properties of gases **III**	07	02	02	01
Wave motion **IV**	10	02	02	03
Modern Physics **V**	07	02	02	01
Industrial chemistry **VI**	10	02	04	01
Total	**52**	**15**	**15**	**8**

Guidelines for Question Paper Setting:

1. The question paper must be prepared based on the blue print without changing the weightage of model fixed for each unit.
2. The question paper pattern provided should be adhered to

Part – A: 10 questions to be answered out of 15 questions each carrying 02 marks

Part – B: 10 questions to be answered out of 15 questions each carrying 05 marks.

Part – C: 05 questions to be answered out of 08 questions each carrying 06 marks.

Model Question Paper:

Code:15SC03S

I Semester Diploma Examination
APPLIED SCIENCE
(Common for All Engineering Programmes)

Time: 3 Hours][Max Marks: 100

*Note***:** i) Answer any 10 questions from section A, each carry 02marks.

ii) Answer any 10 questions from section B, each carry 05 marks.

iii) Answer any 05 questions from section C, each carry 06 marks.

SECTION – A

1. Define Unit.
2. Differentiate scalars and vectors.
3. Define Resultant of forces.
4. Define moment of couple.
5. Define plasticity.
6. Define compressibility.
7. Define viscosity of liquid.
8. Define specific heat of substance.
9. Define thermodynamics.
10. Define time period.
11. Define beats.
12. Define Electro-magnetic waves.
13. Define Nano-Technology.
14. Define electrolyte.
15. Define composite materials.

PART-B

1. Draw a neat diagram of Vernier calipers and label its parts.
2. Write the condition for equilibrium of coplanar parallel forces with an example.
3. Explain stress-strain graph.
4. Define K.E of liquid in motion. State Bernoulli's theorem.
5. Define capillarity? Write any three application of surface tension.
6. State 1st law of thermodynamics. Explain isothermal & adiabatic process.
7. State the three gas laws.(Boyle's law, Charle's law & Gay-Lussac law)
8. Explain mechanical &non- mechanical waves with examples.
9. Distinguish between longitudinal & transverse waves.
10. Write any three advantages and two disadvantages of F.M.
11. Write the principle of laser. Lists its properties.
12. Explain the mechanism of electrolysis of HCL.
13. Write the basic concepts of batteries. Mention any three applications of batteries.
14. Distinguish between minerals and ore. Write any three applications of pH.
15. Define composite materials. Write the advantages of composite materials.

PART-C

1. Derive an expression for magnitude and direction of resultant of two forces acting at a Point.
2. Describe an experiment to determine coefficient of viscosity of water by Poiseuille's method.
3. 1.25cc volume of a gas at 15^0C &755mm of mercury pressure. Calculate volume at NTP.
4. Derive an expression for fundamental frequency of transverse vibrations of stretched string.
5. Describe an experiment to find the unknown frequency of the given tuning fork using sonometer   by comparison method.
6. Calculate the velocity of sound in air at 25^0C & 75cm of mercury pressure, if thedensity of air at 0^0C & 76cm of mercury pressure is 1.29kgm^{-3}. (given γ=1.41 for air).
7. Write the basic elements of communication system with block diagram.
8. Explain any two methods of polymerization.

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Model Question Bank:

Course Title : **APPLIED SCIENCE**	Course Code : **15SC03S**

UNIT – I : MECHANICS

PART – A (02MARKS QUESTIONS)

1. Define unit of a physical quantity.
2. Define fundamental and derived units.
3. List supplementary units in S.I systems.
4. Define S.I units give two eg of S.I, basic units.
5. Define least count of measuring instrument.
6. Write the principle of Vernier calipers and screw gauge.
7. Define least count of Vernier calipers?
8. Define pitch of a screw.
9. Define ZE and ZC in screw gauge.
10. Define scalar quantity & give its examples.
11. Define vector quantity & give its examples.
12. Write the relation between resultant and equilibrant.
13. State law of parallelogram of vectors.
14. State Converse law of triangle of forces.
15. State Lami's theorem.
16. Define moment of force.
17. Write the two rectangular component of a vector.
18. Write how moment of force is measured.
19. Discus why the handles of the doors and windows are fixed at the end.
20. Define couple.
21. Define is moment of couple.
22. Write how you measure moment of couple.
23. Define equilibrium.
24. Write the conditions of equilibrium when number of co-planar parallel forces acting on a body.
25. Define like & unlike parallel forces.

PART – B (05 MARKS QUESTIONS)

1. Mention seven basic units and two supplementary units of SI system.
2. Draw a neat diagram of Vernier calipers and label its parts.
3. Draw a neat diagram of Screw Gauge and label its parts.
4. Explain parallel forces with their types.

5. List two types of moment of force. Write any three applications of couple.
6. Write the advantages of S.I system.
7. Mention the difference between scalars and vectors.
8. State Converse law of triangle of forces; write the line diagram & equationof Converse law of triangle of forces.
9. State Lami's theorem, write the line diagram & equation of lami's theorem
10. Define moment of force, write the equation to measure moment of force & give its examples.

PART – C (06 MARKS QUESTIONS)

1. Derive an expression for magnitude and direction of resultant of two forces acting at a point.
2. Derive an expression for horizontal and vertical components of force acting at an angle θ with horizontal.
3. Write the conditions for equilibrium of coplanar parallel forces acting on a rigid bodywith equations & diagram.
4. Describe an experiment to verify law of parallelogram of forces.
5. Describe an experiment to verify Converse law of triangle of forces.
6. Describe an experiment to verify Lami's theorem.
7. Describe an experiment to verify the conditions of equilibrium of co-planar parallel forces using moment bar.
8. A main scale is divided into 0.5 mm the length of vernier attached to it is 12mm and isdivided into 25equal parts. Calculate the value of 1vsd and L.C of vernier.
9. In Vernier calipers, main scale is divided into 1mm;9division of main scale is divided into 10 equal parts on Vernier scale. In a setting zero of Vernier scale lies between 4.8cm and 4.9cm, and 7th division of vernier coincide with the main scale division. What is the total reading?
10. A screw gauge has a pitch of 0.5mm and 50 divisions on head scale. The reading when jaws touch is +5div. When gripping a wire the reading is 3 turns and 17 div. What is the diameter of the wire?
11. The resultant of two equal forces acting at a right angle to each other is 1414N.Findthe magnitude of each force.
12. Two forces of 5kg wt. and 10kg wt. acts at right angles to one another. Find the magnitudeand direction of the resultant forces.
13. Two unlike parallel forces equal to 20N and 12N acts at two points A and B on a rigidbody.Find the magnitude and direction of their resultant and the point where it acts if AB=0.8m
14. Two like parallel forces equal to 80N and 100N act on a body at two points A and B. If AB=0.6m,find the magnitude and the point where there resultant acts.
15. Three forces P, Q and 100 N acting on a body in equilibrium. If the angles opposite to P and Q are 120^0 and 150^0 respectively. Find the magnitude of P and Q.

UNIT II: PROPERTIES SOLIDS & LIQUIDS

PART – A (02MARKS QUESTIONS)

1. Define plasticity.
2. Define elasticity.
3. Define deforming force.
4. Define restoring force.
5. Define stress.
6. Write the types of stress.
7. Define strain.
8. Write the type of strain.
9. Define elastic limit.
10. State Hooke's law.
11. Define Young's modulus.
12. Define Bulk modulus.
13. Define Rigidity modulus.
14. Define compressibility? Write its S.I unit.
15. Write S.I units of stress and strain.
16. Define pressure of liquid.
17. Write equation for the pressure at a point inside the liquid at rest.
18. State Bernoulli"s theorem.
19. Define cohesive force.
20. Define Adhesive force.
21. Write reason why glue stick to paper?
22. Define angle of a contact.
23. Name the type of angle of a contact formed for water and glass, water and mercury.
24. Define surface tension.
25. List the factors affecting surface tension.
26. Define capillarity.
27. Write any four applications of capillarity.
28. List the applications of surface Tension.
29. Write the equation used to determine surface tension of water by capillary raise method.
30. Define viscous force.
31. Give two examples of viscous liquid.
32. Define co-efficient of viscosity. Write its S.I unit.
33. List the factors affecting viscosity of liquid.
34. Write the effect on viscosity of gas if temperature is increased.
35. Write any four applications of viscosity.
36. List the types of flow of liquid.

PART – B   (05 MARKS QUESTIONS)

1. Explain elasticity with an example.
2. Define elasticity and list three types of modulei of elasticity.
3. Define strain. Write the types of strain. Give e.g. for each type of strain.
4. Define stress. Write the types of stress. Give e.g. for each type of stress.
5. Define elastic limit. State Hooke's law? Write its mathematical form .
6. Explain stress-strain graph.
7. Define compressibility and factor of safety. Write the SI unit of stress.
8. Define thrust and pressure,write their SI units.
9. Define K.E and P.E of liquid. State the Bernoulli's theorem.
10. Define cohesive and adhesive force with an example.
11. Define pressure energy and angle of contact.
12. Define two types of flow of liquid with an example.
13. Define angle of a contact. What type of angle of contact is formed for water and glass, water and mercury? List the factorsaffecting surface tension.
14. Define capillarity.Write any four applications of capillarity.
15. Write the difference between stream line flow and turbulent flow of liquids.
16. Define viscosity and write the effect of temperature on viscosity of liquid & gas.
17. Define stress and explain the types of stress.
18. Define strain and explain the types of strain.
19. State Hooke's law?List any three applications of viscosity.
20. Define surface tension. Mention any three factors affecting surface tension.

PART – C (06 MARKS QUESTIONS)

1. Derive an expression for young's modulus of elasticity.
2. Derive an expression for pressure at any point inside the liquid at rest.
3. Derive an expression for co-efficient of viscosity of liquid.
4. Describe an   experiment to determine   the surface tension of water by capillary rise method.
5. Describe an   experiment to determine coefficient of viscosity of water by Poiseuille's method.
6. A uniform wire of length 0.5m and diameter 0.0006m when stretched by a mass of 5kgextends by 0.0004m. Calculate Young's modulus of wire.
7. A wire of length 1m is fixed at one end and a mass of 1kg is hung from free end,the area of cross section of the wire is 2.5×10^{-6} m^2 and the Young's modulus of the material of the wire is 2×10^{11} Nm$^{-2.}$ Calculate stress, strain and extension ofthe wire.
8. A spring 60cm long is stretched by 2cm by the application of a load 200g. What will bethe length when the load of 500g is applied (given g = 980cm/s^2).

9. A rectangular tank is 3m long,2m wide and 1.5m in height, it contains water to a depth of 1m,the density of water is 1000kg/m^3. Calculate the pressure at the bottom of the tank.

10. Calculate the pressure at the bottom of a swimming pool 10m wide if the water is 3m deep,the density of water is 1000kg/m^3.

11. A square plate of 6cm side moves parallel to another plate with a velocity of 10cm/s, both theplates being immersed in water ($\eta = 0.01$poise). If the distance between the plates 0.5mm.Calculate the viscous force.

12. In a certain experiment on the flow of water through a capillary tube, the following data were obtained. Volume of water coming out per minute = 15cc; pressure head of water = 30cm
Length of tube = 25cm; radius of tube = 0.05cm; calculate coefficient of viscosity of water(g=980cm/s^2, density=1gm/cc)

13. A castor oil of viscosity 98.6NS/ m^2 fills the space between two horizontal plates1cm apart. If the lower plate is stationary and upper plate is moving horizontally with a velocity of 3m/s . Find the tangential force per unit area.

UNIT-III: HEAT AND PROPERTIES OF GASES.

PART – A (02MARKS QUESTIONS)

1. Define heat & write SI unit of heat.
2. Define temperature & write SI unit of temperature.
3. Define specific heat of substance & write its SI unit.
4. Define conduction of heat.
5. Define convection of heat.
6. Define Radiation of heat.
7. Define Thermal conductivity.
8. Define specific heat of a gas at constant volume.
9. Define specific heat of a gas at constant pressure.
10. State Boyle's law.
11. State Charle'slaw.
12. State Gay-Lussac's law
13. Define isothermal process.
14. Define adiabatic process.
15. Define thermodynamics.
16. State zeroth law of thermodynamics.
17. State Ist law of Thermodynamics.
18. State IInd law of Thermodynamics
19. Write Mayer's equation.

PART – B (05 MARKS QUESTIONS)

1. Write any five differences between heat & temperature.

2. Define heat, temperature & specific heat of Substance. Write Mayer's equation for gas.
3. Define conduction, convection, radiation and thermal conductivity.
4. Write any five applications of conduction.
5. Write any five applications of convection.
6. Write any five applications of radiation.
7. Define Cp&Cv , write the relation between them.
8. Define conduction, write applications of conduction.
9. Define convection, write applications of convection.
10. Define radiation, write applications of radiation..
11. State 1st law of thermodynamics, explain isothermal & adiabatic process.
12. Derive an expression for coefficient of thermal conductivity (K).
13. Compare the three modes of transfer of heat.
14. State the three gas laws. (Boyle's law, Charle's law & Gay-Lussac's law).
15. State zeroth law, 1st law& 2nd law of thermodynamics.

PART – C   (06 MARKS QUESTIONS)

1. With usual notations prove that pv = nRT
2. Define thermal conductivity. Derive an equation for co-efficient of thermal conductivity(K).
3. Define specific heat of a substance. Derive an equation for specific heat of substance.
4. Describe an experiment to verify Boyle's law.
5. The volume of a gas at 27^0c at2 atmospheric pressure is 2 liters.
If the pressure is double & absolute temperature is reduced to half.
    What will be the new volume of gas?
6. A sealed glass bulb contains air at 30^0C at normal pressure. The bulb is immersed in an oil bath &heated gradually. Find the temperature in degree centigrade at which the bulb bursts if it can withstand a maximum pressure of 3.5atm.
7. The volume of certain mass of a gas at STP is $2x10^{-4}$ m^3. Find its volume at 27 ^{0}C at pressure $2.2x10^5$ Pa.
8. The volume of a gas at 15^0C is1.25cc   &755mm of mercury pressure. Calculate volume at NTP.
9. How much heat is required to raise the temperature of 5kg of copper from 27^0C to its melting point of 1063^0C? Given that specific heat of copper is 400 J/k^{0}C.
10. A hot iron ball of mass 0.2kg is dropped into 0.5g of water at 10^0C. The resulting temperature is 30^0C. Calculate the temperature of the hot ball. Specific heat of iron = 336J/kg^{0}C and specific heat of water = 4200J/kg^{0}C.
11. A silver rod 0.15m long has cross-sectional area of 0.0003m^2. If one end is maintained at 10^0C and other end at 75^0C. How much heat will flow through the rod in 5 minutes? Given that co-efficient of thermal conductivity of silver = 406 J/ms^{0}C.

UNIT-IV: WAVE MOTION

PART – A (02MARKS QUESTIONS)

1. Define frequency and amplitude of a vibrating particle.
2. Wrote the relation between frequency and time period.
3. Define periodic motion with example.
4. Define S.H.M with example.
5. Write the equation for displacement of the particle in S.H.M.
6. Define wave motion.
7. Define wave period, wave frequency.
8. Write the relation between wave velocity, wavelength & wave frequency
9. Define non mechanical wave. Give an example.
10. Define mechanical wave. Write two types of Mechanical wave
11. Define transverse wave & givean example.
12. Define longitudinal wave & give anexample.
13. Write any two differences between transverse wave and longitudinal wave.
14. Write twocharacteristics of transverse wave.
15. Write two characteristics of longitudinal wave.
16. Write Newton's equation for velocity of sound in a medium and name the terms involved in the equation.
17. Write the Newton's Laplace equation for velocity of sound in air
18. Write the effect of pressure on velocity of sound in air.
19. Write the effect of temp on velocity of sound in air.
20. Write the equation for velocity of sound in air at 0°c.
21. Write the effect of humidity on velocity of sound in air.
22. Define free and forced vibration.
23. Define natural frequency.
24. Define resonance.
25. Give any two practical examples of resonance.
26. Define how stationarywaves areproduced?
27. Write any two characteristics of stationary waves.
28. Define nodes and antinodes.
29. Write the difference between stationary waves and progressive waves.
30. Write the fundamental note in vibration of stretched string.
31. Write the formula for the fundamental frequency of vibration of stretched string.
32. State the law of tension as applied to the vibration of stretched string.
33. State the law of length as applied to the vibration of stretched string.
34. State the law of mass per unit length as applied to the vibration of stretched string.
35. Define beats.
36. Define beat frequency.
37. Write any two applications of beats.

38. Write how beat frequency can be calculated?

PART-A   (05 MARKS QUESTIONS)

1. Define period, frequency & amplitude of vibrating particle.
2. Explain mechanical &non mechanical waves with examples.
3. Define longitudinal waves & transverse waves.
4. Define beat and beat frequency.
5. Obtain the relation between v, n andλ.
6. Define periodic motion & SHM with example in each.
7. Derive an expression for displacement of a particle executing SHM.
8. Define wave period, wave frequency, wave amplitude, wave length and wave velocity.
9. Distinguish between longitudinal & transverse waves.
10. Explain propagation of sound waves in air with practical example.
11. Describe Newton's formula for velocity of sound in air.
12. Explain Newton's formula for velocity of sound in air and hence Laplace correction to it.
13. Explain various factors affecting velocity of sound in air.
14. What is stationary wave? Mention the characteristics of stationary waves.
15. Why the soldiers are asked to break steps while marching across bridges.

PART- C (06 MARKS QUESTIONS)

1. Derive an expression for displacement of a particle executing SHM
2. Derive an expression for velocity of wave in terms of its frequency and wavelength.
3. Derive an expression for fundamental frequency of vibrations of stretched string.
4. Describe an experiment to determine the velocity of sound in air at room temperature by resonance air column method.
5. Describe an experiment to find the unknown frequency of the given tuning fork using sonometer by comparison method.
6. Describe an experiment to determine frequency of Turing fork by absolute method using sonometer.
7. A wave of frequency 600MHZ travels at a speed of $3x10^8$ m/s. Calculate itswavelength &calculate the frequency of same type of wave whose wavelength is 40m.
8. If the frequency of tuning fork is 500Hz & velocity of sound is 300m/s. Find how far sound travels while the fork completes 25 vibrations.
9. Calculate the velocity of sound in air at 25^0C & 75cm of mercury pressure, if thedensity of air at 0^0C & 76cm of mercury pressure is 1.29kgm^{-3}. (Given γ=1.41 for air).
10. Calculate the speed of sound at -50^0C & at $+100^0$C, given speed of sound   at 0^0c is 332m/s.

11. The density of air at NTP is 1.293 kgm^{-3} & γ=1.402. Calculate the frequency of a tuning fork which emits sound of wavelength 0.75m at 26^0 c.

12. A string of length 2m is stretched by a force of 3200N. If the frequency of vibration is 100Hz. Find the mass of the string.

13. A string has length of 0.3m & weight 2x10^{-3}kg. What must be the tension in the string so that when vibrating string transversely, it has a fundamental frequency 320 Hz?

14. A Sonometer wire of 0.5m long vibrates in two segments & is stretched by a force of 5kg wt. Calculate the frequency of the note emitted. (g=9.8m/s^2 linear density of the wire=0.018kg/m).

15. The frequency of Sonometer wire is doubled when the tension is increased by 12kg wt.Find the original tension.

UNIT V: MODERN PHYSICS

PART – A (02MARKS QUESTIONS)

1. Define electromagnetic waves.
2. State two characteristics of electromagnetic waves.
3. Write how electromagnetic waves are produced?
4. Define electromagnetic spectrum.
5. Write any two uses of electromagnetic spectrum.
6. Write the principle of LASER.
7. List any two types of LASER.
8. Write any two principle of LASER.
9. Write any two applications of LASER.
10. Define nanotechnology.
11. Write two advantages of nanotechnology.
12. Write two disadvantages of nanotechnology.
13. Write what do you mean by communication?
14. Write the basic elements of communication system.
15. List any two commonly used terms in electronic communication system.
16. Write two advantages of communication satellite.
17. Write two disadvantages of communication satellite.
18. Define optical fiber.
19. Write the principle of optical fiber.
20. Write two advantages of optical fiber.

PART-B   (05 MARKS QUESTIONS)

1. Describe the generation of electromagnetic waves.
2. Write any five properties of electromagnetic waves.
3. Explain how electromagnetic spectrum is classified?
4. Write any five applications of electromagnetic spectrum.
5. Explain the principleof LASER. List the properties of LASER.

6. Write any five advantages of LASER.
7. Write five advantages of nanotechnology.
8. Write advantages and disadvantages of nanotechnology.
9. Write the block diagram of communication system.
10. List any five commonly used terms in electronic communication system..
11. Write five advantages of satellite communication.
12. Write any five disadvantages of satellite communication.
13. Write any five advantages of optical fiber.
14. Explain satellite communication. List any two disadvantages of satellite communication system.

PART- C (06 MARKS QUESTIONS)

1. Define electromagnetic waves. Write four properties of electromagnetic waves.
2. Define electromagnetic spectrum. Explain how electromagnetic spectrum is classified.
3. Write the applications of electromagnetic spectrum.
4. List six applications of LASER.
5. Write six advantages of nanotechnology.
6. Write what you mean by communication system. Write the block diagram of communication system..
7. Define satellite communication system. Write four advantages of satellite communication system.
10. Write the principle of optical fiber. Write four applications of optical fiber.

UNIT VI INDUSTRIAL CHEMISTRY

PART – A (02MARKS QUESTIONS)

1. Define electrolysis.
2. Define electrolyte.
3. Write any four examples of electrolyte.
4. Define strong and weak electrolyte.
5. Write any two postulates of Arrhenius theory of electrolytic dissociation.
6. State Faradays Ist law of electrolysis.
7. State Faradays IInd law of electrolysis.
8. Define corrosion.
9. List any two preventive methods of corrosion.
10. Define batteries.
11. Write any two applications of batteries.
12. Define fuel cells.
13. Write any two types of fuel cells.
14. Write any two advantages of fuel cells.
15. Define minerals.
16. Define ore.
17. Define flux.

18. Define slag.
19. Define an alloy.
20. Write any two uses of alloys.
21. Define polymers.
22. Define polymerization.
23. Write any two applications of polymers.
24. List the methods of polymerization.
25. Define composite materials.
26. Write any two types of composite materials.
27. Write two advantages of composite materials.
28. Write two disadvantages of composite materials.
29. Define solute.
30. Define solvent.
31. Define solution.
32. Define saturated solution.
33. Define unsaturated solution.
34. Define concentration of a solution.
35. Define normal solution.
36. Define molar solution.
37. Define molal solution.
38. Define pH of a solution.
39. Write any two applications of pH.
40. Write hydrogen ion concentration in case of neutral solution.

PART-B   (05 MARKS QUESTIONS)

1. Explain the mechanism of electrolysis of HCl.
2. Define corrosion. Write the necessary condition of corrosion.
3. Write any five postulates of Arrhenius theory of electrolytic dissociation.
4. State Ist and IInd Faradays laws of electrolysis.
5. Write any five preventive methods of corrosion.
6. Write the classification of batteries. Write two applications of batteries.
7. Write two types of fuel cells. List any three advantages of fuel cells.
8. Define alloys. Write the purpose of making alloys.
9. Write the classification of polymers. Write any three applications of polymers.
10. Define composite material. Write any two advantages of composite materials.
11. Calculate the concentration of solution when 110gmof copper sulphate is dissolved in 550gm of a solvent.
12. Define pH of a solution. Explain acid, base, and neutral solution on the basis of pH value.

PART- C (06 MARKS QUESTIONS)

1. State and explain Faradays laws of electrolysis?
2. Explain the mechanism of electrolysis of HCL.

3. Define corrosion. Write the necessary condition for corrosion.

4. Write any six preventive methods of corrosions.

5. Explain the electrochemical theory of corrosion.

6. Mention what is battery? Write the applications of batteries.

7. Define fuel cells. Mention the types of fuel cells.

8. Write the advantages of fuel cells.

9. Define minerals, ore, flux, slag and alloys?

10. Write the composition steel. List three uses of alloys.

11. Explain any two methods of polymerization.

12. Write the applications of polymers.

13. Write the advantages and disadvantages of composite materials.

 14. Define molar and normal solution. What is concentration of a solution?

15 .Write any six applications ofpH.

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Government of Karnataka
Department of Technical Education, Bengaluru
Course: APPLIED SCIENCE
Course code: 15SC03S

Curriculum Drafting Committee 2015-16

	Name	Designation	Institution
1	Mr. R B Pawar	Principal	Govt. Polytechnic, Bijapur
2	Mr. K.Nazeer Ahmed	Selection Grade Lecturer	Govt. Polytechnic, Mulbagilu
3	Mr. Liyakhat Ali Khan	Selection Grade Lecturer	S.J. Govt. Polytechnic, Bengaluru
4	Dr. Hanumantha Nayak	Selection Grade Lecturer	S.J. Govt. Polytechnic, Bengaluru
5	Ms. Bhagirathi B N	Selection Grade Lecturer	S.J. Govt. Polytechnic, Bengaluru

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Curriculum Review Committee

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2	Mr. Liyakhat Ali Khan	Selection Grade Lecturer	S.J. Govt. Polytechnic, Bengaluru
3	Smt. Revathi	Selection Grade Lecturer	M.E.I. Polytechnic, Bengaluru

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

Course Title:	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	Course Code	: **15EE01E**
Semester	: **I / II**	Course Group	: **Core**
Teaching Scheme (L:T:P)	: **4:0:0** (in Hours)	Credits	: **4 Credits**
Type of course	: **Lecture + Assignments**	Total Contact Hours : **52**	
CIE	: 25 Marks	SEE	: **100 Marks**
Programme: Mechanical (GL), Mechanical (Instr.), MTT, HPT, WSM,Mechatronics, Printing Technology, Textile Technology, Ceramics, Mining Engg., Metallurgical Engg.			

Pre-requisites	:Mathematics and Science in Secondary Education.
Course Objectives	:To introduce the concept of electrical current, voltage, power, energy, electrical circuits, magnetic fields, electromagnetic induction and alternating current. Introduction of Transformers, DC Generators, AC Generators and Motors, protective devices and Earthing.Introduction to Battery,UPS, electronic components and their applications.

Course Unit-wise Weightage of Marks:

Unit Nos.	Topics	Teaching Hours	SEE Max. Marks
1	Electricity and DC Circuits	9	30
2	Electromagnetism and DC Generators	7	20
3	AC Fundamentals, Transformers and AC Generators	9	25
4	Electric Motor Drives	9	25
5	Protective Devices, UPS and Estimation	9	25
6	Electronic Components and Applications	9	20
	Total	52	145

Course Content:

Unit 1

Electricity and DC Circuits: Introduction to sources of electrical energy, advantages, effects of electric current and its applications. Electrical current, voltage, emf, potential difference, electric work, power, energy & their units and measuring instruments.Conductors,insulators and semiconductors.Resistance, Ohm's lawand limitations.Resistances connected in series, parallel, series and parallel combinations.Horse Power and BHP.Simple problems on Ohm's law, resistance combinations and energy calculations.

Unit 2

Electromagnetism: Magnetic field,Magneticflux,Magneto motive force, flux density, Reluctance and their units.permeability.Faraday's laws, statically and dynamically induced EMF, self and mutual induced emf.Inductance, mutual inductance and their units.
DC Generator: Constructionandworking.

Unit 3

Fundamentals of AC Circuits: Sinusoidal voltage, current, amplitude,time-period,cycle,frequency, phase, phase difference, RMS value, Average value, form factor, and their units.Capacitance, capacitive reactance, inductive reactance,impedance and their units.Power,power factor and units.Difference between single phase and three phase power.Advantages of three phase power over singe phase power.
Transformers:constructionworking, application,ratings.
AC Generators:construction working, applications, ratings.

Unit 4

Electric Motor Drives:DC motors, types, applications and selection criteria. AC motors, single and three phase motors, selection criteria, FHP motorsapplications and selection criteria, applications of single phase and three-phase motors. Name plate details of single phase and 3 phase motors. Necessity of starters for AC motors, types and applications. Advantages of 3 phase motors over single phase motors. List out the motors used for following purposes; Mining, Printing, Textiles, Cement, Mechanical, Aeronautical and Chemical industries by giving selection criteria.Importance of Motor enclosures, types, and their applications.

Unit 5

Protective Devices, UPS& Estimation: Necessity of protective devices,ratings, rewireable, cartridge, and HRC fuses. Types of switches,MCB and ELCB.Necessity of electrical earthing and types.General safety precautions to prevent electricalaccident, first aid in electric shock.Cell, battery, types of batteries,conditions of fully charged and discharged battery of lead acid battery,sealed maintenance free (SMF) battery.Selection of batteries.UPS, types, applications and selection criteria of UPS.
i)Plan and estimate the cost of electrical wiring for one 3mX3m room having consisting of 2 tubelights, 1 ceiling fan, 2 three pin socket.
ii) Plan and estimate the cost of electrical wiring for one lathe for three phase wiring with MCBs, starters, Iron clad switches, and HRC fuses.

Unit 6

Electronic Components and Applications: Intrinsic and extrinsic semiconductors, P and Ntype materials. Diode, typesand their applications.Forward and Reverse bias characteristics of a Diode.Half wave ,full waveandbridge rectifiers without filter. Zenerdiodeas a voltage regulator.Transistor, working, applications, and transistor as a switch.SCR working and industrial applications.Timers, applications.Relays, applications.Logic gates –OR,AND,NOT, EX-OR, NAND, and NOR,meaning and advantages of IC.

ReferenceBooks

1. ABC of Electrical Engineering by B. L. Theraja and A. K. Theraja, S Chand Publishers, New Delhi, 2014 Edition.
2. Basic Electrical and Electronics Engineering by S. K. Bhattacharya, Pearson Education India, 2012 Edition.
3. Electronic Devices and Circuits by I. J. Nagrath, PHI Learning Pvt. Ltd., 2007 Edition.
4. Basic Electrical Engineeringby V. Mittle and ArvindMittle,McGraw Hill Companies, 2005 Edition.
5. Basic Electrical Engineering. By Sapna Publications.

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6. http://jenko.eu/marjan/fpp_izredni/knjiga_df/df_1_digital_concepts.pdf
7. http://www.facstaff.bucknell.edu/mastascu/elessonshtml/eeindex.html - Welcome to Exploring Electrical Engineering.
8. Fundamentals Handbook of Electrical Science, Module 1, Basic Electrical Theory, Department of Energy, U. S. Department of Energy, June 1992.
9. http://www.freeengineeringbooks.com/Electrical/Basic-Electrical-Engineering.php
10. http://www.electrical-engineering-portal.com

Course Delivery:

The Course will be delivered through lectures, classroom interaction, animations, group discussion, exercises and assignments.

Course Contents with Lecture Schedule:

Lesson No./ Session No.	Contents	Duration
	Electricity and DC Circuits:	**9 Hours**
1.	Introduction to sources of electrical energy, advantages,	01 Hour
2.	Effects of electric current and its applications.	01 Hour

Lesson No./ Session No.	Contents	Duration
3.	Electrical current, voltage, emf, potential difference	01 Hour
4.	Electric work, power, energy & their units and measuring instruments.	01 Hour
5.	Conductors, insulators and semiconductors. Resistance.	01 Hour
6.	Ohm's law and limitations.	01 Hour
7.	Resistances connected in series, parallel, series and parallel combinations. Horse Power and BHP.	01 Hour
8.	Simple problems on Ohm's law, resistance combinations and energy calculations.	01 Hour
9.	Simple problems on Ohm's law, resistance combinations and energy calculations.	01 Hour
	Electromagnetism and DC Generator	**7 Hours**
10.	Magnetic field, Magnetic flux, Magneto motive force	01 Hour
11.	Flux density, Reluctance and their units. Permeability.	01 Hour
12.	Faraday's laws,	01 Hour
13.	Statically and dynamically induced EMF,	01 Hour
14.	Self and mutual induced emf.	01 hour
15.	Inductance, mutual inductance and their units.	01 Hour
16.	DC Generator- construction and working	01 Hour
	Fundamentals of AC Circuits, Transformers, and AC Generators	**9 Hours**
17.	Sinusoidal voltage, current, amplitude, time - period, cycle, frequency,	01 Hour
18.	Phase, phase difference, RMS value, Average value, form factor, and their units.	01 Hour
19.	Capacitance, capacitive reactance, inductive reactance, impedance and their units.	01 Hour
20.	Power, power factor and units. Difference between single phase and three phase power.	01 Hour

Lesson No./ Session No.	Contents	Duration
21.	Advantages of three phase power over single phase power	01 Hour
22.	Transformers- construction and working,	01 Hour
23.	Transformers- ratings and applications.	01 Hour
24.	AC Generators- construction working,	01 Hour
25.	AC Generators-ratings and applications.	01 Hour
	Electric Motor Drives	**9 Hours**
26.	DC Motors, types, applications	01 Hour
27.	Selection criteria of DC motors.	01 Hour
28.	AC motors, single and three phase	01 Hour
29.	Selection criteria for AC motor selection	01 Hour
30.	FHP motors applications and selection criteria,	01 Hour
31.	Applications of single phase and three-phase motors.	01 Hour
32.	Name plate details of single phase and 3 phase motors. Necessity of starters for AC motors, types and applications.	01 Hour
33.	Advantages of 3 phase motors over single phase motors.	01 Hour
34.	List out the motors used for following purposes; Mining, Printing, Textiles, Cement, Mechanical, Aeronautical and Chemical industries by giving selection criteria. Motor enclosures, importance and their applications.	01 Hour
	Protective Devices, Batteries ,UPS and Estimation	**9 Hours**
35.	Necessity of protective devices, ratings,	01 Hour
36.	Rewire-able fuse, fuse cartridge, and HRC fuse. Types of switches, MCB and ELCB.	01 Hour
37.	Necessity of electrical earthing and types.	01 Hour
38.	General safety precautions and electric shock treatment.	01 Hour
39.	Cell, battery, types of batteries, conditions of fully charged and discharged battery of lead acid battery	01 Hour

Lesson No./ Session No.	Contents	Duration
40.	Sealed maintenance free (SMF) battery. Selection of batteries.	01 Hour
41.	UPS, types, applications and selection criteria of UPS.	01 Hour
42.	Plan and estimate the cost of electrical wiring for one 3mx3m room consisting of 2 tube-lights, 1ceiling fan, 2 three pin socket.	01 Hour
43.	Plan and estimate the cost of electrical wiring for One lathe for three phase wiring with MCBs, starters, Iron clad switches, and HRC fuses.	01 Hour
	Electronic Components and Applications	**9 Hours**
44.	Intrinsic and extrinsic semiconductors, P and N type materials.	01 Hour
45.	Diode, types and their applications. Forward and Reverse bias characteristics of a Diode.	01 Hour
46.	Half wave and full wave bridge rectifiers without filter.	01 Hour
47.	Zener diode as a voltage regulator. Transistor-working,	01 Hour
48.	Transistor types, applications, and transistor as a switch.	01 Hour
49.	SCR working and industrial applications.	01 Hour
50.	Timers, applications.	01 Hour
51.	Relays, applications.	01 Hour
52.	Logic gates –OR, AND, NOT, EX-OR, NAND, and NOR, advantages and applications of IC.	01 Hour

Course Outcomes

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

1. Understand Ohm's law and Faraday's laws of electromagnetic induction; solve problems on resistance combinations and energy.
2. Understand AC fundamentals.
3. Differentiate the applications of DC & AC motors and Generators, necessity of starters.
4. Explain protective devices like Fuses, MCB, and ELCB and earthing and safety measures, Batteries and UPS.
5. Understand electronic components and their applications, working of rectifiers and logic gates.

Mapping Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S	M									M	
2	S										M	
3	M	S									M	
4	M	S									M	
5	S				M						M	

S – Strong Relationship   **M- Moderate Relationship**

Course Assessment and Evaluation

		What	To Whom	Frequency	Max Marks	Evidence Collected	Course Outcomes
Direct Assessment	**CIE (Continuous Internal Evaluation)**	I A Tests	Students	Three IA tests for Theory: (Average marks of Three Tests to be computed).	20	Blue Books	1 to 5
		Classroom Assignments		Classroom Assignments	05	Log of Activity	3 and 4
				TOTAL	**25**		
	SEE (Semester End Examination)	End Exam	Students	End Of the Course	100	Answer Scripts at BTE	ALL CO's
Indirect Assessment		Student Feedback on course	Students	Middle Of The Course	Feed Back Forms		All COs
		End Of Course Survey		End Of The Course	Questionnaires		All COs

Note: I.A. test shall be conducted for 20 marks. Any decimals shall be rounded off to the next higher digit.

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No	Bloom's Category	% in Weightage
1	Remember	40
2	Understand	40
3	Apply	20

Model Question Paper:

Code: 15EE01E

I /II Semester Diploma Examination

BASIC OF ELECTRICAL AND ELECTRONICS ENGINEERING

(Common for Mechanical (GL), Mechanical (Instr.), MTT, HPT, WSM, Mechatronics, Printing Technology, Textile Technology, Ceramics, Mining Engg., Metallurgical Engg..)

Time: 3 Hours]   **[Max Marks: 100**

Note: i) Answer any SIX questions from PART - A. Each question caries 5 marks.
       ii) Answer any SEVEN Questions from PART - B. Each question caries 10 marks.

PART – A

1. State the Sources of Electrical Energy.

2. Define and mention the SI units of i) Electric Current ii) Voltage

3. State Faraday's First and Second Laws of Electromagnetic Induction.

4. Define i) RMS value ii) Average value and write equations.

5. State the working principle of a Transformer.

6. State Five applications of DC motors.

7. Write the name plate details of a three phase Induction Motor.

8. Distinguish between MCB and ELCB.

9. State the advantages of Integrated Circuits over discrete components.

PART – B

10. a. State Ohm's Law and mentions the limitations.   4

    b. Three resistances of 6 Ω, 4 Ω and 10 Ω are connected in series, across supply of 100 V, Find   i) Effective resistance of the circuit.

                    ii) Total current in the circuit.

                    iii) Current through each resistance   6

11. a. Define i) Electric Power ii) Electric Energy   and mention the meters used to measure them.   4

    b. A house consists of two bulbs of 100W each, three bulbs of 60W each and one fluorescent lamp of 40W. If they are used for 4 hours a day, find monthly consumption chargesat Rs. 2.70 per unit. 6

12. a. Define with SI Units. i) Magnetic Flux ii) Magneto motive Force.   4

    b. Distinguish between Statically Induced and Dynamically Induced emf. 6

13. a. Explain the construction of DC Generator.   4

    b. Draw a sinusoidal waveform and mark the following

        i) Maximum value

        ii) Instantaneous value

        iii) cycle   6

14. a. State Five advantages of 3-phase power supply over 1-phase power supply.   5

    b. Explain the construction of an AC Generator.   5

15. a. State Five applications of FHP motors.   5

    b. State the necessity of starters for 3-phase induction motors and list the types.   5

16. a. State the advantages of three phase motors over single phase motors.   5

    b. Explain the need for different motor enclosures and state the applications. 5

17. a. State any five general electrical safety precautions.   5

    b. Mention the conditions for fully charged and discharged lead acid battery.   5

18. a. Explain the selection criteria of an un-interrupted power supply (UPS).   4

    b. Distinguish between Intrinsic and extrinsic semiconductors.   6

19. a. Explain the working of a full wave diode bridge rectifier with a neat sketch. 5

    b. Draw the logic symbol and write the truth table for   i) NAND gate and ii) NOR gate.   5

---Xxx---

Model Question Paper Bank

Course Title:	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	Course Code	: **15EE01E**

All the questions carry 5 marks each.

Unit 1 - Electricity and DC Circuits

1. State the Sources of Electrical Energy.
2. State Five effects of Electrical Current with an example each.
3. Mention any five applications of Electrical Energy.
4. State five advantages of electrical energy over other forms of energy.
5. Define and mention the SI units of   i) Electric Current   ii) Voltage.
6. Define and mention the SI units of i) Potential Difference ii) Resistance
7. Define i) Electric Current ii) Voltage and
   mention the meters used to measure them.
8. Distinguish between Conductors and Insulators.
9. Distinguish between Conductors and Semi-conductors.
10. State Ohm's Law and mentions its limitations.
11. State and explain Ohm's Law.
12. Determine the equivalent resistance of three resistances R1, R2 and R3 when connected in series across a supply voltage of V volts.
13. Determine the equivalent resistance of three resistances R1, R2 and R3 when connected in parallel across a supply voltage of V volts.
14. Three resistances of 6 Ω, 4 Ω and 10 Ω are connected in series, across supply of 100 V,   Find
    i) Effective resistance of the circuit.
    ii) Total current in the circuit.
    iii) Current through each resistance
    iv) Voltage drop across each resistance.
15. Define i) Electric Power ii) Electric Energy and mention the meters used to measure them.
16. Define Electric Power and write the three equations of electrical power with current, voltage and resistance.
17. A 100 watt lamp is used for 6 hours and a 60 watt lamp is used for 4 hours a day. Find   i) Energy consumed per month and
                    ii) Cost of energy if each unit costs Rs.2.70
18. A house consists of two bulbs of 100W each, three bulbs of 60W each and one fluorescent lamp of 40W. If they are used for 4 hours a day, find monthly consumption charges at Rs. 2.70 per unit.
19. Define Horse power and Brake Horse power.

Unit 2 - Electromagnetism

20. Define with SI units. i) Flux density ii) Reluctance.
21. Define with SI units. i) Magnetic flux ii) Magneto Motive Force.
22. State Faraday's First and Second Laws of Electromagnetic Induction.
23. Define with SI units i) Permeability ii) Reluctance.
24. Distinguish between Statically Induced and Dynamically Induced e.m.f.
25. Distinguish between self-induced and mutual-induced e.m.f.
26. Define with SI units a) Inductance b) Mutual inductance
27. Explain with a sketch statically induced emf with an example.
28. Explain with a sketch dynamically induced emf with an example.
29. Explain the construction of DC Generator.
30. Explain the working of a DC Generator.

Unit 3 - Fundamentals of AC Circuits

31. Define i) RMS value ii) Average value and write equations.
32. Explain with illustration i) phase and ii) phase difference.
33. Draw a sinusoidal waveform and mark the following
     i) Maximum value
     ii) Instantaneous value
     iii) cycle
     iv) Time Period.
34. Define the following with reference to a sinusoidal waveform
     i) Maximum value
     ii) Instantaneous value
     iii) Form factor.
35. Define with SI units. i) Frequency and ii) Time period.
36. The instantaneous value of current is given by i = 50 sin 520 t, find
     i) Instantaneous value at t = 5ms
     ii) Maximum value
     iii) Frequency
     iv)Time period
37. Define with equations, i) Capacitive reactance ii) Inductive reactance.
38. Explain Impedance, mention the SI unit and also write the equation.
39. A resistance of 100 Ω is connected in series with a capacitance of 150 μF. If this is connected to a 200 V, 50 Hz supply, Find
     i) Capacitive reactance.
     ii) Impedance of the circuit
     iii) Power factor
     iv) Current

40. A resistance of 20 is connected in series with a inductance of 0.07 H . If this is connected to a 200V, 50 Hz supply, find   i)   Inductive reactance
      i)   Impedance
      ii)   Power factor
      iii)   current
41. Define power factor and explain its effect on electrical power.
42. Compare between three phase power supply and single phase power supply.
43. State Five advantages of three phase power supply over single phase power supply.
44. Explain the working principle of an AC generator.
45. Explain the construction of an AC Generator.
46. State the working principle of a transformer.
47. Explain the construction of a transformer.
48. What is a transformer? State its applications.
49. Write the ratings of a typical transformer.
50. Write the ratings of a typical AC generator.
51. What is an AC generator? State its applications.

Unit 4 - Electric Motor Drives

52. What is a DC motor? List the types of DC motors.
53. State five applications of DC motors.
54. Explain briefly the selection of DC motors.
55. What is an AC motor? List the types of AC motors.
56. Compare single phase and three phase AC motors.
57. Explain briefly the selection of single phase and three phase AC motors.
58. State the applications of single phase AC motors.
59. State the applications of three phase AC motors.
60. What is FHP motor? List the applications of FHP motors.
61. Explain briefly the selection of FHP motors.
62. What is the importance of name plate details of an AC motor. Give one example for single phase and three phase AC motor.
63. State the necessity of starters for three phase AC motors and list the types and applications.
64. State the necessity of starters for three phase induction motors and list the types.
65. State the advantages of three phase motors over single phase motors.
66. List out the various industrial applications of DC motors.
67. List out the selection criteria of DC motors for various industrial applications.
68. List out the various industrial applications of AC motors.
69. List out the selection criteria of AC motors for various industrial applications.
70. Explain the need of mechanical enclosures for motors and state the applications.

71. List the different types of mechanical enclosures for motors with their applications.

Unit 5 - Protective Devices, UPS and Estimation

72. Explain the necessity of Protective devices. List the types.
73. Sate the meanings of over voltage, under voltage and normal voltage w.r.t AC.
74. Sate the meanings of over loading, over and short circuit currents.
75. What is fuse? List the types.
76. List the applications of re-wire able, cartridge, and HRC fuses.
77. List out the different types of switches with their symbols.
78. Distinguish between MCB and ELCB.
79. Explain the necessity of electrical Earthing. List types of earthing.
80. Explain the necessity of earthing an electrical equipment..
81. State any five general electrical safety precautions.
82. Explain briefly electric shock treatment.
83. State the sequence of steps for shock treatment.
84. State the definitions of Cell and Battery. List the types of Batteries.
85. Explain the ratings of Battery.
86. Differentiate Primary and Secondary Batteries.
87. Mention the conditions for fully charged and discharged Lead Acid Battery.
88. What are SMF batteries? List the advantages over conventional batteries.
89. Explain the selection of batteries.
90. What is an UPS and its rating? List the different types.
91. What are the functions of UPS.
92. Explain the selection criteria of an Un-interrupted Power Supply.
93. Plan and estimate the cost of electrical wiring for one 3mX3m room having consisting of 2 tubelights,1 ceiling fan, 2 three pin socket .
94. Plan and estimate the cost of electrical wiring for One lathe for three phase wiring with MCBs, starters, Iron clad switches ,and HRC fuses

Unit 6 - Electronic Components and Applications

95. What are semiconductors? List the properties.
96. What are semiconductors? List the types and applications.
97. Distinguish between Intrinsic and Extrinsic semiconductors.
98. Explain P and N type semiconductors.
99. What is a Diode. List the types and their applications.
100. Explain the operation of PN junction Diode.
101. Explain the operation of Diode in no bias, forward and reverse bias conditions.
102. Explain the VI characteristics of Diode.
103. With a neat diagram explain the working of half wave rectifier.
104. Explain with a neat sketch and waveforms the working of a full wave bridge rectifier.

105. Explain the operation of Zener diode as a Voltage Regulator.
106. What is a transistor? Mention the types with their symbols.
107. Explain the operation of NPN Transistor.
108. What is a BJT. List the applications of BJTs.
109. Explain with a neat circuit diagram the operation of Transistor as a Switch.
110. What is a SCR or Thyristor. Write the symbol. Also, list the industrial applications of SCRs.
111. Explain with a simple diagram he operation of SCR.
112. What is a Timer. List the types.
113. List the applications of Timers.
114. What is a Relay. List the types.
115. List the applications of Relays.
116. Draw the logic symbol, write the truth table and Boolean expression for the following logic gates;
    a) NOT
    b) OR
    c) AND
    d) NAND
    e) NOR
    f) EX-OR.
117. What is an IC? State the advantages of Integrated Circuits over discrete components.

Government of Karnataka
Department of Technical Education
Board of Technical Examinations, Bengaluru

	Course Title: **ENGINEERING GRAPHICS-II**	Course Code:**15ME21D**
	Teaching Scheme (L:T:P) : **0:2:4** (3 Credits)	Core/ Elective: **Core**
	Type of course: **Lectures & Practice**	Total Contact Hours: **78**
	CIE :**25 Marks**	SEE : **100 Marks**

(Common to all Mechanical /AE/MTT/CH Programmes)

Prerequisites: Engineering Graphics-IinFirst Semester Diploma programme.

COURSE OBJECTIVES

1. The course is aimed at developing Basic Graphic skills
2. Develop Skills In Preparation Of Engineering Drawings, their Reading And Interpretation

COURSECONTENT

UNIT:I	PROJECTION OF SOLIDS	CONTACT HOURS:21 Hours

Introduction-Positioning of solids –Solid lying with base on HP- Solids lying with base or axis inclined to HP- Solids lying with one of the lateral faces on HP- Solids lying with one of their lateral edges on HP-Cylinder lying with its axis or base inclined to HP- Cone lying with its axis or base inclined to HP -Solid lying with their axis inclined to both HP and VP.

UNIT:II	SECTION OF SOLIDS	CONTACT HOURS: 18 Hours

Introduction to Sectioning –Representation of section planes-Section lines and hatching-Types of Section planes-True shape of a section-Sectioning of solid like cube, prism, pyramid, cylinder and cone -Obtaining true shape of section.

UNIT:III	DEVELOPMENT OF SURFACES	CONTACT HOURS: 15 Hours

Introduction to Development of surfaces-Development of lateral surfaces of cube, prism, cylinder, pyramid, and cone-Development of lateral surfaces of truncated prism, cylinder, pyramid, and cone-Development of lateral surfaces ofTray, Funnel.

UNIT:IV	CONVERSION OF PICTORIAL VIEWS INTO ORTHOGRAPHIC VIEWS	CONTACT HOURS: 12 Hours

Introduction –Guidelines for conversion of pictorial views into orthographic views-Illustrative problems.

UNIT:V	ISOMETRIC PROJECTIONS	CONTACT HOURS: 12 Hours

Principles of isometric projection – isometric scale – isometric views of simple solids – cube – prisms, pyramids, cylinder and cone - Conversion of orthographic views into isometric View -Drawing of Isometric views of machine parts.

	TOTAL: 78 Hours

TEXT BOOK

1. K.R.Gopalakrishna*"Fundamentalsof Drawing"* Subhas Publications, 2010.
2. K.R.Gopalakrishna*"Engineering Drawing" (Vol. I & II),*Subhas Publications, 2014.

REFERENCES

1. R.K. Dhawan, *"A text book of Engineering Drawing",*S.ChandPublishers, Delhi,2010.
2. G.S. Phull and H.S.Sandhu, *"Engineering Graphics",*Wiley Publications, 2014.
3. K.Venugopal and V.Prabhu Raja, *"Engineering Graphics",* New Age International Private
   Limited, 2008.
4. M.B.Shah and B.C.Rana, *"Engineering Drawing",* Pearson Education, 2005.
5. BasantAgarwal and Agarwal.C.M.,*"Engineering Drawing",* Tata McGraw Hill Publishing
   Company Limited, New Delhi, 2008.

COURSE OUTCOMES

On successful completion of the course, the student will be able to

1. Draw Orthographic and sectional views of simple solids
2. Draw the development of simple utility articles.
3. Draw Orthographic views of given machine component.
4. Develop the ability to draw the isometric view from the orthographic views of a given machine component.

Mapping Course Outcomes with Program Outcomes

Course Outcomes	Program Outcomes (PO's)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S		M							S		
2	S		M							S		
3	S		M							S		
4	S		M							S		

S:StrongRelationship M:Moderate Relationship

Course Assessment and Evaluation Scheme:

Method	What		To whom	When/Where (Frequency in the course)	Max Marks	Evidence collected	Course outcomes
Direct Assessment	CIE – Continuous Internal Evaluation	IA	Students	Graded Exercises (Average of marks allotted to each graded exercise)	25	Drawing Sheets	1,2,3,4
	SEE – Semester End Exam	End Exam		End of the course	100	Answer scripts at BTE	1,2,3,4
Indirect Assessment	Student Feedback on course		Students	Middle of the course		Feedback forms	1, 2,3 ,4 Delivery of course
	End of Course Survey			End of the course		Questionnaires	1,2,3,4Effectiveness of Delivery of instructions & Assessment Methods

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's Taxonomy) such as:

1. Remembering and Understanding :   - 30% weightage
2. Applying the knowledge acquired from the course :   - 65 % weightage
3. Analysis :   - 1% weightage
4. Evaluation :   - 1% weightage
5. Creating new knowledge :   - 3% weightage

Weightage of Marks

Unit No	Unit Name	Hour	Questions to be set for (10marks) PART - A	Questions to be set for(15marks) PART - B
I	Projection of solids	21	01	02
II	Section of solids	18	-----	02
III	Development of Surfaces	15	-----	02
IV	Conversion of pictorial views into Orthographic views	12	-----	01
V	Isometric projection	12	-----	02
	Total	**78**	**01(10)**	**09(135)**

Code: **15ME21D**

Second Semester Diploma Examination

ENGINEERING GRAPHICS - II
(Conventional)
(Common to all Mechanical /AE/MTT/CH Programme)

Time: 4 Hours]   **[Max. Marks: 100**

*Note:*Part –A is compulsory. Answer ANY TWO full questions from Part-B,C & D

Part –A   1x10 = 10

1. A hexagonal pyramid of 25 mm side of base and height 55 mm rests with one of its triangular faces on HP and the axis parallel toVP. Draw its top and front views.

Part –B   2x15 = 30

2. Draw the projection of a pentagonal prism of base side 25mm and axis length 45mm resting on a corner such that the two base edges passing through it make equal inclination with HP and its base inclined at 60° to HP and the axis appears to be inclined at 30° to VP in the top view.

3. A cone of base diameter 50mm and altitude 70mm is lying with one of its generators on HP and the axis appears to be inclined to VP at an angle of 40 degree in the top view.Draw its top and front views.

4. A cylinder 60 mm diameter and 80 mm long stands with its base on HP. A section plane Perpendicular to VP and inclined at 60° to HP cuts the axis at a point 28 mm from its top end.Draw the sectional top view and true shape of the section.

Part –C   2x15 = 30

5. A hexagonal pyramid of base side 30 mm and axis 65 mm rests on its base on the HP withone of its base edges perpendicular to VP. A cutting plane perpendicular to VP and inclined at 45° to HP meeting the axis 25 mm from the vertex. Draw the sectional top view and true shape of the section.

6. A vertical cone 40 mm diameter of base and height 50 mm is cut by a section plane perpendicular to VP and inclined at 30° to HP so as to bisect the axis of the cone. Draw the development of the lateral surface of the truncated cone.

7. A square pyramid of 30mm edges of base and height 50mm rests on its base on HP with one of its base edges parallel to VP.Itis cut by a sectional planeperpendicular to VP and inclined at45° to HP bisecting the axis.Draw the development of the truncated pyramid.
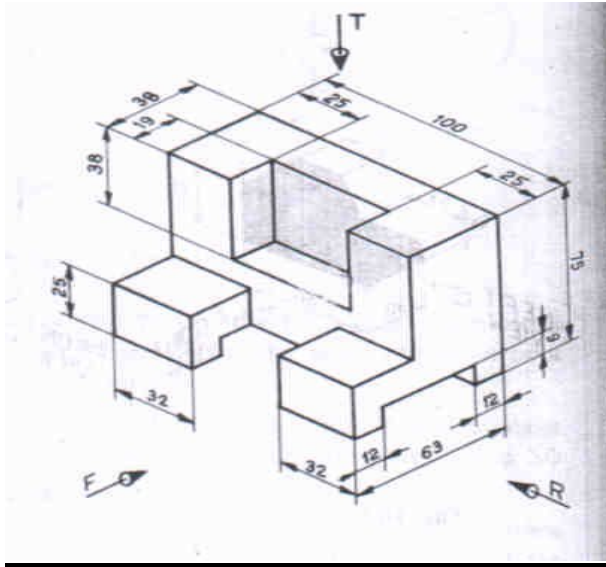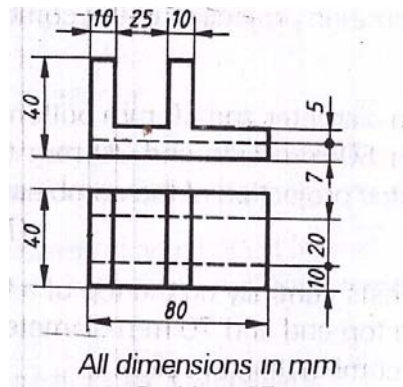
8. Draw the three principal views of the component as shown in the figure.

9. Draw the isometric view of the machine component whose orthographic views are given below:

All dimensions in mm

10. Draw the isometric projection of a frustum of a cone of 40 mm top diameter, 80 mm bottom diameter and 60 mm height.

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Second SemesterDiploma Examination

Course title:**ENGINEERING GRAPHICS-II**(Conventional)Code: **15ME21D**

UNIT-I(10Marks Questions)

1. A triangular prism of base edge 40mm and height 65mm rests with one of its base edges on HP so that the axis of the prim is inclined at 30° with HP. Draw the projections when the axis of the prism is parallel to VP.
2. A square prism of base edge 40mm and height 65mm rests with one of its base edges on HP. The axis of the prism is inclined at 45° to HP and parallel to VP. Draw the top and the front views of the prism.
3. A pentagonal prism of base 35mm and height 60mm has its base edge on HP. Draw the projections if the base of the prism is inclined at 30° to the HP. The axis of the prism is parallel to the VP.
4. A Hexagonal prism of base 35mm and height 60mm is resting with its base edge on HP so that the axis is inclined at 45° and parallel to VP. Draw its projections.
5. The axis of the square prism of base edge 40mm and height 60mm is inclined at 30° to HP and parallel to the VP. Draw the projections when the prism is placed with one of its corners on HP. The two adjacent base edges containing this corner are equally inclined to HP.
6. A pentagonal prism of base 35mm and axis height 60mm is resting with one of its base corners on HP such that the axis is inclined at 30° to the HP. Draw the projections when the axis of the prism is parallel to VP.
7. A triangular pyramid of base edge 40mm and height 65mm is resting with one of its base edges on HP so that the axis of the pyramid is parallel to VP and inclined at 45° to HP. Draw the projections.
8. Draw the projections of a hexagonal pyramid resting with one of its base edges on HP such that the axis of the pyramid is inclined at 30° to HP. The hexagonal pyramid has its base edges as 35mm and axis height as 60mm.
9. A pentagonal pyramid of base edge 35mm and axis height 65mm rests with one of its base corners on HP so that the axis of the pyramid is inclined at 45° to the HP. Draw the projections if the axis of the pyramid is parallel to the VP.
10. A square pyramid of base 40mm and axis height 65mm rests with its triangular lateral surfaces on HP so that the axis of the pyramid is parallel to the VP. Draw the projections.
11. A hexagonal pyramid is resting with one of its triangular lateral surfaces on HP. Draw the projections if its base edges are 40mm and the axis height is 65mm.
12. A pentagonal pyramid of base edge 40mm and axis 65mm rests with its slant edge on HP so that its axis is parallel to the VP. Draw the projections.

13. A cylinder of 40mm diameter and axis height 65mm rests with its points of the circumference on HP so that the axis is inclined at 45° to the HP and parallel to the VP. Draw the projections.

14. A cone of 40mm diameter and axis height 65mm is resting with points of the circumference on HP. Draw the projections if the axis of the cone is inclined at 30° with HP and parallel to VP.

15. A cone of 45mm diameter and axis height 60mm is resting with its end slant generator on HP so that the axis of the cone is parallel to VP. Draw the projections of the cone.

16. A pentagonal prism of 30mm side of base and height 60mm rests with one of its edges of the base on HP such that the axis is inclined at 30° to HP and parallel to VP. Draw the top and front views.

17. A hexagonal pyramid of 25mm side of base and height 60mm rests with one of its base edges on HP such that the base is inclined at 45° to HP, and the axis parallel to VP. Draw the top and front views.

18. A hexagonal pyramid of 25mm edge of base and height 60mm rests with one of its corners of the base on HP such that the base is inclined at 30° to it and the axis parallel to VP. The two of the base edges containing the corner on which the pyramid rests make equal inclinations with HP. Draw the projections.

19. A pentagonal prim of 30mm side of base and height 55mm rests with one of its rectangular faces on HP and the axis parallel to VP. Draw its projections.

20. Draw the top and front views of a triangular prism of 35mm side of triangular faces and height 60mm rest with one of its longer edges on HP such that the axis is parallel to VP and the rectangular face opposite to the slant edge on which the prism rests in perpendicular to VP.

21. Draw the top and front views of a pentagonal pyramid of side of base 30mm and height 60mm rests with one of its slant edges on HP and the axis parallel to VP.

22. A cube of 40mm edge rests on HP so that this edge is inclined at 45° to VP. One of the lateral surfaces is inclined at 45° to HP. Draw the top and front views of the cube.

23. An equilateral triangular prism of base side 25mm and 50mm long rests with one of the its shorter edges on HP so that the rectangular face containing the edge on which the prism rests inclined at 30° to the HP. The edge on which the prism rests is inclined at 60° to the VP. Draw its projections.

24. A pentagonal prism of base edge 30mm and 60mm long has its base edge on HP. The axis of the prism is inclined at 30° to the HP and appears to be inclined at 45° to the VP. Draw the top view and the front views of the prism.

25. A hexagonal prism of 30mm base edge and axis 60mm long is placed with one of its base edges on HP so that the axis is inclined at 30° to HP and the axis appears to be inclined at 45° to VP. Draw the projections when the base of the prism is nearer to the observer.

26. A square prism of base edge 40mm and 60mm long rests with one of its corners of the base so that the longer edge passing through this corner is inclined at 40° to

the HP. Draw the projections if the axis appears to be inclined at 45° to the VP in the top view.

27. A square pyramid of base edge 40mm and 60mm long has one of its shorter edges on HP. The axis of the pyramid is inclined at 30° to the HP and appears to be inclined at 45° to the VP. Draw the projections if the apex is near to the observer.

28. A cylinder of 40mm diameter and axis height 60mm is resting with its ends of the base diameter on HP. The axis of the cylinder is inclined at 30° to the HP and appears to be inclined at 45° to VP. Draw the projections.

29. A cone of base diameter 50mm and axis 80mm lies on HP with its axis inclined at 45° to HP and appears to be inclined at 30° to the VP in the top view. Draw the top and front views of the cone.

30. A right cylinder is 50mm diameter of base and height 70mm. It rests such that the axis is inclined at 30° and 45° to HP and VP respectively. Draw the top and front views.

31. A cone of base 80mm diameter and height 100mm is lying with one of its generators on HP and its axis appears to be inclined at 40° to VP in the top view. Draw its front and top views.

32. Draw the projections of a pentagonal prism 20mm side of base and axis 40mm long resting on a corner such that two base edges passing through it make equal inclinations with HP and its base is inclined at 60° to HP, and the axis appears to be inclined at 30° to VP in the top view.

33. Draw the top and front views of a rectangular pyramid of sides of base 20x25mm and height 35mm when it lies with one of its triangular faces containing the longer edge of the base on HP. This longer edge of the base containing the triangular face lying on HP is inclined at 60° to VP in the top view with the apex of the pyramid nearer to VP.

34. A pentagonal pyramid 20mm side of base of 35mm altitude rests with one of its corners on HP such that the two base edges passing through the corner on which it rests make equal inclinations with HP. The axis is inclined at 45° to VP and 30° to HP. Draw the top and front views of the pyramid.

35. A hexagonal pyramid, base 30mm side and axis 60mm long has one of its slant edges on HP such that two of its triangular faces containing the slant edge on which it rests are equally inclined to HP. The top view of the axis appears to be inclined at 45° to VP. Draw its projections when its base is nearer to the observer than its apex.

36. A cone of base 60mm diameter and axis 80mm long rests on HP with its axis inclined 45° and 30° with HP and VP respectively. Draw the top and front views of the cone.

37. Draw the top and front views of a right cylinder of base 45mm diameter and 60mm long when it lies on HP, such that its axis is inclined at 30° to HP and the axis appears to be perpendicular to the VP in the top view.

UNIT-II (15 Marks Questions)

1. A cube of 30 mm edges rests with a square face of HP such that one of its vertical square faces is inclined at 30° to VP. A section plane perpendicular to VP and inclined at 60° to HP passes through a point on the axis 5 mm below its top end. Draw its sectional top view, front view and true shape of the section.

2. A square prism of 45 mm side ofbase, height 90 mm rests with its base on HP such that one of the rectangular faces is inclined at 30° to VP. A section plane perpendicular to VP and inclined at 60° to HP passes through a point on the axis at a height of 70 mm. Draw the front view, sectional top view and true shape of the section.

3. A square prism side of base 40 mm and axis 60 mm long rests with its base on HP such that one of its rectangular faces is inclined at 30° to VP. A section plane perpendicular to HP and inclined at 60° to VP passes through the prism at a distance of 10 mm from the axis. Draw the top view, sectional front view and true shape of the section.

4. A pentagonal pyramid of 20 mm edge of base and 40 mm high stands vertically with its base on HP and an edge of the base perpendicular to VP. A section plane perpendicular to HP and inclined at 30° to VP cuts the pyramid such that it passes through the pyramid at a shortest distance of 5 mm from its axis and in front of it. Draw the top view, sectional front view and true shape of the section.

5. A triangular pyramid of 30 mm side of base and axis 45 mm long is placed with its base on HP such that an edge of the base is parallel to VP and nearer to it. A cutting plane inclined at 60° to HP and perpendicular to VP bisects the axis of the pyramid. Draw the front view, sectional top view and true shape of the section.

6. Draw the front view,sectional top view and true shape of the section of a hexagonal pyramid, 20 mm side of the base and 50 mm high resting with its base HP such that an edge of the base is parallel to VP. The pyramid is cut by a section plane perpendicular to VP and inclined at 30° to HP. Section plane bisects the axis of the pyramid.

7. A cylinder 60 mm diameter and 80 mm long stands with its circular base on HP. A section plane perpendicular to VP and inclined at 60° to HP cuts the axis at a point 28 mm from its top end. Draw front view, sectional top view and true shape of the section.

8. A cylinder of base diameter 45 mm and height rests on its base onHP. It is cut by a section plane perpendicular to VP and inclined at 30° to HP and meets the axis at a distance of 30 mm from the base.Draw the front view, sectional top view and true shape of the section.

9. A cone, diameter of base 60 mm and axis 70 mm long, is resting on its base on HP. It is cut by a section plane perpendicular to VP, inclined at 45° to HP and passing through a point on the axis 40 mm above the base. Draw the front view, sectional top view and true shape of the section.

10. A cone, base 60 mm diameter and axis 70 mm long, stands vertically with its base on HP. It is cut by a section plane perpendicular to VP, inclined at 45° to HP and is bisecting the axis. Draw the front view, sectional top view and true shape of the section.Name the true shape of the section.

11. A cone, base 60 mm diameter and axis 70 mm long, stands vertically with its base on HP. It is cut by a section plane whose vertical trace is perpendicular to VP and parallel to one of the end generators of the cone and passes at a distance of 15 mm

from it. Draw the front view, sectional top view and true shape of the section. Name the true shape of the section.

12. A cone, base 60 mm diameter and axis 70 mm, stands vertically with its base on HP. It is cut by a section plane perpendicular to VP and inclined at 75° to HP, so as to cut the axis of the cone at a point 20 mm above the base. Draw the front view, sectional top view and true shape of the section. Name the true shape of the section.

13. A cone, base 60 mm diameter and axis 70 mm, stands vertically with its base on HP. The section plane perpendicular to HP and parallel to VP cuts the cone at a distance of 10 mm from the axis. The section plane is in front of the axis of the cone. Draw top view, sectional front view and true shape of the section. Name the true shape of the section.

14. A square pyramid of base side 30 mm and axis length 60 mm is resting on HP on its basewith one side of base inclined at 30° to VP. It is cut by a section plane inclined at 45° to HP and perpendicular to VP and passes through the axis at a distance 52 mm from the apex. Draw its front view, sectional top view and true shape of the section.

15. A pentagonal pyramid of base side 40 mm and axis length 75 mm is resting on HP on its base with one of its base side parallel to VP. It is cut by a section plane inclined at 35° to HP and perpendicular to VP and is bisecting the axis. Draw its front view, sectional top view and true shape of the section.

16. A pentagonal pyramid of base side 20 mm and altitude55 mm rests on its base on HP with one of the base edgesbeing perpendicular to VP. It is cut by a section plane perpendicular to VPandinclined at 50° to the HP. The section plane meets the axis at 15 mm above the base. Draw its front view, sectional top view and true shape of the section.

17. A hexagonal pyramid of base side 25 mm and axis 50 mm long rests with its base on HP and an edge of its base is perpendicular to VP. It is cut by a section plane perpendicular to VP, inclined at 30° to HP and passing through a point on the axis 20 mm below the apex. Draw its front view, sectional top view and true shape of the section.

18. A hexagonal pyramid of base side 30 mm and altitude 70 mm rests with its base on HP and with a side of base is parallel to VP. It is cut by a section plane perpendicular to VP, inclined at 35° to HP and is bisecting the axis. Draw its front view, sectional top view and true shape of the section.

19. A hexagonal pyramid of base side 25 mm and axis 50 mm long rests with its base on HP such that one of the edges of its base is perpendicular to VP. It is cut by a section plane perpendicular to HP and inclined at45° to VP and passing through the pyramid at a distance of 10 mm from the axis. Draw its top view, sectional front view and true shape of the section.

20. A square prism side of base 40 mm and axis 60 mm long rests with its base on HP such that one of its rectangular faces is incline at 30° to VP. A section plane perpendicular to HP and inclined at 60° to VP passes through the prism at a distance of 10 mm from the axis. Draw its top view, sectional front view and true shape of the section.

21. A cube of 40mm edge rests on HP so that this edge is inclined at 45° to VP. One of the lateral surfaces is inclined at 45° to HP. Draw the top and front views of the cube.

22. An equilateral triangular prism of base side 25mm and 50mm long rests with one of the its shorter edges on HP so that the rectangular face containing the edge on which the prism rests inclined at 30° to the HP. The edge on which the prism rests is inclined at 60° to the VP. Draw its projections.

23. A pentagonal prism of base edge 30mm and 60mm long has its base edge on HP. The axis of the prism is inclined at 30° to the HP and appears to be inclined at 45° to the VP. Draw the top view and the front views of the prism.

24. A hexagonal prism of 30mm base edge and axis 60mm long is placed with one of its base edges on HP so that the axis is inclined at 30° to HP and the axis appears to be inclined at 45° to VP. Draw the projections when the base of the prism is nearer to the observer.

25. A square prism of base edge 40mm and 60mm long rests with one of its corners of the base so that the longer edge passing through this corner is inclined at 40° to the HP. Draw the projections if the axis appears to be inclined at 45° to the VP in the top view.

26. A square pyramid of base edge 40mm and 60mm long has one of its shorter edges on HP. The axis of the pyramid is inclined at 30° to the HP and appears to be inclined at 45° to the VP. Draw the projections if the apex is near to the observer.

27. A cylinder of 40mm diameter and axis height 60mm is resting with its ends of the base diameter on HP. The axis of the cylinder is inclined at 30° to the HP and appears to be inclined at 45° to VP. Draw the projections.

28. A cone of base diameter 50mm and axis 80mm lies on HP with its axis inclined at 45° to HP and appears to be inclined at 30° to the VP in the top view. Draw the top and front views of the cone.

29. A right cylinder is 50mm diameter of base and height 70mm. It rests such that the axis is inclined at 30° and 45° to HP and VP respectively. Draw the top and front views.

30. A cone of base 80mm diameter and height 100mm is lying with one of its generators on HP and its axis appears to be inclined at 40° to VP in the top view. Draw its front and top views.

31. Draw the projections of a pentagonal prism 20mm side of base and axis 40mm long resting on a corner such that two base edges passing through it make equal inclinations with HP and its base is inclined at 60° to HP, and the axis appears to be inclined at 30° to VP in the top view.

32. Draw the top and front views of a rectangular pyramid of sides of base 20x25mm and height 35mm when it lies with one of its triangular faces containing the longer edge of the base on HP. This longer edge of the base containing the triangular face lying on HP is inclined at 60° to VP in the top view with the apex of the pyramid nearer to VP.

33. A pentagonal pyramid 20mm side of base of 35mm altitude rests with one of its corners on HP such that the two base edges passing through the corner on which it rests make equal inclinations with HP. The axis is inclined at 45° to VP and 30° to HP. Draw the top and front views of the pyramid.

34. A hexagonal pyramid, base 30mm side and axis 60mm long has one of its slant edges on HP such that two of its triangular faces containing the slant edge on which it rests are equally inclined to HP. The top view of the axis appears to be inclined at 45° to VP. Draw its projections when its base is nearer to the observer than its apex.

35. A cone of base 60mm diameter and axis 80mm long rests on HP with its axis inclined 45° and 30° with HP and VP respectively. Draw the top and front views of the cone.

36. Draw the top and front views of a right cylinder of base 45mm diameter and 60mm long when it lies on HP, such that its axis is inclined at 30° to HP and the axis appears to be perpendicular to the VP in the top view.

UNIT-III (15 Marks Questions)

1. A vertical square prism, side of the base 30mm and altitude 60 mm rests with its base on HP such that one of its rectangular faces makes an angle of 30° to VP. The prism is cut by a section plane perpendicular to VP and inclined at 60° to HP. The cutting plane bisects the axis of the prism. Develop the lower portion of the lateral surfaces of the prism.

2. A pentagonal prism 20 mm side of the base and height 55 mm stands vertically such that one of its rectangular faces is parallel to VP and nearer to it. Prism is cut by a cutting plane which is perpendicular to VP, inclined at 60° to HP and passes through one of the extreme corners of the top face of the prism. Develop the lower portion of the lateral faces of the prism so as to produce a one-piece development.

3. A vertical cylinder of base diameter 80 mm and axis length 100 mm is cut by a section plane perpendicular to VP and inclined at 45° to HP. Vertical trace of the section plane passes through the top end of one of the extreme generators. Develop the lower portion of the lateral surface of the cylinder.

4. A square pyramid of 30 mm side of the base and height 50 mm rests with its base on HP with one of the edges of the base parallel to VP. It is cut by a section plane perpendicular to VP and inclined at 45° to HP and bisecting the axis. Draw the development of the truncated pyramid.

5. A vertical cone 40 mm diameter of base and height 50 mm is cut by a section plane perpendicular to VP and inclined at 30° to HP so as to bisect the axis of the cone. Draw the development of the lateral surface of the truncated cone.

6. A pentagonal pyramid of side of base 30 mm and axis length 60 mm is resting on its base on HP with an edge of the base perpendicular to VP. It is cut by a section plane perpendicular to VP and parallel to HP and meets the axis at a distance of 30 mm from the vertex. Draw the development of remaining portion of the pyramid.

7. Draw the development of lower portion of a hexagonal pyramid of side 30 mm and height 60 mm resting on HP such that two of its base edges are perpendicular to VP. It is cut by a section plane perpendicular to VP and inclined at 40° to HP.

8. The frustum of a square pyramid has the following dimensions:
   i)   Side of the bottom square = 50 mm
   ii)   Side of the top square = 25 mm
   iii)   Height of the frustum = 70 mm.
   Draw the development of lateral surface of the pyramid.

9. Develop the lateral surface of the funnel shown in the figure:
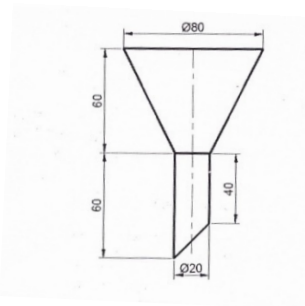
10. Draw the development of the tray shown in figure:
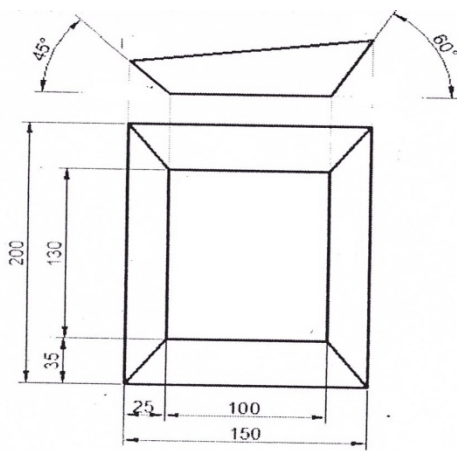
UNIT-IV(15 Marks Question)

1. Draw the three principal views of the component as shown in the figure.
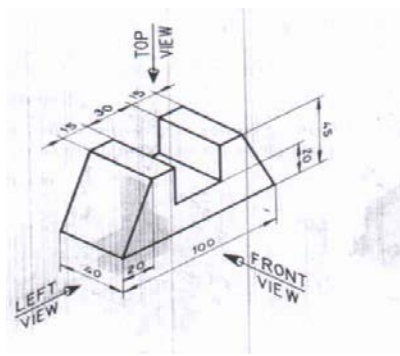
FIG-1   **FIG-2**
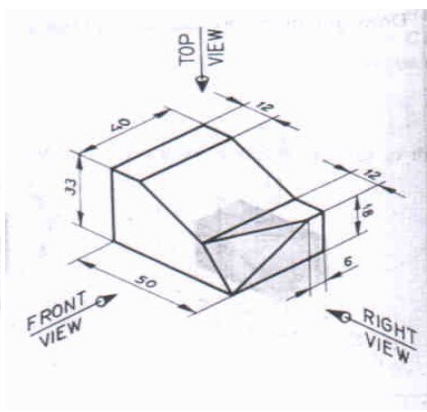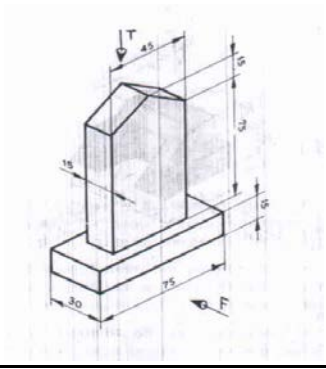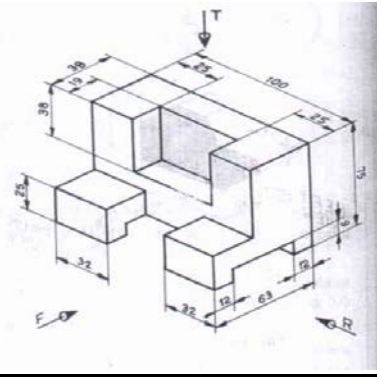
FIG-3   **FIG-4**
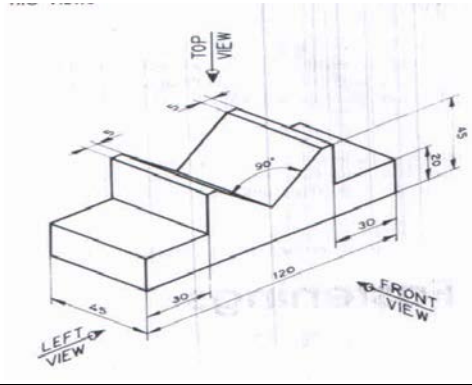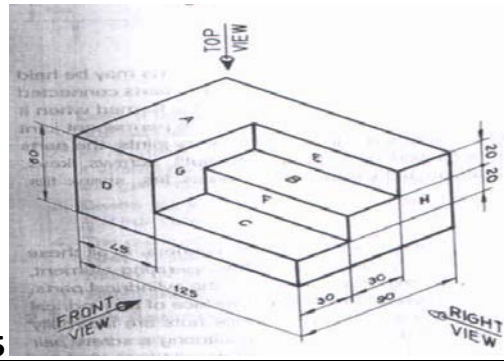
FIG-5   **FIG-6**
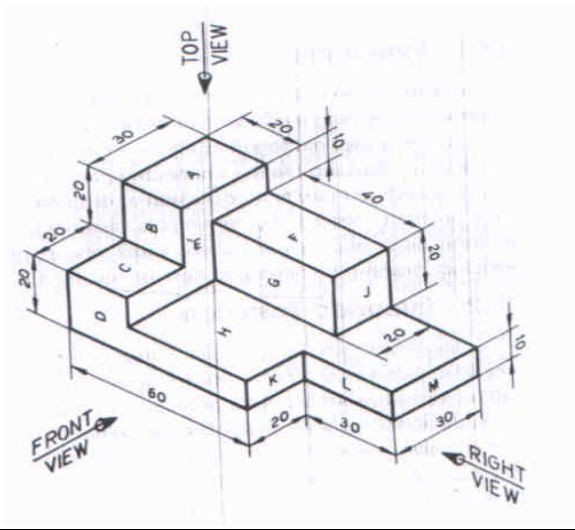
FIG-7
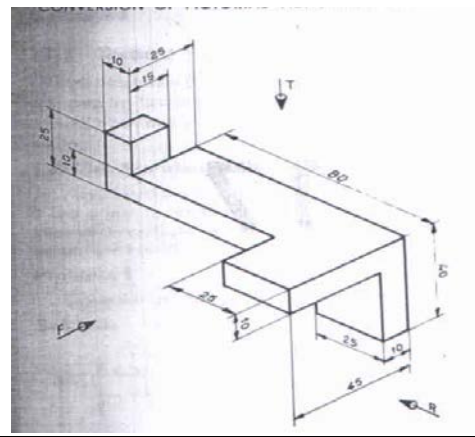
FIG-8
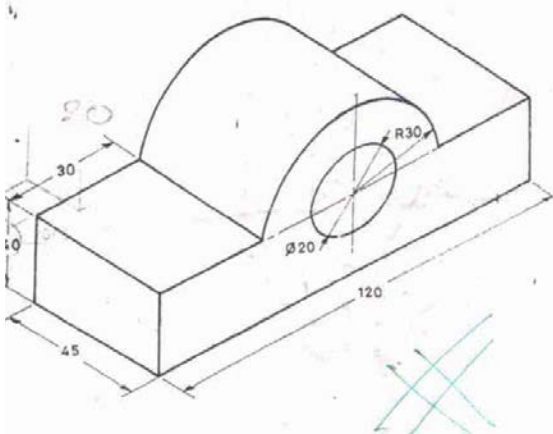
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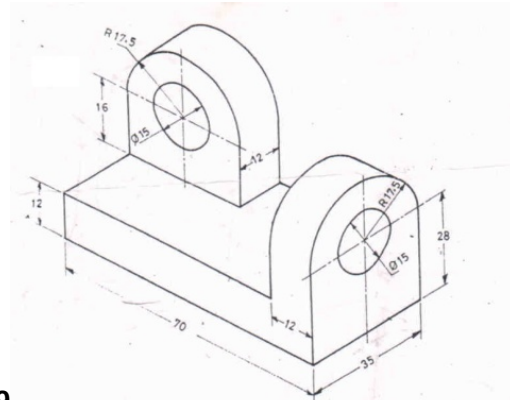
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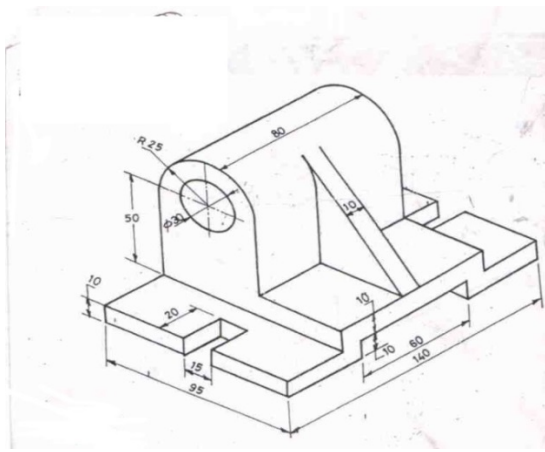
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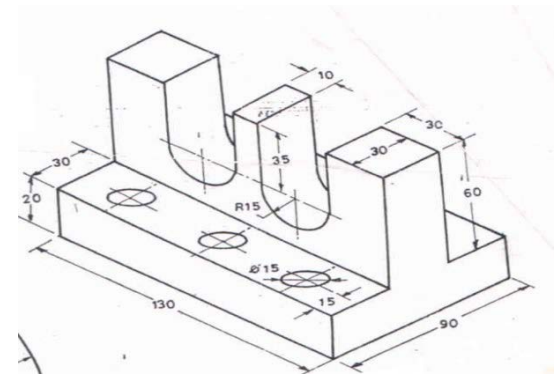
FIG-12
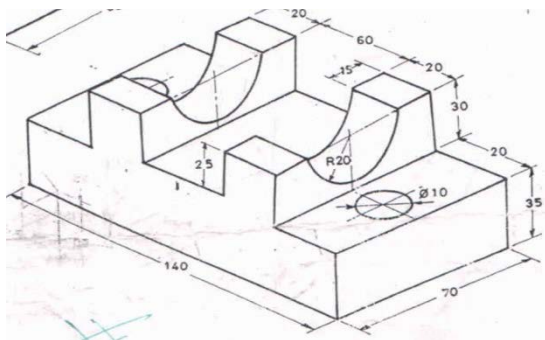
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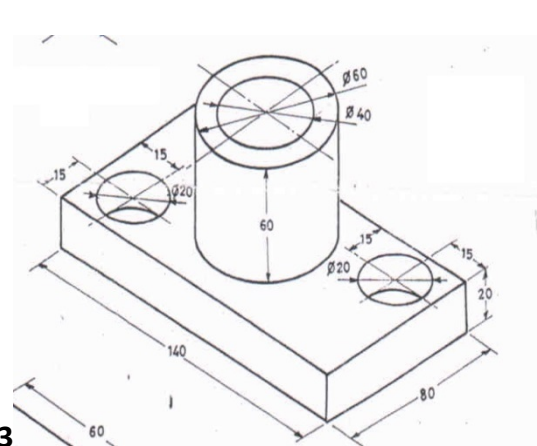
FIG-14
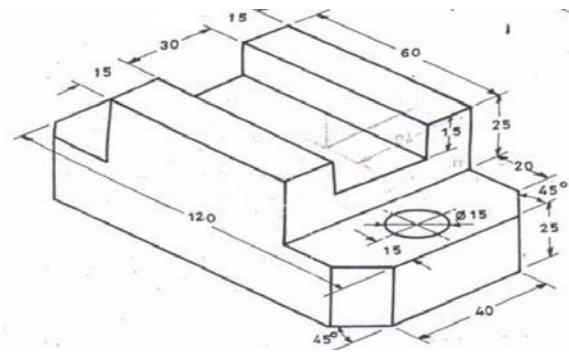
FIG-15
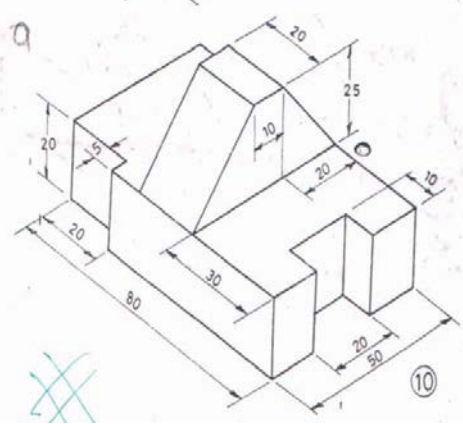
FIG-16

ALL DIMENSIONS ARE IN MM

UNIT-V(**15Marks Question**)

Draw the isometric view of the machine component whose orthographic views are given below:
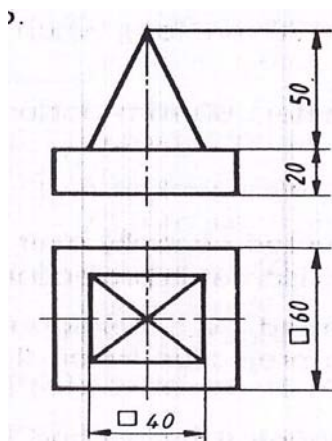
FIG-1
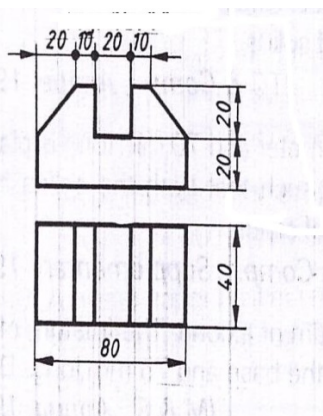
FIG-2
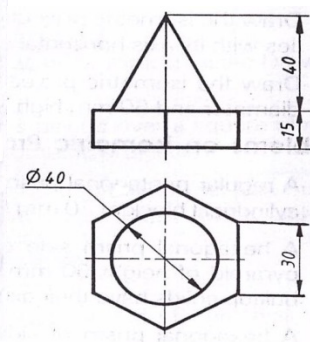
FIG-3
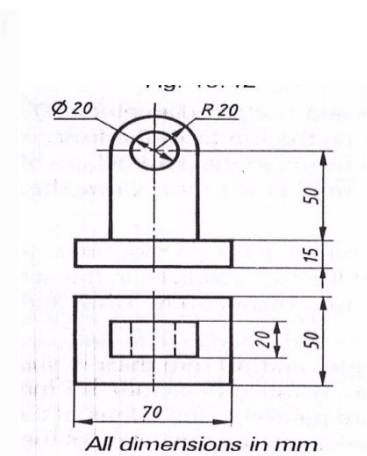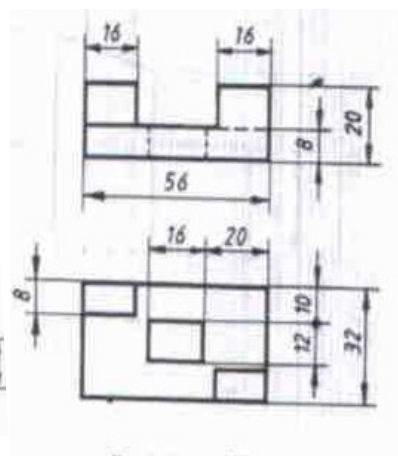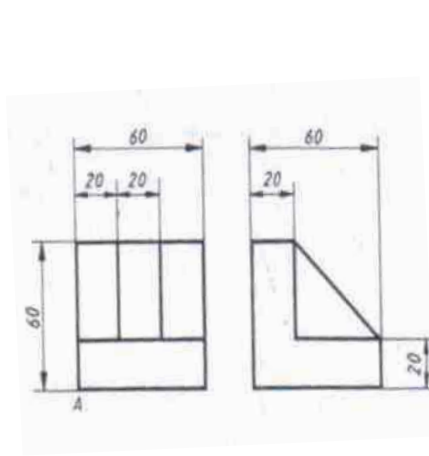
FIG-4   **FIG-5**   **FIG-6**

All dimensions in mm

FIG-7
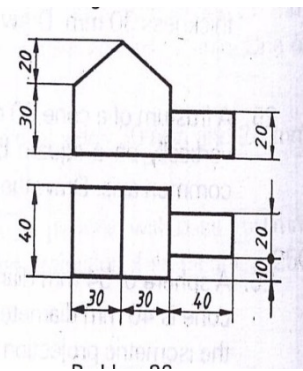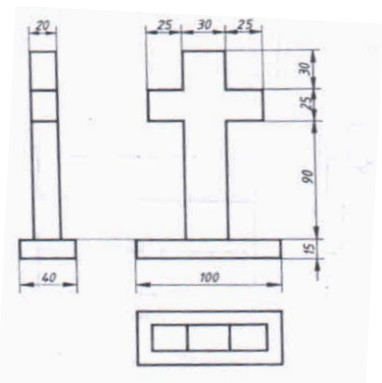
FIG-8   **FIG-9**
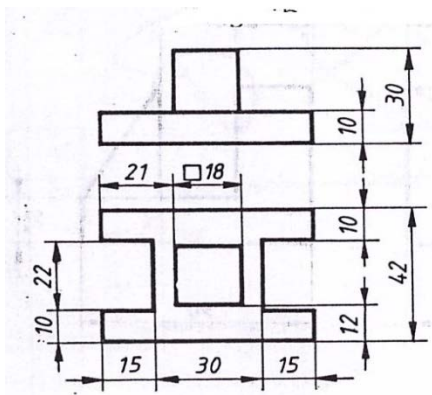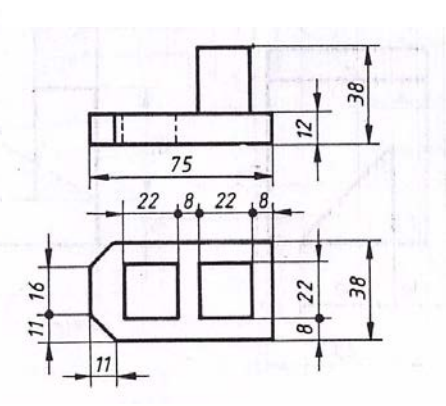
FIG-10FIG-11   **FIG-12**
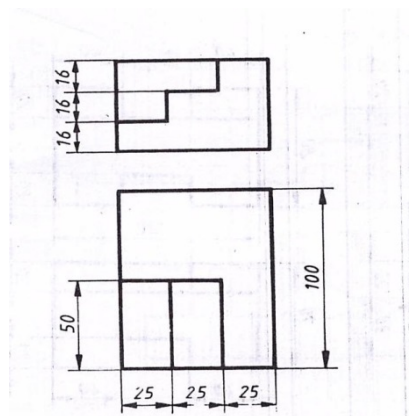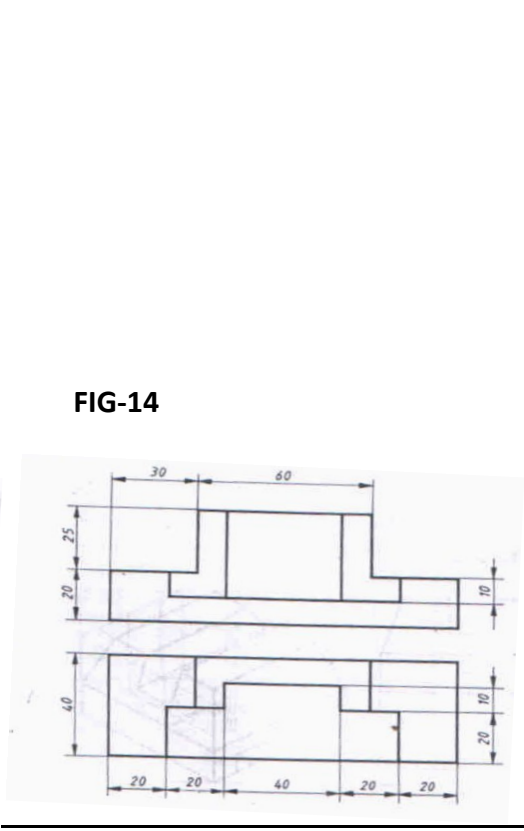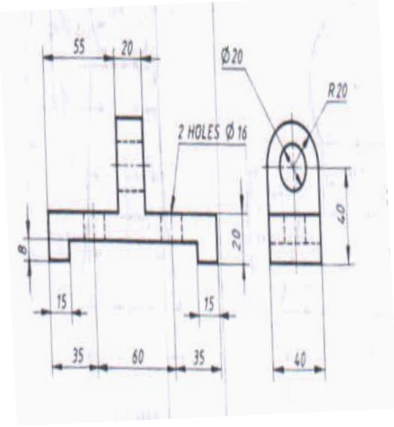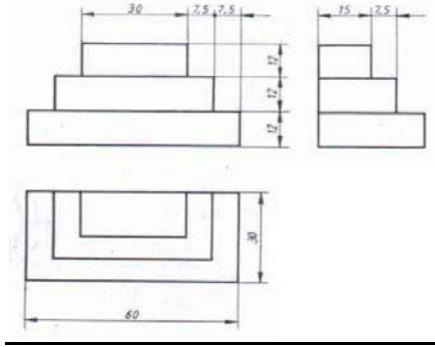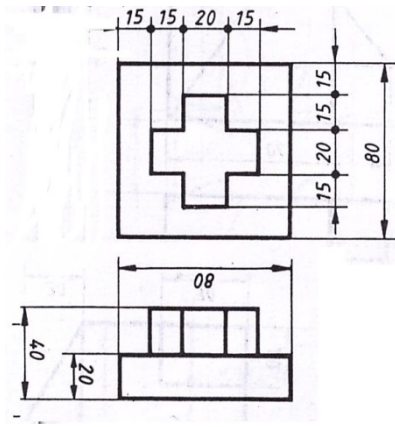
FIG-13   **FIG-14**   **FIG-15**
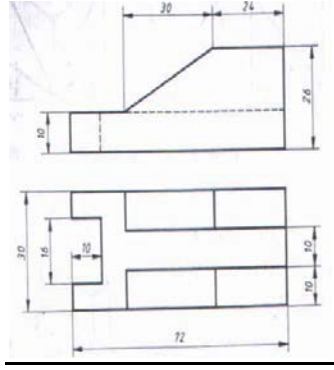
FIG-16FIG-17   **FIG-18**
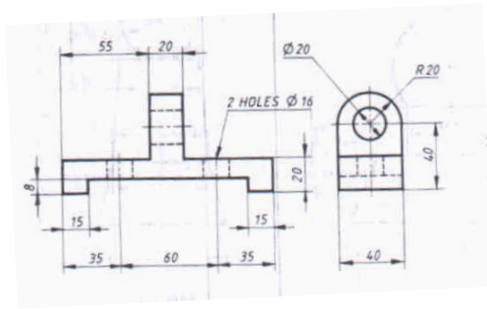
FIG-19
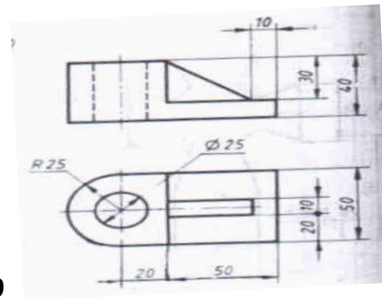
FIG-20

2. Draw the isometric view of a frustum of a cone of 40 mm top diameter, 80 mm bottom diameter and 60 mm height.
3. A cube of side 30 mm rests centrally on the top of another cube of side 60 mm. Draw the isometric view of the solid.
4. A square pyramid of base edge 50 mm and height 80 mm rests on the top of the cube of side 100 mm. Two sides of the base of the pyramid are parallel to the top edges of the cube. Draw the isometric view of the solid.
5. A cylindrical block of 40 mm diameter and length 50 mm is resting vertically on the center of the cube of 70 mm side. Draw the isometric view of the combination of solids.
6. A square pyramid of base side 22 mm and height 20 mm rests centrally on the top of a cylinder of base diameter 40 mm and height 30 mm.

Course Title	: **APPLIED SCIENCE LAB**	Course Code	: **15SC04P**
Semester	: **I / II**	Course Group	: **Core**
Teaching Scheme in Hrs (L:T:P) : **0:2:4**		Credits	: **3** Credits
Type of course	: **Tutorial & Practical**	Total Contact Hours : **78**	
CIE	: **25 Marks**	SEE	: **100 Marks**
Programme	: **Common to all Engineering Diploma Programmes**		

Prerequisite:

Applied Science theory in the current semester.

Course objective:

1. Learn to measure different dimensions of objects accurately using measuring instruments.
2. Enhance the vectorial concepts of concurrent forces.
3. Learn the concepts of properties of fluids.
4. Enhance the practical concept of resonance.

Experiments:

PART- A

1. **Vernier Calipers**:

   a) To determine the dimensions of given solid cylinder and hence calculate its volume.
   b) To determine the dimensions of given hollow cylinder and hence calculate its volume

   Activity: To calculate the density of material of given solid/hollow cylinder knowing its volume and mass.

2. **Screw Gauge**:

   a) To determine the thickness of given metal and glass plate.
   b) To determine the diameter of given thin wire and hence to calculate its volume.
   c) To determine the diameter of given metallic sphere and hence to calculate its volume.

Activity: 1. To calculate volume of such half meter length wire.
               2. To calculate volume of such number (50 or 75etc) of spheres.

3. Laws of concurrent forces:

a) Verify the law of parallelogram of forces.
b) Verify the converse law of triangle of forces.
c) Verify Lami's theorem.

Activity: To determine the weight of given body using law of parallelogram of forces.

4. Moment bar:

     To verify the conditions of equilibrium of coplanar parallel forces acting on a body.

Activity: To determine the weight of given body using moment bar.

PART-B

5. Viscosity:

a) To determine the co-efficient of viscosity of water by poiseuille's method (for a given radius of capillary tube)

Activity: To plot a graph of **ht** versus **V** and to find ht**/V** from slope.

6. Sonometer:

a) To determine the frequency of given tuning fork by comparison method.
b) To determine the frequency of given tuning fork by absolute method.

Activity: 1. Plot a graph of 'n' versus 'l' from the graph, find the frequency unknown
           Tuning fork
          2. Plot a graph of $\sqrt{T}$ versus 'l' from the slope of graph   find $\sqrt{T}$/l
          3. To calculate linear density 'm' by knowing $\sqrt{T}$/l   and 'n'

7. Resonance:

a). To determine the velocity of sound in air at room temperature by using resonance air column apparatus. (for single resonating length)

Activity: 1. To calculate velocity of sound in air at 0^0 C.

2. To determine the unknown frequency of tuning fork.

8. **Surface Tension**:

   a) To determine the Surface Tension of water by capillary rise method using
      Travelling Microscope. (radius of capillary tube is given)

Activity: Calculate radius of the capillary tube by knowing the surface tension of the
liquid and height of liquid column in capillary tube.

9. **Boyle's law**:

   a) To verify Boyle's law using Boyle's law apparatus.

Activity: 1.To plot a graph of pressure versus volume

2. To plot a graph of 1/pressure versus volume.

Course outcome:

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

1. Measure the various dimensions of given objects using instruments.
2. Apply the vector concepts in engineering.
3. Apply the acquired knowledge of fluid dynamics in the field of engineering.
4. Apply the concepts of wave motion in engineering.

Mapping Course Outcomes with Program Outcomes:

Course outcomes	Programme Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
1	S	M							M			
2	S	S							M			
3	S	M							M			
4	S	S							M			

S: Strong relationship   **M: Moderate relationship**

Course Assessment and Evaluation:

		What	To Whom	Frequency	Max Marks	Evidence Collected	Course Outcomes
Direct Assessment	CIE (Continuous Internal Evaluation)	I A Tests	Students	Two IA tests for Practical (Average of Two Test marks will be computed)	10	Blue Books	1 to 4
		Record Writing		Record Writing (Average of Marks allotted for each expt.)	10	Record Book	1 to 4
		Class room Assignments		Two Assignments (Average of Two Assignments to be computed)	05	Log of Activity	1 to 3
				TOTAL	25		
	SEE (Semester End Examination)	End Exam	Students	End of the Course	50	Answer Scripts at BTE	All the CO's
Indirect Assessment		Student Feedback on course	Students	Middle Of The Course	Feedback forms		1 to 2 delivery of the course
		End Of Course Survey		End Of The Course	Questionnaire		1 to 4 Effectiveness of delivery of instructions and assessment

Note: I.A. test shall be conducted as per SEE scheme of valuation. However the obtained marks shall be reduced to 10 marks. (Any decimals shall be rounded off to next higher digit).

Composition of Educational Components:

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's Taxonomy) such as:

Sl. No.	Educational Component	Weightage (%)
1	Remembering and Understanding	15
2	Applying the knowledge acquired from the course	20
3	Analysis	25
4	Evaluation	30
5	Creating new knowledge	10

Reference Books:

1. Practical physics by pro. J.D. Belani and N.J. Belani. Published by Nebhandas Hiranand.
2. Practical physics by C.L. Arora. Published by S. Chand and company.
3. www.jac production.co.za

Model Question Bank:

Course: APPLIED SCIENCE LAB   Course Code: **15SC04P**

PART- A

1. Determine the dimensions of given Solid Cylinder using Vernier Caliper and hence calculate its volume.
2. Determine the dimensions of given Hollow Cylinder using Vernier Caliper and hence calculate its volume.
3. Determine the thickness of given metal and glass plate using screw gauge.
4. Determine the diameter of given thin wire using screw gauge and hence, to calculate its volume.
5. Determine the diameter of given metallic sphere using screw gauge and hence, calculate its volume.
6. Verify the law of parallelogram of forces.
7. Verify the converse of triangle law of forces.
8. Verify lami's theorem.
9. Verify the conditions of equilibrium of coplanar parallel forces using Moment bar.

PART- B

10. Determine the coefficient of viscosity of water by Poiseuille's method
    (For a given radius of capillary tube)
11. Determine the frequency of given tuning fork by comparison method using sonometer.
12. Determine the frequency of given tuning fork by absolute method using sonometer.
13. Determine the velocity of sound in air at room temperature by using resonance Air column Apparatus.
14. Determine the Surface Tension of water by capillary rise method.
    (For a given radius of capillary tube)
15. Verify Boyle's law using Boyle's law apparatus.

Scheme of Valuation for SEE (Semester End Examination)

Sl. no.	Performance	Max. Marks
1	Writing Observation, Tabular column, formula.	05x2=10
2	Conduction of experiment.	10x2=20
3	Calculation and Result.	05x2=10
4	Viva Voce.	10
	TOTAL	**50**

Note: The students will submit record books at the time of semester end exam.

Guidelines for Question Paper Setting

The question paper must be prepared by selecting **ONE** experiment from **PART – A** and **ONE** question from **PART – B**.

Specification of the Apparatus Required for Applied Science Lab

The following are the specification of the apparatus required for science lab, and number of apparatus required for the batch of 20 students.

Sl. No.	Name of the Apparatus	Specification	Required Number
1	Vernier calipers	With L.C 0.01cm having Metallic scale marked in cm, with objects :solid cylinder &hollow cylinder	10
2	Screw gauge	U-Shaped metallic frame with L.C 0.01mm with objects :glass plate, metal plate, thin wire and metallic sphere	10
3	Law of concurrent forces apparatus	Vertical Drawing Board fixed with pulleys. Weights 50g each with weight hangers set	10

4	Moment bar	Having two vertical metallic stands, two spring balances measuring up to 500 g . horizontal bar.	10
5	Surface tension apparatus	Traveling microscope, having L.C 0.005cm, both horizontal and vertical movement of telescope, eye piece with fine cross-wire, slow moving stand, beaker, with capillary tube	10
6	Viscosity apparatus	Aspiratory bottle, cork, capillary tube, stopwatch, measuring jar. With stand to keep Aspiratory bottle	10
7	Boyle's law apparatus	*Wide bore glass tube mounted vertically in front of a scale graduated 0 to 60cm* *Zero corresponds to the inside of the closed (top) end of the tube* *Air is confined in the tube by a coloured oil contained in a metal pressure chamber* *Pressure chamber is fitted with a Bourdon type gauge calibrated 0 to 3.5kg cm² (0 to 50 lb/in²) actual pressure* *A valve is fitted to the air inlet tube from the pump* *As the pressure in the oil chamber is increased, oil level and its actual (total) pressure are directly indicated* *Tube is made of extra strong glass and is securely covered with transparent plastic on the front* *Overall height of apparatus approx. 690mm*	05
8	Sonometer	Wooden box fixed with meter scale, pulley, metallic string, weight with weight hanger (500g each)	10
9	Resonance air column apparatus	Consists of a resonance tube brass N.P. 100cms, reservoir brass N.P. 250ml & meter scale both sides millimeters, which are mounted on	10

		wooden polished board. The reservoir is caged in wooden block that has sliding facility.	
10	Electronic balance	0.1g accuracy 500g capacity	01
11	Tuning fork set	Set of eight tuning forks of different frequency blue steel(Ragg's type)	06

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Government of Karnataka
Department of Technical Education, Bengaluru

Course: **APPLIED SCIENCE LAB**
Course code: 15SC04P

Curriculum Drafting Committee 2015-16

	Name	Designation	Institution
1	Mr. R B Pawar	Principal	Govt. Polytechnic, Bijapur
2	Mr. K. Nazeer Ahmed	Selection Grade Lecturer	Govt. Polytechnic, Mulbagilu
3	Mr. Liyakhat Ali Khan	Selection Grade Lecturer	S.J. Govt. Polytechnic, Bengaluru
4	Dr. Hanumantha Nayak	Selection Grade Lecturer	S.J. Govt. Polytechnic, Bengaluru
5	Ms. Bhagirathi B N	Selection Grade Lecturer	S.J. Govt. Polytechnic, Bengaluru

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Curriculum Review Committee

	Name	Designation	Institution
1	Mr. K. Nazeer Ahmed	Selection Grade Lecturer	Govt. Polytechnic, Mulbagilu
2	Mr. Liyakhat Ali Khan	Selection Grade Lecturer	S.J. Govt. Polytechnic, Bengaluru
3	Smt. Revathi	Selection Grade Lecturer	M.E.I. Polytechnic, Bengaluru

Course Title: **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB**		Course Code	: **15EE02P**
Semester	: **I / II**	Course Group	: **Core**
Teaching Scheme (L:T:P)	: **0:2:4** (in Hours)	Credits	: **3 Credits**
Type of course	: **Tutorial + Practical**	Total Contact Hours : **78**	
CIE	: **25 Marks**	SEE	: **50 Marks**
Programme: Mechanical (GL), Mechanical (Instr.), MTT, HPT, WSM, Mechatronics, Printing Technology, Textile Technology, Ceramics, Mining Engg., Metallurgical Engg.			

Pre-requisites	**:** Basic Electrical and Electronics Engineering theory in Diploma curriculum.
Course Objectives	**:** To provide practical knowledge about the DC & AC circuits, different wiring circuits, Battery, Relay, three phase AC motor, Cubical Panel board, semiconductor diodes, rectifiers and basic logic gates.

List of Experiments:

1. Construct a suitable circuit to verify Ohm's law.
2. Rig up and test the wiring circuit to control a lamp and a three pin socket independently.
3. Rig up and test the wiring circuit to control two lamps independently.
4. Construct and test fluorescent lamp circuit.
5. Construct and test the staircase wiring circuit (control from 2 places).
6. Construct and test Meter board wiring using single phase Energy meter, MCB/ELCB, Kit-kat fuse and neutral link.
7. Build and test a circuit to measure power and power factor in a single phase ac circuit.
8. Construct a circuit to measure energy in KWh in a single phase ac circuit.
9. Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL/ Star-Delta/ Auto-Transformer starter.
10. Test and make a report of the fully charged and discharged conditions of a given Lead-acid battery.
11. Construct a circuit using a single Relay to turn ON a lamp connected to NC and to turn OFF another lamp connected to NO contacts of Relay.
12. Construct a circuit to obtain the forward bias characteristic of a Diode.
13. Construct and test Zener diode as a voltage regulator.
14. Build and test half wave rectifier circuit.
15. Build and test full wave bridge rectifier circuit (without filter).

16. Construct a circuit to verify the truth tables of NOT, AND, OR, NOR and NAND gates.

17. Identify and draw the layout diagram for a simple CUBICAL PANEL BOARD/consisting of bus bars, CB/MCB/ELCB, meters, HRC fuses, magnetic contactors, cables, earthing points.

Reference Books:

1. Experiments in Basic Electrical Engineering by S. K. Bhattacharya, New Age International Publications, 2007 Edition.
2. A Text book on Laboratory courses in Electrical Engg. by S.G. Tarnekar and P. K. Karbanda.

e-Resources:

1. http://www.scribd.com/doc/39578646/New-First-year-Electrical-lab-manual#scribd
2. http://mrcet.ac.in/newwebsite/pdfs/Labmanuals-13/ECE/LabManuals/ DC%20LAB% 20%28180%29%20II-I.pdf

Course Delivery:

The Course will be delivered through Tutorial, classroom interaction, group discussion, practical exercises and assignments.

Tutorial - 1Hr:

Staff-in-charge will
1. Explain the concept of experiment to be conducted.
2. Teach required selection of components/ meters/ equipment/ suitable wires for the experiment to be conducted.
3. Ask students to draw the circuit.
4. Give clear instructions about safety precautions to be followed while conducting experiment.

Conduction/ Execution - 2 Hr:

Student will rig up the circuit diagram and conduct experiment individually under the supervision of the staff-in-charge.

Course Outcomes:

On successful completion of the Course, the student will be able to:

1. Understand Ohm's law

2. Rig-up various wiring circuits individually, including meter board and test.

3. Test and report the ratings of Battery and UPS.

4. Start and reverse the three phase induction motor.

5. Understand the operation of relay, diode circuits and logic gates

Mapping Course Outcomes with Program Outcomes:

Course Outcomes	Program Outcomes (POs)											
	1	2	3	4	5	6	7	8	9	10	11	12
1	M	S							M			
2	M	S							M			
3	M	S							M			
4	S	M							M			
5	S	M							M			

S – Strong Relationship   **M- Moderate Relationship**

Course Assessment and Evaluation:

	What		To Whom	Frequency	Practical	Evidence Collected	Course Outcomes
Direct Assessment Method	**CIE (Continuous Internal Evaluation)**	I A Tests	Students	Two IA tests for Practical (Average marks of both the tests to be computed)	10	Blue Books	1 to 5
		Record Writing		Record Writing (Average of Marks allotted for each experiment.)	10	Lab Record	1 to 5
				Assignments	05	Log of Activity	1 to 5
				TOTAL	**25**		
	SEE (Semester End Examination)	End Exam	Students	End of the Course	50	Answer Scripts	1 to 5
Indirect Assessment Method	Student Feedback on course		Students	Middle of The Course	Feed Back Forms		1 to 3
	End of Course Survey			End of The Course	Questionnaire		1 to 5

Note: I.A. test shall be conducted as per SEE scheme of valuation. However the obtained marks shall be reduced to 10 marks. (Any decimals shall be rounded off to next higher digit).

Composition of Educational Components:

Questions for CIE and SEE will be designed to evaluate the various educational components (Bloom's taxonomy) such as:

Sl. No	Educational Component	% in Weightage
1	Remember	30
2	Understand	40
3	Apply	20
4	Analyze	10

Scheme of Valuation for SEE (Semester End Examination)

Sl. No.	Particulars	Marks
1.	Identification of meters/ equipments/ wires/ tools/ etc.	05
2.	Writing Circuit diagram and Procedure *	10
3.	Conduction	20
4.	Results	05
5.	Viva-voce	10
	Total	**50**
*Question Paper will have any ONE question from the list of experiments.		

Model Question Bank:

Course Title: **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB**	Course Code: **15EE02P**

1. Construct a suitable circuit to verify Ohm's law. Also plot Graph.
2. Conduct an experiment to find the Resistance of a given unknown Resistor.
3. Rig up and test the wiring circuit to control a lamp and a three pin socket independently.
4. Rig up and test the wiring circuit to control two lamps independently.
5. Construct and test fluorescent lamp circuit.
6. Construct and test the staircase wiring circuit (control from 2 places).
7. Conduct an experiment to control a lamp from two places.
8. Construct and test Meter board wiring using single phase Energy meter, MCB/ELCB, Kit-kat fuse and neutral link.
9. Conduct a suitable experiment to test the Meter board wiring circuit.
10. Build and test a circuit to measure power and power factor in a single phase ac circuit.
11. Construct a circuit to measure energy in KWh in a single phase ac circuit.
12. Conduct an experiment to measure the single phase energy consumed in KWh for the given electrical load.

13. Construct a suitable circuit to start and reverse the direction of three phase induction motor using DOL starter.
14. Construct a suitable circuit to start and reverse the direction of three phase induction motor using Star-Delta starter.
15. Construct a suitable circuit to start and reverse the direction of three phase induction motor using three phase auto-transformer starter.
16. Test and make a report of the fully charged and discharged conditions of a given Lead-acid battery.
17. Construct and test a circuit using a Relay to turn ON/ OFF a lamp connected to 230 Volts ac supply.
18. Conduct an experiment to control a lamp using a Relay.
19. Construct a circuit using a single Relay to turn ON a lamp connected to NC and to turn OFF another lamp connected to NO contacts of Relay.
20. Conduct an experiment to turn ON a lamp and turn OFF another lamp using a single Relay.
21. Construct a circuit to obtain the forward bias characteristic of a Diode.
22. Conduct an experiment to Plot the forward bias characteristic of a PN Junction Diode.
23. Construct and test Zener diode as a voltage regulator. Also, plot the Graph.
24. Build and test half wave rectifier circuit. Also, trace the input and output waveforms.
25. Build and test full wave bridge rectifier circuit (without filter). Also, trace the input and output waveforms.
26. Construct a circuit to verify the truth tables of NOT and AND gates.
27. Construct a circuit to verify the truth tables of OR, NOR gates.
28. Construct a circuit to verify the truth tables of NAND and AND gates.
29. Conduct an experiment to verify the truth tables of given logic gates.
30. Identify and draw the layout diagram for a simple CUBICAL PANEL BOARD consisting of bus-bars, CB/MCB/ELCB, meters, HRC fuses, magnetic contactors, cables, earthing points.

Lab Equipment Requirement:

Students Intake : **60**
Students per Batch : **20**

Sl. No.	Name of Equipment and Specification	Quantity Required
1	Dual Channel 30 V, 2 A continuously variable DC Regulated Power Supply with Current and Overload Protection	05 Nos.
2	+/- 15 V, 2 A, fixed DC Regulated Power Supply	05 Nos.
3	Portable Moving Coil DC Voltmeters a) 0 - 1 V b) 0 - 10 V c) 0 - 30 V	Each 05 Nos.
4	Portable Moving Iron AC Voltmeters a) 0 - 300 V b) 0 - 600 V	Each 05 Nos.
5	Portable Moving Coil DC Ammeters a) 0 - 100 mA b) 0 - 1 A c) 0 - 2 A	Each 05 Nos.
6	Portable Moving Iron AC Ammeters a) 0 - 2 A b) 0 - 5 A c) 0 - 10 A	Each 05 Nos.
7	Watt-meters a) 150/ 300V, 2 A, UPF b) 300/ 600 V, 5/ 10 A, LPF	Each 02 Nos.
8	Rheostats – 25 Ohms, 50 Ohms, 150 Ohms, 220 Ohms (all rated at 3 A)	Each 05 Nos.
9	Rheostat Loads s – 1 KW, 230 V	02 Nos.
10	Wire wound Resistors- 5 Ohms 2 Watts, 25 Ohms 5 Watts, 330 Ohms 2 Watts, 560 Ohms 2 Watts, etc.	Each 05 Nos.
11	Soldering Iron 60 W	05 Nos.
12	Fluorescent lamp sets	10 Nos.
13	Single Phase Energy meter 10 A, 230 V, 50 Hz, Digital type	05 Nos.
14	Multi-meter Digital ¾"	06 Nos.
15	Duel Trace Oscilloscope – 30 MHz	02 Nos.
16	Three Phase Induction Motors : 1 HP – 440 V 50 Hz, 2 HP – 440 V 50 Hz.	Each 02 Nos.
17	Three phase DOL, Star-Delta, Auto transformer starter	Each 02 Nos.
18	UPS 1 KVA	01 Nos.
19	Battery Lead-Acid type, 140 A-hr and Hydrometers	02 Nos.

Sl. No.	Name of Equipment and Specification	Quantity Required
20	I C Trainer kit	05 Nos
21	Digital IC's 7400, 7402, 7404, 7408, 7486 etc	Each 10 Nos.
22	Wooden Wiring board (2x3) ft	10
23	Wiring accessories a)　　PVC conduit - ¾" - 10 lengths b)　　Cap and casing - ¾" - 10 lengths c)　　Switches Single Pole- 5A, 230 V d)　　Switches two way – 5 A, 230 V e)　　3 Pin Sockets 5A, 230 V f)　　Bulb Holders – 5 A, 230 V g)　　3 Pin Plug 5A, 230 V h)　　60 Watts Lamps i)　　100 Watts Lamps j)　　15 W CFL lamps k)　　Copper Wires of sizes 　　　1.5 mm^2, 2.5 mm^2, 4 mm^2 – 1 coil each l)　　Gang boxes (1+1, 2+1, 2+2) m)　　Kit –Kat fuses 5A, 15 A n)　　MCB 16 A & 32 A/ 230 V, Single and Double Pole o)　　ELCB 16 A & 32 A/ 230 V, Double Pole p)　　Neutral link- 16 A, 230 V q)　　Screws of assorted sizes r)　　Testers	Each 10 Nos.
24	Electronic Components a)　　Diodes - BY 127 and IN 4001 b)　　Zener Diodes – 6.2 V, 5.6 V, 7.8 V c)　　Relays – solid state Sugar cube type, SPST, 　　　Coil 6V, Power circuit 230 V, 5 A. d)　　Spring Boards e)　　Bread Boards f)　　Tag Boards.	Each 10 Nos.
25	Simple PANEL BOARD/ CUBICAL consisting of bus-bars, CB/MCB/ELCB, meters, HRC fuses, magnetic contactors, cables, earthing points.	1 No

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF STUDY AND EXAMINATION
CURRICULUM-2010-11
(III Semester)

Q P CODE	Name of the Subject	Instruction Periods/ Week		Total Periods Per Semester	Scheme Of Examinations					
		Theory	Practical		Duration (hrs)	IA marks	End Exam Marks	Minimum passing Marks	Total Marks	Minimum passing marks with IA marks
THEORY SUBJECTS										
9ME31	Engineering Mechanics & Strength of Materials	4	-	64	3	25	100	35	125	45
9ME32	Fluid Mechanics & Machinery	4	-	64	3	25	100	35	125	45
9ME33	Manufacturing Technology-I	4	-	64	3	25	100	35	125	45
9ME34	Mechanical Measurements & Metrology	4	-	64	3	25	100	35	125	45
PRACTICAL SUBJECTS										
9ME35P	Mechanical Testing & Quality control Lab	-	6	96	3	25	100	50	125	60
9ME36P	Basic workshop practice-II	-	6	96	3	25	100	50	125	60
9ME37P	Machine shop-I	-	6	96	3	25	100	50	125	60
	Total	**16**	**18**	**470**	**-**	**700**	**100**	**290**	**875**	**360**

DIPLOMA IN MECHANICAL ENGINEERING
SCHEME OF STUDY AND EXAMINATION
CURRICULUM-2010-11
(IV Semester)

Q P CODE	Name of the Subject	Instruction Periods/Week		Total Periods Per Semester	Scheme Of Examinations					
		Theory	Practical		Duration (hrs)	IA marks	End Exam Marks	Minimum passing Marks	Total Marks	Minimum passing marks with IA marks
THEORY SUBJECTS										
9ME41	Theory of Machines	4	-	64	3	25	100	35	125	45
9ME42	Thermal Engineering-I	4	-	64	3	25	100	35	125	45
9ME43	Manufacturing Technology-II	4	-	64	3	25	100	35	125	45
9ME44	Fluid Power Engineering	4	-	64	3	25	100	35	125	45
PRACTICAL SUBJECTS										
9ME45P	Fluid Power Lab	-	6	96	3	25	100	50	125	60
9ME46P	Machine Shop-II	-	6	96	3	25	100	50	125	60
9ME47P	Parametric Solid Modeling Lab	-	6	96	3	25	100	50	125	60
	Total	**16**	**18**	**470**	**-**	**175**	**700**	**290**	**875**	**360**

ENGINEERING MECHANICS & STRENGTH OF MATERIALS

Subject Title : **Engineering Mechanics & Strength of Materials.**
Subject Code :
Hours Per Week : **04**
Hours Per Semester : **64**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Introduction to Engineering Mechanics	01	02
2	Force Analysis	08	18
3	Centre of Gravity & Moment of Inertia	10	30
	SECTION-II		
4	Simple stresses & Strains	08	20
5	Bending moment & Shear forces	10	30
	SECTION-III		
6	Strain energy & Impact loading	02	05
7	Theory of simple bending & Theory of torsion	08	20
8	Thick & Thin cylinders	08	20
9	Industry Institute Interaction	05	-
10	Tests & Revisions	**04**	
	Total	**64**	**145**

OBJECTIVES
On completion of the course the students should be able to…

1. Understand the Basics of Engineering Mechanics.
2. Understand the force analysis.
3. Understand the concept of centre of gravity & moment of inertia.
4. Understand the concept of simple stresses & strains.
5. Understand the concept of bending moment & shear force diagrams.
6. Understand strain energy & impact loading.
7. Understand the concept of bending & torsion.
8. Understand the concept of thick & thin cylinders.

COURSE CONTENTS

1.0   INTRODUCTION TO ENGINEERING MECHANICS
1.1   Introduction to Engineering Mechanics.
1.2   Statics, Dynamics, Kinetics & Kinematics.
1.3   Scalar & Vector quantities.

2.0   FORCE ANALYSIS
   2.1   Composition & Resolution of forces – Force,effect,characteristics of a force, system of forces, resultant force, methods for the resultant force and simple problems.
   2.2   Parallelogram law of forces and simple problems.
   2.3   Triangle law of forces
   2.4   Polygon law of forces
   2.5   Moments & their applications – Moments of a force, types of moments, law of moments, applications of moments - levers, types of levers.
   2.6   Parallel force & couples – Classification of parallel forces, analytical method for the resultant of parallel forces and simple problems.
   2.7   Couple – Moment of a couple and classification of couples.
   2.8   Equilibrium of forces – Introduction, principles of equilibrium, lami's theorem, types of equilibrium.

3.0   CENTRE OF GRAVITY & MOMENT OF INERTIA
   3.1   Centre of gravity, methods of finding centre of gravity and axis of reference.
   3.2   Centre of gravity of symmetrical & unsymmetrical plane figures.
   3.3   Simple problems.
   3.4   Moment of inertia, units of moment of inertia.
   3.5   Moment of inertia of a plane area.
   3.6   Methods for moment of inertia.
   3.7   Moment of inertia of triangular, rectangular, circular & hollow circular sections.
   3.8   Simple problems.
   3.8   Theorem of parallel axis and Theorem of perpendicular axis.
   3.9   Moment of inertia of L, I, T sections.
   3.10   Simple problems.

4.0   SIMPLE STRESSES & STRAINS
   4.1   Elasticity, stress, types of stress, strain.
   4.2   Elastic limit, Hooke's law & modulus of elasticity.
   4.3   Deformation of a body due to force acting on it.
   4.4   Simple problems.
   4.5   Temperature stresses in simple bars.
   4.6   Elastic constants, linear strain, lateral strain, volumetric strain & Poisson's ratio.
   4.7   Bulk modulus, relation between bulk modulus & young's modulus (without proof).
   4.8   Shear stress, shear strain & modulus of rigidity.
   4.9   Relation between modulus of elasticity & modulus of rigidity (without proof).
   4.10   Simple problems.

5.0   BENDING MOMENT AND SHEAR FORCES
   5.1   Introduction, types of loading.
   5.2   Shear force and bending moment.
   5.3   Sign conventions.
   5.4   Shear force and bending moment diagrams.
   5.5   Shear force and bending moment diagrams for cantilever, simply supported beams subjected to point load & uniformly distributed load.

6.0   STRAIN ENERGY & IMPACT LOADING
   6.1   Introduction, resilience, proof resilience and modulus of resilience.
   6.2   Types of loading.
   6.3   Equation for strain energy stored in a body when the load is gradually applied.
   6.4   Simple problems.

6.5 Equation for strain energy stored in a body when the load is suddenly applied.
6.6 Simple problems.

7.0 THEORY OF SIMPLE BENDING & THEORY OF TORSION
7.1 Introduction, assumptions in theory of simple bending.
7.2 Bending stress, relation between bending stress & radius of curvature (without proof).
7.3 Position of neutral axis, moment of resistance.
7.4 Bending equation (without proof).
7.5 Modulus of section for rectangular, hollow rectangular and hollow circular sections.
7.6 Simple problems.
7.7 Theory of torsion, assumptions and polar moment of inertia.
7.8 Power transmitted by a shaft.
7.9 Torsional rigidity equation (without proof).
7.10 Simple problems.

8.0 THICK AND THIN CYLINDERS
8.1 Introduction to thin cylinders, stresses in thin cylindrical shells.
8.2 Expression for circumferential stress & longitudinal stresses (without proof).
8.3 Simple problems.
8.4 Design of thin cylinders with simple problems.
8.5 Thick cylinders, assumptions Lame's theory.
8.6 Equation of Lame's theory (without proof).
8.7 Simple problems.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0 Introduction to engineering mechanics
1.1 Explain the importance of engineering mechanics.
1.2 Define the various branches of engineering mechanics.
1.3 Define statics, dynamics, kinetics and kinematics.
1.4 Explain scalar and vector quantities with examples.

2.0 Force analysis
2.1 Define force
2.2 List effects of a force
2.3 List characteristics of a force.
2.4 Explain the system of forces
2.5 Define resultant force.
2.6 State the methods for the resultant force.
2.7 State parallelogram law of forces and solve simple problems.
2.8 State the principle of resolution
2.9 Explain the method of resolution for the resultant force and solve simple problems.
2.10 State triangle law of forces and polygon law of forces.
2.11 Define moment of a force.
2.12 State types of moments – clockwise and anticlockwise moments.
2.13 State law of moments
2.14 Define a lever.
2.15 List the types of levers.
2.16 Explain the concept of parallel forces and give classification of parallel forces – like and unlike parallel forces.

2.17	Analytical method for the resultant of parallel forces and simple problems.
2.18	Define a couple, Explain moment of a couple, and classify couple – clockwise and anticlockwise moments.
2.19	Explain equilibrium of forces.
2.20	State principles of equilibrium.
2.21	State Lami's theorem (without proof).
2.22	Explain types of equilibrium – stable, unstable and neutral equilibrium.

3.0   Centre of gravity & moment of inertia

3.1	Define centroid and list methods for finding centroid.
3.2	Explain axis of reference.
3.3	Explain centre of gravity of plane figures and solve simple problems on finding centre of gravity of symmetrical & unsymmetrical sections.
3.4	Define moment of inertia and mention the units of moment of inertia.
3.5	Explain the moment of inertia of a plane area.
3.6	State methods for moment of inertia – Routh's rule & Integration method.
3.7	Explain the moment of inertia by Integration method.
3.8	Mention the equation of moment of inertia of triangular, rectangular, circular and hollow circular sections and solve simple problems.
3.9	State theorem of parallel axes and theorem of perpendicular axes (without proof).
3.10	Solve simple problems on finding moment of inertia of L, I & T sections.

4.0   Simple stresses & strains

4.1	Define elasticity, stress, and strain.
4.2	Explain types of stresses – tensile, compressive stress.
4.3	Define elastic limit, state Hooke's law and explain modulus of elasticity.
4.4	State the equation for deformation of a body due to force acting on it.
4.5	Solve simple problems on finding deformation, modulus of elasticity and diameter of a given component.
4.6	Explain temperature stresses in simple bars.
4.7	Explain elastic constants – linear strain, lateral strain, volumetric strain and Poisson's ratio.
4.8	simple problems.
4.9	Define bulk modulus and state the relation between bulk modulus and young's modulus (without proof).
4.10	Simple problems.
4.11	Explain shear stress, shear strain and modulus of rigidity.
4.12	State relation between modulus of elasticity and modulus of rigidity (without proof)
4.13	Simple problems.

5.0   Bending moment & shear forces

5.1	Explain types of loading – point load, uniformly distributed load and uniformly varying load.
5.2	Define shear force and bending moment.
5.3	Explain sign conventions for shear force and bending moment.
5.4	Explain shear force and bending moment diagrams.
5.5	Solve simple problems on calculating shear force and bending moment for cantilever, simply supported beams subjected to point load and uniformly distributed load with shear force and bending moment diagrams.

6.0   Strain energy & impact loading

6.1	Explain strain energy.
6.2	Define resilience, proof resilience and modulus of resilience.
6.3	Explain types of loading – gradually applied load and suddenly applied load.

6.4   State the equation for strain energy stored in body when the load is gradually applied. and solve simple problems.

6.5   State the equation for strain energy stored in a body when the load is suddenly applied.

7.0   Theory of simple bending & Theory of torsion

7.1   Explain bending stress and list the assumptions in theory of simple bending.

7.2   State relation between bending stress and radius of curvature (without proof).

7.3   Explain position of neutral axis and moment of resistance.

7.4   State bending equation (without proof).

7.5   Explain modulus of section.

7.6   State equation for modulus of section of rectangular, hollow rectangular, circular and hollow circular sections.

7.7   Solve simple problems on above sections only using bending equation.

7.8   Explain torsion and state assumptions for shear stress in a circular shaft subjected to torsion.

7.9   Explain polar moment of inertia.

7.10 State torsion equation (without proof).

7.11 State the equation for power transmitted by a shaft.

7.12 State the equation for torque transmitted by solid shaft and hollow shaft.

7.13 Solve simple problems on solid and hollow circular shafts considering above equations only.

8.0   Thick and Thin cylinders

8.1   Explain the concept of thin cylindrical shells.

8.2   State the stresses in thin cylindrical shell – circumferential and longitudinal stress.

8.3   State the equation for circumferential and longitudinal stress.

8.4   Solve simple problems on above.

8.5   State the equation for thickness of thin cylindrical shells and solve simple problems.

8.6   Explain the concept of thick cylindrical shells

8.7   State assumptions of lame's theory.

8.8   State equation of lame's theory (without proof).

8.9   Solve simple problems.

Text Books: 1. Engineering mechanics and Strength of materials by I.S.Hiremath, Sapna Publishers

REFERENCE BOOKS

1.   Engineering mechanics by R.S.Khurmi.

2.   Strength of materials by R.S.Khurmi.

3.   Applied Mechanics by S.S.Bhavikatti.

4.   Strength of Materials by S.S.Bhavikatti.

5.   Applied Mechanics & Strength of Materials by S.Ramamrutham.

6. Applied Mechanics & Strength of Materials by I.B.Prasad.

7. Introduction to strength of materials by Prakash Rao-Universities Press (India) Pvt. Ltd.

8. Engineering mechanics by Sheshagiri Rao- Universities Press (India) Pvt. Ltd.

DEPARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING
THIRD SEMESTER
MODEL QUESTION PAPER

ENGINEERING MECHANICS & STRENGTH OF MATERIALS

Time: 3Hrs   **Max marks: 100**

Note: 1 Section-I is compulsory
  2 Answer any **six full** questions from Section-**II, Section-III, and Section**-**IV,** Choosing at least **two** from each section.

<div align="center">SECTION- I</div>

1   a) Fill in the blanks with appropriate words   **1X5= 5**
     i)   The ratio of volumetric stress to volumetric strain is called _____.
     ii)   A set of forces whose resultant is zero are called _____.
     iii)   The point through which the whole weight of the body acts irrespective of its position is known as ___
     iv)   A pair of two equal & unlike parallel forces with lines of action parallel to each other & acting in opposite directions is   known as   _____.
     v)   The layer which is neither compressed nor stretched when the section is subjected to bending is known as ___

     b) State the assumptions in theory of simple bending?   **5**

<div align="center">SECTION-II</div>

2   a) Define resultant force.   **2**
     b) What are the effects of a force?   **3**
     c) A triangle ABC has its sides AB=40mm along X-axis and side BC=30mm along positive Y-axis, three forces 40N,50N & 30N along the sides AB,BC & CA respectively. Determine the magnitude of resultant of such a system of forces.   **10**

3   a) Define centroid   .   **2**
     b) State methods for determining centre of gravity.   **3**
     c) Find the centroid of an unequal angle section shown in figure below   **10**
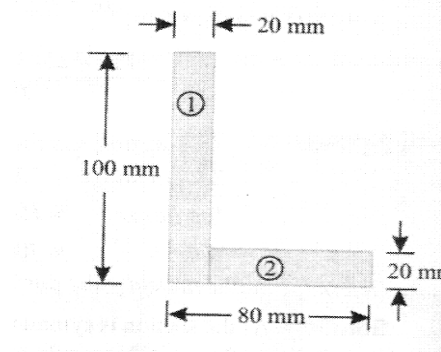
4   a) Define moment of inertia   **2**
     b) State theorem of parallel axis.   **3**

c) Find the moment of inertia of T-section shown in the figure below   **10**

Fig. 7.14.
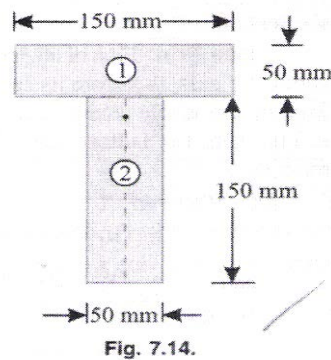
5   a) Define modulus of elasticity.   **2**
     b) Explain the temperature stres   **3**
     c) In an experiment a bar of 30   all of 60 KN.The measured
        extension on gauge length of   nge in diameter is 0.0039mm.
        Calculate the Poisson's ratio   rigidity modulus and bulk modulus.   **10**

6   a) Define shear force   **2**
     b) State the types of loading   **3**
     c) Draw shear force and bending moment diagrams for a cantilever beam of span 1.5m carrying
        point loads as shown in figure.   **10**
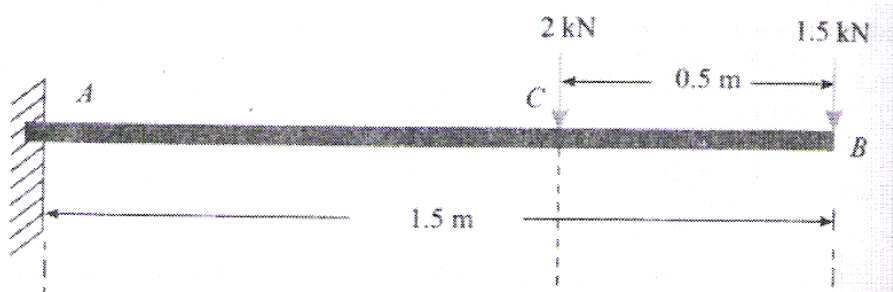
7   a) Define bending moment.   **2**
     b) Explain sign conventions for shear force and bending moment.   **3**
     c) A simply supported beam AB of span 2.5m is carrying two point loads as shown in figure.
        Draw the shear force and bending moment diagrams.   **10**

Fig. 13.13
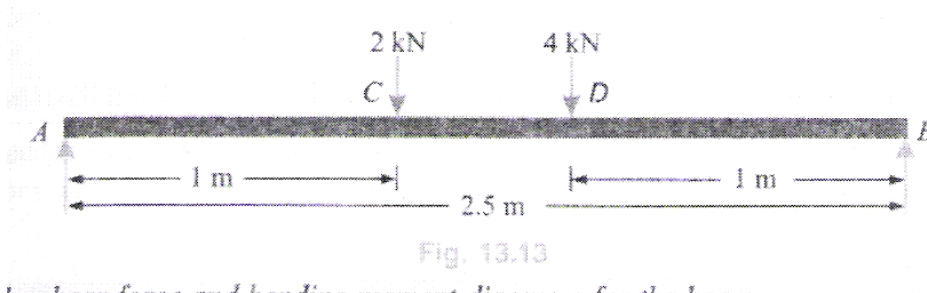
SECTION-IV

8   a) Define strain energy   **2**
     b) Define i) proof resilience   ii) modulus of resilience   **3**
     c) A rectangular beam60mm wide and 150 mm deep is simply supported over a span of 6m.If the beam is
        subjected to a central point load of 12KN find the maximum bending stress induced in the beam section. **10**

9   a) Define polar moment of inertia   **2**
     b) State the assumptions for shear stress in a circular shaft subjected to torsion.   **3**
     c) A hollow shaft is to transmit 200 KW at 80 rpm.If the shear stress is not to exceed 60 MPa and internal

diameter is 0.6 of external diameter. Find the diameters of the shaft. **10**

10   a) what is a thin cylindrical shell? **2**

       b) State equations for circumferential stress and longitudinal stress in a thin cylindrical shell**.** **3**

       c) A cylindrical shell of 1.3 m diameter is made up of 18mm thick plates. Find the circumferential & longitudinal stress in the [plates if the boiler is subjected to an internal pressure of 2.4 MPa.Take efficiency of the joints as 20%. **10**

FLUID MECHANICS AND MACHINERY

Subject Title   **: Fluid Mechanics and Machinery**
Subject Code   **: M-**
Hours Per Week   **: 04**
Hours Per Semester **: 64**

TOPIC ANALYSIS

S.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Introduction	05	10
2	Fluid statics	02	5
3	Fluid kinematics	02	5
4	Fluid dynamics	06	15
5	Flow through pipes and nozzles	06	15
	SECTION-II		
6	Impact of jet on vanes	06	15
7	Hydraulic turbines	12	30
	SECTION-III		
8	Centrifugal pumps	08	25
9	Reciprocating pumps and Special Purpose Pumps	08	25
10	Industry innovations	05	-
11	Test	04	
	Total	**64**	**145**

GENERAL INSTRUCTIONAL OBJECTIVES

At the end of the course, student should be able to…
1. Understand the basic of fluid mechanics
2. Understand the basic principles of fluid statics
3. Understand the basic principle of fluid kinematics
4. Understand the principles of fluid dynamics and its applications
5. Understand the principles of fluid flow through pipes
6. Understand the impact of jet on vanes
7. Understand the working of hydraulic turbines
8. Understand the working of Centrifugal Pumps
9. Understand the working of Reciprocating pumps & special purpose pumps

1.0   Introduction
1.1   Scope of the subject
1.2   Fluid
1.3   Type of fluid
1.4   Fluid mechanics
1.5   Classification of fluid mechanics
1.6   Statics, kinematics, and dynamics
1.7   Hydraulics
1.8   Ideal and real fluids
1.9   properties of fluids
1.9.1   Definitions - Mass Density, Specific Volume, Specific Weight, Specific Gravity,
           Viscosity, Kinematics, SI units of viscosity Surface Tension, Capillarity, Compressibility
           and Bulk   Modulus
1.10   Fluid pressure
1.10.1   Definition of pressure and units of pressure
1.10.2   Relation between vacuum, absolute and atmospheric pressure
1.10.3   Pressure head of a liquid
1.10.4   Pascal's law
1.10.5   Pressure measurement and Types of pressure measuring instruments
1.10.6   Manometers –Simple and Differential- Advantages and Limitations
1.10.7   Mechanical gauges-Construction and working of principle of gauges:
           Bourdon tube, Diaphragm,
1.10.8   Vacuum gauges

2.0   Fluid statics
2.1   Definition of total pressure, centre of pressure, Buoyancy, metacentre and metacentric
           height
2.3   Archimedes' principle
2.4   Types of Equilibrium of floating bodies
2.5   Stable, unstable and neutral equilibrium

3.0   Fluid kinematics
3.1   Types of fluid flow
3.1.1   Steady and unsteady flow
3.1.2   Uniform and non-uniform flow
3.1.3   One, two and three dimensional flow
3.1.4   Rotational and irrotational flow
3.1.5   Compressible and in-compressible flow
3.2   Rate of flow or discharge
3.3   Continuity equation
3.4   Simple problems

4.0   Fluid dynamics
4.1   Various forms of energy present in fluid flow.
4.1.1   Pressure energy, Potential energy, Kinetic energy, Total head or total energy.
4.1.2   Simple problems

4.2   Bernoulli's equation:
4.2.1   Statement and equation
4.2.2   Assumptions
4.2.3   Simple problems
4.3   Practical applications pf Bernoulli's Equation:
4.3.1   Venturimeter (horizontal only), Flow nozzle, Orifice meter, Pitot's tube
4.3.2   Simple problems

5.0   Flow through pipes
5.1   Loss of head in pipes due to friction
5.1.1   Major and minor energy losses
5.1.2   Darcy's formula (without proof)
5.1.3   Chezy's formula (without proof)
5.2   Hydraulic Gradient and total energy line
5.3   syphon
5.4   Definitions of nozzle and its applications
5.5   power transmitted thro the nozzle
5.6   Water hammer in pipes
5.7   Simple problems

6.0   Impact of jet on Vanes
6.1   Force of jet striking normally on a fixed plate,
6.2   Force of jet striking on inclined fixed plate.
6.3   Force of Jet striking on fixed curved vane.
6.4   Force of jet on moving flat plate held normal to the jet and work done.
6.5   Force of jet on moving flat plate held inclined to the jet and work done.
6.6   Force of jet on moving flat plate fixed on the rim of a wheel,
6.7   power and efficiency
6.8   Problems on the above.
6.9   Force of jet impinging on moving curved vane.

7.0   Hydraulic turbines
7.1   Scope of the hydraulic turbine
7.1.1   Definition of a turbine
7.1.2   Classification of hydraulic turbine.
7.2   Impulse turbines
7.2.1   Constructional details and working of a Pelton wheel
            (Impulse turbine)
7.2.2   Work done and efficiency of pelton wheel with velocity triangles
            (Definition and formulae only)
7.2.3   Types of heads
7.2.3.1   Gross head
7.2.3.2   Net or effective head- definition and formula
7.2.4   Efficiencies with formula
7.2.4.1   Hydraulic Efficiency, Mechanical Efficiency, Volumetric Efficiency, Overall Efficiency
7.3   Reaction turbines
7.3.1   Constructional details and working of Kaplan and Francis turbine
7.3.2   Work done and efficiency of Francis turbine

7.3.3   Use of penstock, Anchor block, surge tank and draft tube
7.3.4   Unit power, unit speed and unit discharge- Specific speed their significance
7.3.4.1   Simple problems.
7.3.5   Performance Characteristics of turbines
7.3.6   Selection of turbines based on specific speed and head of water.
7.3.7   Comparison between impulse and reaction turbines

8.0   Centrifugal Pumps
8.1   definition-pumps and centrifugal Pumps
8.1.1   Scope of pumps
8.1.2   Classification of pumps
8.2   Principle of operation and Constructional details of a centrifugal pump,
8.2.1   Types of casing.
8.3   Work done by a centrifugal pump
8.4   Heads of centrifugal pumps
8.5   Efficiency, Discharge and Power required in a centrifugal pump.
8.6   Minimum starting speed of a centrifugal pump.
8.7   Specific speed- formula and definition
8.8   Simple problems
8.9   Priming of centrifugal pump.
8.10   Cavitations and its effects in centrifugal pump
8.11   Multistage centrifugal pumps for high heads and for high discharge.
8.12   Selection of pumps
8.13   Operational difficulties in centrifugal pumps

9.0   Reciprocating pumps
9.1   Definition of Reciprocating pumps and its applications
9.2   Types of reciprocating pumps
9.3   Principle of operation, Constructional details and working
9.4   Power required to drive a reciprocating pump
9.5   Slip, Negative slip and co-efficient of discharge in reciprocating pump.
9.6   Simple problems
9.7   Air vessels and its functions
9.8   Comparison between centrifugal and reciprocating pumps
9.9   Special purpose pumps-Construction, working and uses of Submersible pump, Jet pump and Air lift pump

Specific Instructional Objectives

Understand the basic of fluid mechanics
Explain scope of the subject
Define fluid
Classify fluid
Define fluid mechanics
Classify fluid mechanics
Define statics, kinematics and dynamics

Define hydraulics

Differentiate between ideal fluid and real fluid

Mention various properties of fluids

Define density, specific volume, specific gravity and solve simple problems.

Define viscosity, dynamic viscosity, kinematics viscosity and their units

Define surface tension, capillarity, compressibility, bulk modulus and their units

Define fluid pressure and its units

1.10.1 Explain the difference between absolute pressure, atmospheric pressure, gauge pressure and vacuum pressure

1.10.2 Explain pressure head of a liquid

1.10.3 State Pascal's law

1.10.4 Classify pressure measuring instruments

1.10.5 Explain simple and differential manometers with sketches and state their advantages and limitations

1.10.6 Explain the construction and working principle of Bourdon tube and diaphragm gauges

1.10.7 Explain briefly vacuum gauges and mention their types

2.0 Understand the basic principles of fluid statics

2.1 Define total pressure and centre of pressure

2.2 Explain buoyancy, metacentre and metacentric height

2.3 State Archimedes principle of buoyancy

2.4 State types of equilibrium of floating bodies

2.5 Explain stable, unstable and neutral equilibria

3.0 Understand the basic principle of fluid kinematics

3.1 State types of fluid flow

3.1.1 Define steady flow and unsteady flow

3.1.2 Define uniform flow and non- uniform flow

3.1.3 Define one, two and three dimensional flow

3.1.4 Define rotational and irrotational flow

3.1.5 Define compressible and incompressible flows

3.2 Define rate of flow or discharge

3.3 State law of continuity and explain continuity equation

3.4 Solve simple problems on discharge and law of continuity.

4.0 Understand the principles of fluid dynamics and its applications

4.1 Mention and explain types of head of liquid in motion

4.1.1 Explain potential energy, kinetic energy, pressure energy and total head

4.2 State Bernoulli's theorem

4.2.1 Explain Bernoulli's equation (without proof)

4.2.2 State the assumptions made in Bernoulli's theorem

4.2.3 Solve simple problems on Bernoulli's theorem

4.3 Mention the practical applications of Bernoulli's theorem

4.3.1 Explain horizontal venturimeter, flow nozzle, orifice meter and pitot's tube with expressions for discharge

4.3.2 Solve simple problems on the above

5.0 Understand the principles of fluid flow through pipes

5.1 Define loss of head in pipes due to friction

5.1.1 Mention major energy losses and minor energy losses

5.1.2 State the Darcy- weisbach's formula (without proof)

5.1.3 State the chezy's formula (without proof)

8.2.1   Explain types of casing.
8.3   Define Work done by a centrifugal pump and state the formula without proof
8.4   State the various Heads of centrifugal pumps
8.5   Explain the Efficiency, Discharge and Power required in a centrifugal pump with formulae.
8.6   Derive on expression for Minimum starting speed of a centrifugal pump.
8.7   Define and state the formula of Specific speed
8.8   Simple problems on the above
8.9   Explain Priming of centrifugal pump.
8.10   Explain cavitation and its effects in centrifugal pump
8.11   Explain multistage centrifugal pumps for high heads and high discharge and their uses
8.12   Explain the criteria for Selection of pumps
8.13   Explain the operational difficulties in centrifugal pumps
9.0   **Understand the working of Reciprocating pumps**
9.1   Definition of Reciprocating pumps and its applications
9.2   Classify reciprocating pumps
9.3   Explain the Principle of operation, Constructional details and working reciprocating pumps
9.4   Derive on expression for discharge, work done and Power required to drive a reciprocating pump
9.5   Explain Slip, Negative slip and co-efficient of discharge in reciprocating pump.
9.6   Solve simple problems on the above
9.7   Explain the construction of Air vessel and its functions
9.8   Differentiate between centrifugal and reciprocating pumps
9.9   Special purpose pumps-Construction, working and uses of submersible pump, Jet pump, Air lift pump

Text Books : 1. Fluid Mechanics and Machinery By R K Hegde & Neeranjan Murthy, Sapna Publishers

BOOKS FOR REFERENCE

1) Fluid Mechanics and Machinery-BCS Rao-2nd Edn.-Tata McGraw Hill Publ.,2010

2) Fluid Mechanics and Hydraulic Machines-R.K.Bansal-Laxmi Publications(P)Ltd.,New Delhi,2003

3) Fluid Mechanics and Hydraulic Machines-R.K.Rajput-S.Chand and Co., 4th Revised Edn. 2010

4) Fluid Mechanics and Hydraulic Machines-R.S.Khurmi- S.Chand and Co,19th Edn,2010

5) Hydraulic Engg – Roberson Cassidy & Choudhary , Jaico Publishing House

MODEL QUESTION PAPER

Duration:3hours

Max.Marks:100

NOTE : (i) Section I is compulsory

(ii)Answer TWO Full questions in each of section-II, Section – III & Section – IV

(iii) Assume missing data ,if any, suitably.

SECTION –I

1)

   a) Fill in the blanks with appropriate word/s   5x1=5
      i)   STOKE is the unit of ----------
      ii) Bulk modules is the reciprocal of ------------
      iii) The formula $V = C \sqrt{mi}$ is called ---------- (with usual notations)
      iv) A pipe of gradually increasing area which is used for discharging water from the exit of a turbine to the tail race is called-----------
      v) Submersible pump is basically --------------

   b) Write a note on siphon   5

SECTION –II

2)

   a) Define statics, kinematics and dynamics   6
   b) Calculate specific weight, density specific volume and specific gravity of a liquid having a volume of $5m^3$ and weighing 50kN. Assume missing data suitably   4
   c) Define metacentre and metacentric height   5

3)

   a) Differentiate between steady flow and unsteady flow   4
   b) State and explain Bernoulli's theorem with equation   4
   c) A horizontal venturimeter with inlet & outlet throat dia 30cm and 20cm respectively is used to measure the flow of water. The reading of differential manometer connected to the inlet and the throat is 25cm. Determine the rate of flow Take c_d=0.95   4

4)

   a) State any FOUR assumptions made in Bernouli's theorem   4
   b) Explain hydraulic gradient and total energy lines   5
   c) Compare the discharges of 10cm dia and 20cm dia pipes when loss of head due to friction is same. Both the pipes have same length & coefficient of friction.   6

SECTION –III

5)

   a) Derive an expression for force of set striking normally on stationary curved plate when the jet strikes the curved plate at the centre   7
   b) A jet of water of dia 10cm strikes a flat plate normally with a velocity of 20m/s. The plate is moving with a velocity of 5m/s in the direction of jet and away from the jet .
      Find

       i)   The force exerted by jet on the plate

       ii) Work done by the jet per second

       iii) Power of jet

       iv) Efficiency of jet   8

6)

   a) Explain the construction and working of Pelton wheel with a neat sketch   8

   b) Explain draft tube with a neat sketch   5

   c) Define unit speed   2

7)

   a) Mention any five differences between Impulse & Reaction turbines   5

   b) Explain criteria for selection of hydraulic turbines   5

   c) Explain the constant – head and constant speed characteristics of hydraulic turbine   5

SECTION –IV

8)

   a) Describe the construction & working of centrifugal pump   7

   b) Find the power required to drive a centrifugal pump which delivers $0.05 m^3/s$ of water to a height of 25cm through a 20cm dia pipe & 100m long. The overall efficiency of the pump is 75% & coefficient of friction f = 0.1 in the formula $h_f = 4flv^2 / 2gd$.   8

9)

   a) Mention any five differences between centrifugal and reciprocating pumps   5

   b) Explain submersible pump with a neat sketch   5

   c) Explain the principal of working & application of air vessel with a neat sketch   5

10) Write short notes on any three of the following

   a) Scope of Hydraulics

   b) Bourdon tube

   c) Anchor Block

   d) Priming

   e) Manometer   5x3=15

MANUFACTURING TECHNOLOGY – I

Subject Title :   **Manufacturing Technology - 1**
Subject Code   :   **M**
Hours Per Week   : 04   **Hours Per Semester   :   64**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Materials for manufacturing	06	15
2	Metal casting process	08	20
3	Forging	08	20
	SECTION-II		
4	Mechanical working of metals	06	15
5	Advanced welding process	08	20
6	Press work	06	15
	SECTION-III		
7	Lathe	09	25
8	Drilling	05	15
9	Industry Institute Interaction	04	-
10	Tests & Revision	04	-
	Total	**64**	**145**

General Objectives :

On completion of the course the students should be able to:
1. Understand the various materials used in manufacturing of the products.
2. Understand the metal casting techniques used in manufacturing
3. Understand the concepts of forging, its types & importance in manufacturing
4. Understand the various mechanical working processes of metals
5. Understand the various advanced welding methods & applications
6. Understand the basic press work practices, machines & applications
7. Understand the basic working of lathe, its operations & applications
8. Understand the basic working of drilling machines, its operations & applications

CONTENTS:

1.0 Materials for manufacturing
      1.1   Manufacturing
      1.2   Ferrous and non-ferrous materials.
      1.3   Heat treatment
      1.4   Carbon Equilibrium diagram
      1.5   Review of heat treatment processes
      1.6   Advanced materials used in manufacturing
      1.7   Ceramics
      1.8   Polymers
      1.9   Plastics
      1.10   Composite materials

2.0   Metal casting process
   2.1   Introduction to metal casting
   2.2   Casting: steps involved in casting
   2.3   Pattern for casting
   2.4   Pattern making materials
   2.5   Pattern Types & allowances
   2.6   Moulding- Moulding sands-Moulding process
   2.7   Special casting processes - Die casting, Centrifugal casting & Investment casting.
   2.8   Defects in casting and their remedies

3.0   Forging
   3.1   Introduction
   3.2   Presses & Hammers
   3.3   Forging Processes
   3.4   Forging operations
   3.5   Defects in forging and their remedies

4.0   Mechanical working of metals
   4.1   Introduction
   4.2   Comparison of cold working and hot working
   4.3   Rolling-Types of rolling mills
   4.4   Hot working-Advantages and limitations
   4.5   Cold working-Advantages and limitations, Types of cold working process

5.0   Advanced welding processes
   5.1   Introduction.
   5.2   Classification of welding process
   5.3   Resistance welding - Spot, Seam and Projection welding
   5.4   Advanced Arc welding types-Shielded metal arc welding, TIG & MIG welding, Submerged arc welding, Plasma arc welding & Laser beam welding.
   5.5   Defects in welding and their remedies

6.0   Press work
   6.1   Introduction.
   6.2   Presses-Types-Power press
   6.3   Press operations: Cutting, bending, drawing, punching, blanking & notching,
   6.4   Die sets-Types-Accessories

7.0   Lathe
   7.1   Introduction to lathe.
   7.2   Classification of lathes -specification of lathe
   7.3   Constructional features of Engine lathe
   7.4   Lathe attachments, accessories & work holding devices
   7.4   Lathe operations
   7.5   Taper turning and thread cutting.
   7.6   Machining parameters-cutting speed, feed, depth of cut and machining time
   7.7   Capstan and Turret lathe-Description-comparison with engine lathe

8.0   Drilling machine
   8.1   Introduction
   8.2   Classification of drilling machines
   8.3   Radial drilling machine-working-drilling operations
   8.4   Twist drill nomenclature
   8.5   Machining parameters-cutting speed, feed, depth of cut and machining time

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0 **MATERIALS FOR MANUFACTURING**
  1.1 Define Manufacturing
  1.2 List the different ferrous & non ferrous materials used in manufacturing & Applications.
  1.3 State the purpose of heat treatment
  1.4 Explain Iron carbon equilibrium diagram
  1.5 Review the heat treatment process
  1.6 List the advanced materials used in manufacturing.
  1.7 State the general properties and applications of ceramic materials
  1.8 State the general properties and applications of polymers
  1.9 Explain Thermo plastic and Thermo setting plastics
  1.10 State the general properties and applications of composite materials
2.0 **METAL CASTING PROCESS**
  2.1 Explain Casting
  2.2 Explain the basic steps involved in casting process
  2.3 Define pattern and explain its importance in metal casting
  2.4 List the different pattern making materials
  2.5 Explain the different pattern making allowances
  2.6 Describe briefly different types of patterns
  2.7 Explain molding
  2.8 List the different types of sands involved in molding process
  2.9 Explain the Molding processes - Sand molding, Pit molding, machine molding & Shell molding.
  2.10 Explain the Special casting processes - die casting, centrifugal casting & Investment casting.
  2.11 State the defects in casting
3.0 **FORGING**
  3.1 Explain the importance of forging.
  3.2 List the different types of Presses and hammers in forging
  3.3 Explain forging process - Drop forging, Upset forging, Die forging & press forging.
  3.4 Explain Forging operations- Closed die Forging operation, Fullering, Edging, Bending, Blocking & Finishing.
  3.5 List the Forging defects and its remedies.
4.0 **MECHANICAL WORKING OF METALS**
  4.1 Explain mechanical working of metals.
  4.2 Differentiate cold working with hot working.
  4.3 Sketch and describe the working principle of rolling,
  4.4 Explain briefly the rolling mills- Two high, Three high, Four high, Universal & Planetary rolling mills
  4.5 State advantages and limitations of hot working.
  4.6 List various cold working processes
  4.7 State advantages and limitations of cold working.
5.0 **ADVANCED WELDING PROCESS**
  5.1 Classification of welding process
  5.2 Explain Resistance welding - Spot, Seam and Projection welding
  5.3 Explain shielded metal arc welding
  5.4 Explain TIG & MIG welding
  5.5 Explain submerged arc welding
  5.6 Explain the Plasma arc welding
  5.7 Explain the Laser beam welding
  5.8 List the welding defects and remedies

6.0   PRESS WORK
     6.1   Introduction
     6.2   List the different types of presses
     6.3   Explain the working of power press
     6.4   Explain the press operations: Cutting, bending, drawing, punching, blanking, notching,
     6.5   Identify different types of die sets
     6.6   Describe various die accessories

7.0   LATHE
     7.1   Explain about lathe
     7.2   List the different types of lathe with classification
     7.2   Specify the size of a lathe
     7.3   Draw the line diagram of the lathe, label its parts & brief working of lathe
     7.4   List the lathe attachments, accessories & work holding devices
     7.4   Explain various operations performed in lathe-turning, taper turning, knurling & thread cutting
     7.5   Explain thread cutting procedure.
     7.6   Define cutting speed, feed, depth of cut and machining time
     7.6   Explain Capstan and Turret lathe with sketch & Identify difference between them.
     7.7   Compare Capstan / Turret and Engine lathe.
     7.8   Simple problems.

8.0 DRILLING MACHINE
     8.1   Introduction
     8.2   List out different types of drilling machines.
     8.3   Explain different parts of radial drilling machine with sketch
     8.4   Explain different operations performed in a drilling machine- drilling, reaming, tapping,
              counter boring & counter sinking.
     8.5   Draw a twist drill & label its parts
     8.6   Define cutting speed, feed, depth of cut and machining time.
     8.7   Simple problems.

REFERENCE BOOKS:
1) Workshop Technology by Hazara choudary VOL - I & VOL – II.
2) Production Technology by Dr.P.C.Sharma., S Chand & Co
3) Workshop technology by B.S.Raghuvamshi
4) Introduction to Manufacturing Processes , P N Rao , Vol 1 & Vol II, Tata Mc Graw Hill Publications
5) **Manufacturing Process- I & II & III- By Dr. Radhakrishna K**
6) Production Technology by R.K.Jain.
7) Manufacturing Technology I & II , Dr P C Sharma , S Chand & Co
8) Manufacturing Technology - P P Date , Jaico Publishing House
9) Foundry Technology –Dr. Radhakrishna.

MODEL QUESTION PAPER

SUBJECT : **MANUFACTURING TECHNOLOGY** – **I**   SUBJECT CODE :_____

TIME : **THREE HOURS**   TOTAL MARKS : **100**

_____

Note : 1) **Section – I** is compulsory .
   2) Answer any **TWO FULL QUESTIONS** FROM SECTION – **II, III & IV**
   3) Each **Full Question** in Section II, III & IV carries **FIFTEEN MARKS**
   4) Marks are indicated for questions at right side.

SECTION – I

Q – I) a) Fill in the blanks with **appropriate words**   **5X1= 5**
   i) _____ gas is used in Metal Inert gas welding.
   ii) Draft allowance is allowed in _____ making.
   iii) _____ invented the engine lathe.
   iv) _____ attachment is used for taper turning in lathe.
   v) With the help of _____ treatment metals acquire desired properties.

   b) State any five manufacturing processes with applications   05

SECTIO N – II

Q – II) a) State the importance of metal casting .   03
   b) Indicate five casting defects & give remedies for each   05
   c) Explain with neat sketch the Centrifugal Casting process   07

Q – III) a) Mention the differences between Open Die & Closed Die forging   05
   b) List at least five forging defects & their remedies   05
   c) Explain with neat sketch DIE FORGING   05

Q- I V) a) State five general properties & applications of Composite materials 05
   b) Explain five pattern making allowances   05
   c) Explain FULLERING with a suitable sketch   05

SECTION - III

Q – V) a) Explain with neat sketch TIG welding process   06
   b) Sketch the POWER PRESS& label its parts   05
   c) List the defects in welding   04

Q- VI) a) Describe the working principle of Rolling with a neat sketch   06
   b) Describe any one die accessories with neat sketch   05
   c) With a suitable sketch explain Three high rolling mill   04

Q- VII) a) Explain with neat sketch spot welding   05
   b) Define any five press operations   05
   c) Mention the advantages & limitations of hot working   05

SECTION – IV

Q – VIII) a) How do you specify the lathe   05

        b) Draw a twist drill & label its parts clearly   05

        c) Explain briefly the thread cutting procedure on the lathe   05

Q- IX)   a) With a neat sketch explain taper turning by taper turning attachment .   06

        b) Sketch & label all the parts of Radial Drilling Machine   05

        c)   Explain the knurling operation   04

Q- X)   a) With suitable notations define :

        i) Cutting Speed   ii) Feed   iii) Depth of Cut   06

        b) With simple sketches briefly explain :

        i) Reaming   ii) Tapping   06

        c)   Define machining time & mention its units   03

MECHANICAL MEASUREMENTS AND METROLOGY

Subject Title	:	**Mechanical measurements and metrology**
Subject Code	:	**M-**
Hours Per Week	:	**04**
Hours Per Semester	:	**64**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Introduction to measurements	06	16
2	Measuring instruments	08	21
3	Limits, fits and Tolerance	06	16
	SECTION-II		
4	Machine tool metrology	06	16
5	Transducers and strain gauges	08	20
6	Measurement of force, torque and pressure	08	20
	SECTTION-III		
7	Applied mechanical measurements	08	20
8	Miscellaneous measurement	06	16
9	Industry innovations	05	-
10	Tests	03	-
	Total	**64**	**145**

OBJECTIVES

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

1. Understand the principle of operation and calibration of an instrument.
2. Know different measuring device for a particular application.
3. Understanding the concepts of limits, fits and tolerance
4. Understand various testing tools for checking the alignment of machine tools
5 Understand the various transducers and application of strain gauges
6. Understand the different devices used to measure force, torque, and pressure
7 Understand the different devices used to measure Speed, Flow, and Temperature
8 Understand the different devices used to measure density, humidity, blood pressure

COURSE CONTENTS
1.0   Introduction to measurements
    1.1   Definition of measurement
    1.2   Significance of measurement,
    1.4   Methods of measurements
    1.5   Generalized measuring system
    1.3   Standards of measurements.
    1.6   Factors in selecting the measuring instruments

1.7 Terms applicable to measuring instruments: Precision and Accuracy, Sensitivity and Repeatability, Range, Threshold, Hysteresis, calibration

1.8 Errors in Measurements: Classification of errors, Systematic and Random error.

2.0 Measuring instruments
2.1 Introduction
2.2 Thread measurements: Thread gauge micrometer
2.3 Angle measurements: Bevel protractor, Sine Bar,
2.4 Gauges: plain plug gauge, ring Gauge, snap gauge, limit gauge
2.5 Comparators: Characterstics of comparators, Types of comparators
2.6 Surface finish -Definition, Terminology of surface finish
   Talysurf surface roughness tester
2.7 Co-ordinating measuring machine

3.0 Limits, Fits, Tolerances
3.1 Limit: Maxium limit, Minium limit, Basic size, Nominal size
3.2 Fit: Types of fits-Hole basis and Shaft basis system
3.3 Tolerance: Basic terminology, unilatrel and bilateral tolerance
3.4 Interchangability and selective assembly

4.0 Machine tool metrology
4.1 Testing instruments for machine tools alignment testing
4.2 Checking Parallelism, Straightness, runout, alignment testing of machine tool as per IS standard procedure.

5.0 Transducers and Strain gauges
5.1 Introduction.
5.2 Transducers: Characteristics, classification of transducers, two coil self inductance transducer, Piezoelectric transducer
5.3 Strain Measurements: Strain gauge, Classification, mounting of strain gauges, Strain gauge rosettes-two and three elements

6.0 Measurement of force, torque, and pressure
6.1 Introduction.
6.2 Force measurements: Spring Balance, Proving ring, Load cell
6.3 Torque measurement: Prony brake, Hydraulic dynamometer
6.4 Pressure measurement: Mcloed gauge,

7.0 Applied mechanical measurements
7.1 Speed measurement- Classification of tachometers, Revolution counters Eddy current tachometers
7.2 Displacement measurement- Linear variable Differential transformers (LVDT),
7.3 Flow measurement-Rotometers,
7.4 Temperature measurement- Resistance thermometers, Optical Pyrometer.

8.0 Miscellaneous measurements
8.1 Humidity measurement –hair hygrometer,
8.2 Density measurement-hydrometer,
8.3 Liquid level measurement –-sight glass, Float gauge
8.4 Biomedical measurement-Sphygmo monometer

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0   INTRODUCTION TO MEASUREMENTS
   1.1   Define measurement.
   1.2   Explain the significance of measurement.
   1.3   Explain direct and indirect comparison methods of measurement
   1.4   Explain with block diagram generalized measuring system.
   1.5   Explain primary and secondary standards of measurements
   1.6   List the factors to be considered while selecting the instruments.
   1.7   Define: Precision and Accuracy, Sensitivity and Repeatability, Reproducibility, Range, Threshold, Hysteresis, calibration with respect to measuring instruments
   1.8   Classification of errors in measuring instruments
   1.9   Explain systematic and random errors.

2.0   MEASURING INSTRUMENTS
   2.1   Explain the measurement of screw threads elements using Thread gauge micrometer
   2.2   Explain the construction and working of sine bar.
   2.3   Explain the construction and working of bevel protractor
   2.4   Sketch and explain: plain plug gauge, ring Gauge, snap gauge, limit gauge, feeler gauge
   2.5   Explain the characteristics of comparators
   2.6   Explain with sketch the working of mechanical comparator (Reed type)
   2.7   Explain with sketch the working of Electrical comparator
   2.8   Explain with sketch the working of optical comparator
   2.9   Explain basic terms of surface finish
   2.10   Explain the measurement of surface finish by Talysurf surface roughness tester
   2.11   Explain the role of co ordinate measuring machines (CMM)

3.0   LIMITS, FITS, TOLERANCES
   3.1   Outline the importance of concepts of limits and tolerance
   3.2   Explain different types of fits-Clearance, transistion, interference
   3.3   Explain unilateral and bilateral tolerance
   3.4   Explain hole basis and shaft basis system
   3.5   Explain Interchangability and selective assembly

4.0   MACHINE TOOL METROLOGY
   4.1   List the various testing instruments for machine tools alignment testing
   4.2   Explain the checking of parallelism of spindle axis to carriage movement in lathe
   4.3   Explain the checking of straightness of the carriage movement in lathe
   4.4   Explain the checking of run out of axis of centre in lathe
   4.5   Explain the checking for the vertical straightness of knee of milling machine

5.0   TRANSDUCERS AND STRAIN GAUGES
   5.1   Explain the characteristics of transducers
   5.2   State the requirement of transducers
   5.3   Out line the classification of transducers

5.4   Explain working of two coil self inductance transducers
5.5   Explain working of Piezo electric transducers
5.6   Explain the principle of strain gauge
5.7   Explain the mounting of strain gauge
5.8   Explain with diagram two element and three element strain gauge rosettes
5.9   Explain optical strain gauge

6.0   MEASUREMENT OF FORCE, TORQUE, AND PRESSURE
6.1   Outline the concepts
6.2   Sketch and explain the spring balance
6.3   Sketch and explain the Proving ring
6.4   Explain the piezoelectric load cell
6.5   Explain measurement of torque by proney brake
6.6   Explain working of hydraulic dynamometer
6.7   Explain working of Mcloed gauge

7.0   APPLIED MECHANICAL MEASUREMENTS
7.1   Outline the classification of tachometers
7.2   Sketch and explain revolution counter
7.3   Sketch and explain Eddy current tachometer
7.4   Explain the working of LVDT
7.5   Explain the measurement of flow of liquid using rotameter
7.5   Explain the principle of working of thermo couple.
7.6   Explain working of resistance thermometer
7.7   Explain working of optical pyrometer

8.0   MISCELLANEOUS MEASUREMENTS
8.1   Explain the working of hair hygrometer
8.2   Sketch and explain hydrometer
8.3   How the level of liquid can be measured using sight glass
8.4   Explain the principle of float gauge for liquid level measurement
8.5   How the blood pressure is measured using sphygmomanometer

REFERENCES

1. **"Mechanical measurements"** by Beckwith Marangoni and Lienhard, Pearson Education, 6th Ed., 2006
2. **" Metrology & Measurement"** by Anand K Bewoor,Vinay kulakarni **,**Tata McGraw hill New delhi 2009
3. **"Principles of Industrial instrumentation and control systems"** by Channakesava .R.Alavala,DELMAR cenage learning,2009
4. **"Principles of Engineering metrology"** by Rega Rajendra Jaico publishers-2008
5. **"Dimensional Metrology** "by Connie Dotson,DELMAR,cenage learning,2007
6. **"Instrumentation measurement and analysis"** by B.C.Nakara,K.K.chaudarysecond edition,Tata cgraw hill,2005
7. **"Engineering Metrology"** by R.K.Jain, Khanna Publishers, 1994.
8. **Mechanical Measurements by DOEBLIN**

DERARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING
THIRD SEMESTER
MODEL QUESTION PAPER
MECHANICAL MEASUREMENTS AND METROLOGY

Time: 3Hrs   **Max marks: 100**

Note:
1.Part-I is compulsory
2. Answer any **six full** questions from **Part-II, Part-III, and Part-IV**
Choosing at least **two** from each section

PART- I

1 A) Fill in the blanks with appropriate words:-   **5X1=5**
I) The actual difference between the true value and indicated value is _____.
ii) Rosette is _____grid strain gauge
iii) _____ device is used for blood pressure measurement
iv) The spring balance is used for measurement of _____.
v) The fluctuating experimental condition results in _____Error
   B) Write a note piezoelectric transducer.   **5**

PART-II

2 a) Define the following terms w.r.t measuring instrument
      i) Sensitivity ii) Hysteresis iii) Range   **6**
  b) Explain with block diagram generalized measuring system.   **5**
  c) Classify the errors in measuring instruments.   **4**
3 a) Explain with sketch bevel protractor   .   **5**
  b) Describe briefly the role of co ordinate measuring machines (CMM)   . **5**
  c)   State the characteristics of comparators   **5**
4 a) Sketch and explain optical comparator   **5**
  b) Explain Transition fit and clearance fit with an example.   **6**
  c) Differentiate between hole basis and shaft basis system   **4**

PART-III

5 a) State various testing instruments for machine tools alignment testing **4**
   b) Explain with diagram checking of parallelism of spindle axis to carriage movement
       in lathe.   **6**
   c) How the vertical straightness of knee of milling machine being checked . **5**
6 a) How are Transducers classified   . **5**
   b) Explain piezoelectric transducers   .   **6**
   c) State the characteristics of transducers   **4**
7 a) How are strain gauges classified   **4**
   b) What are ROSSETTE gauges? Explain two element Rosette gauge.   **6**
   c) How the torque is measured by proney brake   **4**

PART-IV

8 a) Sketch and label Mcloed gauge   **5**
   b) How the force is measured by Proving ring   **5**
   c) State the advantages of resistance thermometers.   **5**
9 a) Explain with sketch Eddy current tachometer   . **5**
  b) How the flow of liquid is measured by rotometer   **5**
  c) Describe briefly linear variable Differential transformers (LVDT),   **5**
10   Write short note on any **three** of the following   **5x3=15**
              i)   Hygrometer
              ii)   Interchangability and selective assembly
              iii)   Plain plug gauge
              iv)   Optical Pyrometer.

MECHANICAL TESTING &QUALITY CONTROL LABORATORY

Subject Title : **Mechanical Testing & Quality control Laboratory**

Subject Code : **M-**

Periods/Week : **06**

Periods/Semester : **96**

Time schedule

SL. No.	Name of Experiment	No of periods
	Mechanical Testing	
1	Hardness tests	06
2	Impact Test	06
3	Viscosity of oil	06
4	Test on Lubricants	06
5	Co-efficient of friction by Thurston oil tester	06
6	Tests on Universal testing machine	30
	Quality Control	
7	Linear measurements	06
8	Angular measurements	06
9	Screw thread measurements	06
10	Ultrasonic Testing to detect flaw	06
10	Dye penetrant test	03
11	Industry Institute interaction	05
12	Tests and revision	04
	Total	**96**

OBJECTIVES

On the completion of course a student should be able to:

1.0 Mechanical testing Laboratory – Understand the various material testing methods.

1.1 Define the various properties of materials such as: yield stress, Ultimate stress, percentage elongation, Young's Modulus.

1.2   Appreciate the importance of various mechanical properties such as hardness, impact strength. Perform tests to determine the above.

1.3   Conduct experiments on finding flash and fire points and co- efficient of viscosity of lubricants

1.4   Conduct experiments on finding Co-efficient of friction of oil.

1.5   Conduct tensile,compression,bending and shear tests on material by Universal testing machine

1.6   Study of various measuring instruments used in quality control area

1.7   Measurement of linear dimensions of objects

1.8   Measurement of angular dimensions of objects

1.9   Measurement of screw thread dimensions.

1.10   Know how to determine the surface and sub surface flaws in a product such as casting etc using ultrasonic unit

1.11   Know to determine the surface flaws by Dye penetrant. test

COURSE CONTENTS

1. Determination of impact strength of the material using Izod and Charpy's tests.
2. Determination of hardness of metal using Brinnel, Rockwell, and vicker hardness testing machines .
3. Determine co efficient of viscosity of oil by redwood viscometer.
4. Determine flash and fire point of lubricants.
5. Determine co efficient of friction of oil by using Thurston oil tester
6. Determination of yield stress, ultimate stress, percentage reduction in area, percentage elongation, Young's modulus by conducting tension test on Universal testing machine.
7. Determination of yield stress, ultimate stress, percentage of increase in area, Young's modulus by conducting compression test on Universal testing machine.
8. Conducting bending test on wood specimen by UTM
9. Study of measuring instruments such as dial gauge, micrometer, vernier height gauge, Vernier depth gauge, Gear tooth Vernier calliper, micrometer
10. Measurement of linear dimension by using vernier height gauge, Vernier depth gauge.
11. Determination of Angular dimensions by using combination set, sine bar, slip gauges and universal bevel protractor.
12. Determination of effective diameter of screw thread by using i) two wire method ii) three wire method.
13. Detection surface and sub- surface cracks by ultrasonic portable equipment.
14. Detection of surface defects by Dye penetrant test.

.

SCHEME OF EVALUATION

Serial no	Description	Marks

1	**Writing procedure**
	    a) One experiment on Mechanical testing
	    b) One experiment on Quality control
		10+10=20

2	**Conducting of Experiment**
	    a) One experiment on Mechanical testing
	        (Group of five)
	    b) One experiment on Quality control
	        (Individual)
		10+15=25

3	**Calculation,results,Inference(Both experiments)**	20+15=35
4	**Viva**	20
	Total	**100**

EQUIPMENT LIST FOR MECHANICAL TESTING & QUALITY CONTROL LAB

List of equipments needed for **Mechanical Testing & Quality Control Lab** :

1. Hardness Testing Machine
2. Impact Testing Machine
3. Red wood Viscometer
4. Thurston Oil Tester
5. Pensky Martin Flash & Fire point Equipment
6. Universal Testing Machine – (20 ton – 40 ton range)
7. Digital Vernier Calliper
8. Digital Vernier Height gauge
9. Gear Tooth Vernier
10. Universal Bevel Protractor
11. Digital Micrometer
12. Digital Screwgauge
13. Sine Bar & Slip Gauges
14. Portable Ultrasonic Equipment Tester
15. Spirit Level
16. Surface Plate (Granite)

BASIC WORKSHOP PRACTICE-II

(Foundry, Welding, sheet metal)

Subject Title : **Basic workshop practice-II**

Subject Code :

Periods per Week : **09**

Periods per Semester : **144**

TOPICANALYSIS

Sl.No.	TOPIC	Hrs Allotted
	FOUNDRY	
1	Study of Foundry Tools	03
2	Sand Mixing, Study of cope and drag	03
3	Practice in a single box and double box	03
4	Preparation of moulds and castings	36
	WELDING	
5	Study of Electric Arc welding tools & equipment	03
6	Study of Gas welding tools & equipment	03
7	Study of MIG and TIG welding equipment	03
8	Preparation of weld joints	36
	SHEETMETAL	
9	Study of Sheet Metal Tools & their uses	03
10	Preparation of lap joints	06
11	Preparation of utility articles	36
12	Tests an Revision	09
	Total	144

OBJECTIVES

On the completion of the course the student should be able to:

1.0 Understand the concepts of foundry
   1.1 Know the sand moulding procedures in a foundry.
   1.2 Prepare a mould sand mix.
   1.3 Identify various foundry shops hand tools.
   1.4 Prepare mould in two boxes, three boxes.
   1.5 Prepare a mould ready for casting with proper provision, of runners, risers and gates
   1.6 Preparation of simple aluminium castings
2.0 Welding
   2.1 Understand the operation of welding transformer and generator
   2.2 Handle the Arc welding setup for welding

2.3   Handle the gas welding setup for welding

2.4   Handle the MIG/TIG welding setup for welding

2.5   Handle the Electrode Holder for laying welding beads.

2.6   Perform various welding joint operations

3.0   Sheet metal

3.1   Handle the Sheet metal tools and their uses

3.2   Preparation of lap single and double grooved joints.

3.3   Soldering of joints.

3.4   Preparation of utility articles

COURSE CONTENTS

1   Foundry

1.1 Study of Foundry Tools and Equipment

1.2 Sand Mixing, Study of cope and drag

1.3 Practice in a single box

1.4 Cutting Practice by double box

1.5 Preparation of moulds-a)Solid bearing) Flange coupling)Split bearing e)Connecting rod) V – Pulley) Gear pulley

1.6 Preparation of simple aluminium castings

2.   Welding

2.1Study of arc welding tool and equipment

2.2Arc welding practice

2.3Study of gas welding tools and equipment

2.4Weld joint preparation

2.5 Gas welding-Lap joints, butt joints-joints

2.6 Preparation weld joints by using MIG welding

2.7 Preparation of weld joints by TIG welding

3.   Sheet metal

3.1Study Sheet Metal Tools & their uses

3.2Preparation of lap joints

3.3Soldering of the joints

3.4Riveting practice

3.5Preparation of utility articles such as a) Funnel b) Tray c) Water jug
    d) Boxes e) Can

<u>SCHEME OF VALUATION</u>

Two models may be prepared in combination of any two of the three shop practices and evaluation of the model should be done as per scheme mention below

Serial no	Description	Marks
1	Listing of tools & operations required for performing job	10
2	Marking of job	10
3	Operation performed	20
4	Dimensional accuracy of job	20
5	Finishing of job	20
6	Viva	20
	Total	**100**

MACHINE SHOP-I

Subject Title   : Machine shop-I

Subject Code   :

Periods per Week   :   **06**

Periods per Semester   :   **96**

OBJECTIVES

On the completion of the course the student should be able to:

1.0   Know the working of Lathe and be in a position to operate the same.

      1.1   Perform a plain turning operation on a lathe machine.
      1.2   Select proper tool to perform the job.
      1.3   Make use of various measuring instruments for taking dimensions.
      1.4   Perform various lathe operations on a lathe.
      1.5   Calculate the taper angle.
      1.6   Know the different taper turning methods on a lathe
      1.7   Turn the required tapers by swivelling the compound rest and tail stock set over method.
      1.8   Produce articles of industrial application such as ring gauges, plug gauges, handle etc.

2.0   Graded Exercises

A) STUDY EXERCISES

      2.1 Use of marking and measuring tools used in machine shop such as Surface plate, Angle plate, Scribing block, Try square, Combination set, Odd leg Caliper, Divider, dot punch, Center punch, Calipers, Vernier Calipers, Digital Calipers, Vernier height gauge, Outside and inside micrometers and Digital micrometers.

      2.2   Study of Lathe, Drilling machine, shaping machine and slotting machine. Study of drives and mechanisms used in these machines

      2.3   Study of Grinding of Lathe tools to the required angle

B) PRACTICE EXERCISES
- Turning practice on mild steel specimen to an accuracy of ± 0.25 mm.
- Preparing at least **FIVE** models involving the following operations.

Machine Shop (Turning)

2.4   Plain Turning
2.5   Step Turning
2.6   Taper Turning.
2.7   Turning Collars
2.8   Knurling
2.9   Facing
2.10   Chamfering,
2.11   Parting
2.12   Thread cutting (Cutting of External and Internal Threads - Right hand
        and Left hand threads)

C) SERVICING OF MACHINE TOOL(Lathe)

2.13   The dismantling some of the components of lathe and then assemble
        the same
2.14   List the faults associated with lathe and its remedies
2.15   The routine and preventive maintenance procedure for lathe

SCHEME OF EVALUATION

One model should be turned comprising of all the operations practiced in the shop practice and the same may be evaluated as per scheme shown below

Serial no	Description	Marks
1	**Listing of tools & operations required for performing job**	05
2	**Marking of job**	05
3	**Operation performed**	20
4	**Dimensional accuracy of job**	15
5	**Finishing of job**	20
6	**One question on servicing aspects of lathe**	15
7	**Viva**	20
	Total	**100**

THEORY OF MACHINES

Subject Title	:	**Theory of Machines**
Subject Code	:	**M-**
Hours Per Week	:	**04**
Hours Per Semester	:	**64**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Introduction	01	02
2	Basic kinematics of machines	10	25
3	Friction	09	23
	SECTION-II		
4	Transmission of power	10	26
5	Cams	09	24
	SECTION-III		
6	Governors	06	15
7	Mechanical vibrations	03	10
8	Balancing	08	20
9	Industry Institution Interaction	04	-
10	Tests and Revisions	04	
11	**Total**	**64**	**145**

General Objectives

On completion of the course, the student should be able to

1. Know the definitions of Theory of Machines
2. Understand the Kinematics of Machines, their Mechanisms & Inversions
3. Understand the friction involved in bearings, clutches & brakes
4. Know different methods of transmission of power
5. Understand different types of cams and their motions and also to draw cam profiles for various motions
6. Know different types of vibration and to understand critical speed of shaft
7. Understand balancing of masses in the same plane
8. Know different types of governors

Subject Content Details

1.0 Introduction
    1.1 Definition of TOM
    1.2 Sub – divisions of TOM
2.0 Basic kinematics of Machines
    2.1 Kinematic link or element

2.2 Types of links

2.3 Kinematic pair –types

2.4 Types of constrained Motions

2.5 Kinematic chain

2.6 Machine, Structure and Mechanism

2.7 Difference between Machine and Structure

2.8 Difference between Machine and Mechanism

2.9 Inversions

2.10 Types of Kinematic Chains

2.11 Four Bar Chain

      2.111 Beam Engine

      2.112 Coupling Rod of Locomotive

      2.113 Watt's Indicator Mechanism

2.12 Single Slider Crank Chain

      2.121 Pendulum Pump

      2.122 Oscillating cylinder engine

      2.123 Rotary I.C Engine

      2.124 Crank and Slotted Lever Quick Return Motion Mechanism

      2.125 Whitworth Quick Return Motion Mechanism.

2.13 Double Slider Crank Chain

      2.131 Elliptical trammel

      2.132 Scotch yoke mechanism

      2.133 Oldham's coupling

3.0 Friction

3.1 Introduction

3.2 Friction in Journal Bearing

3.3 Power Transmission in the above bearing

3.4 Friction in Thrust Bearing

      3.41 Pivot Bearing – Flat and Conical bearing

      3.42 Collar Bearing – Single and Multiple

3.5 Problems on bearings – assuming uniform pressure theory

3.6 Friction in Clutches

      3.61 Single Disc Clutch

      3.62 Multiple Disc Clutch

3.7 Problems on clutches – assuming uniform wear theory

3.8 Introduction to Brakes

3.9 Internal Expanding Brake (Mechanical & Hydraulic)

310 Disc brake

3.11 Dynamometer

3.12 Difference between Brake and Dynamometer

3.13 Difference between Brake and clutch

4.0 Transmission of Power

4.1 Types of Belt Drives

4.2 Length of belt –open and cross belt drives

4.3 Velocity Ratio, Ratio of driving Tensions, Centrifugal Tension and Initial
    Tension

4.4 Power Transmitted by belts(flat and V) and ropes

4.5 Maximum power transmitted by belt (without proof)

4.6 Problems on belt drives

4.7 Introduction to Gears

4.8 Classification of Gears

4.9 Spur Gear Terminology

4.10 Problems on gears

4.11 Introduction to Gear Trains

4.12 Types of Gear trains –Simple, Compound, Reverted and Epicyclic gear trains
4.13 Problems on Gear Trains

5.0 Cams
5.1 Introduction
5.2 Classification of cams
5.3 Classification of followers
5.4 Terminology of Radial disc cam
5.5 Displacement diagram for the following Motion of follower
     5.51 Uniform velocity
     5.52 Simple Harmonic Motion (SHM)
     5.53 Uniform Acceleration and Retardation Motion (UARM)
5.6 Velocity and acceleration during Out stroke and Return stroke of follower
    during SHM and UARM
5.7 Cam profile construction for
     5.81 Knife edge follower
     5.82 Roller follower

6.0 Mechanical Vibrations
6.1 Introduction
6.2 Terms used in Vibrations
6.3 Types of Vibrations
     6.31 Free Vibrations
     6.32 Forced Vibrations
     6.33 Damped Vibrations
6.4 Types of Free Vibrations- Longitudinal ,Transverse and Torsional
6.5 Critical or Whirling speed of a shaft

7.0 Balancing
7.1 Introduction
7.2 Static and Dynamic balancing
7.3 Balancing of single rotating mass in the same plane of projection
7.4 Balancing of several masses rotating in the same plane of projection
7.5 Problems on above (Analytical and Graphical methods)

8.0 Governors
8.1 Introduction
8.2 Types of Governors
8.3 Centrifugal Governor
8.4 Terms used in governors
8.5 Watt Governor
8.6 Porter Governor

Specific Instruction Objectives

1.0 Introduction
1.1 Define the term Theory of Machines
1.2 Define and explain briefly kinematics, dynamics, kinetics and statics

2.0 Basic kinematics of Machines
2.1 Define kinematic link and list its characteristics
2.2 Explain rigid, flexible and fluid link with examples
2.3 Define kinematic pair and explain in detail its classifications based on type
    of relative motion, type of contact and type of closure
2.4 Explain 3 types of Constrained Motion with examples
2.5 Define and explain kinematic chain. Give the relation between link, joint and
    kinematic pairs
 2.6 Define and Explain with examples machine, structure and mechanism

2.7 List the difference between Machine and Structure
2.8 List the difference between Machine and Mechanism
2.9 Explain Inversion with an example
2.10 List types of Kinematic chains
2.11 Explain with sketches, four bar chain and its inversions
2.12 Explain with sketches, single slider Crank Chain and its inversions
2.13 Explain with sketches, double slider Crank Chain and its inversions

3.0 Friction
3.1 Explain the advantages and disadvantages of Friction
3.2 With sketch explain friction in Journal Bearing
3.3 Solve a simple problem on Torque and Power transmission in Journal Bearing
3.4 Explain friction in thrust bearing
      3.41 Explain with sketch types of Pivot Bearings
      3.42 Explain with sketch types of collar Bearings
3.5 Simple problems on the above bearings involving calculation of Intensity of pressure, Friction torque and power lost in friction (Number of collars in Multiple collar bearings)
3.6 Define clutches and explain Friction in Clutches
      3.61 Explain with sketch single disc clutch
      3.62 Explain with sketch multiple disc clutch
3.7 Solve simple problems on clutches involving power transmission, dimensions of the   friction plates, number of active surfaces, intensity of pressure between discs, number of plates required and axial force to engage the clutch
3.8 Briefly explain brakes, its advantages and disadvantages
3.9 Explain with sketch Internal expanding brake(Both Mechanical & Hydraulic-
-actuated)
3.10 Explain with sketch Disc brake.
3.11 Explain Dynamometer
3.12 List the differences between Brake and Dynamometer
3.13 List the differences between Brake and Clutch

4.0 Transmission of Power
4.1 List the types of belt drives
4.2 Explain the equation to determine the length of belt in open and cross belt drives (Derivation of equation not required)
4.3 Explain the terms Velocity ratio, ratio of driving tensions, centrifugal tension and initial tension with related expressions
4.4 List the expressions to determine power transmitted by flat belt, v belt and rope drives
4.5 Explain the condition for Maximum power transmission
4.6 Solve simple problems involving length of belt, width of belt, power transmitted by belts and ropes ,number of v-belts/ropes
4.7 Briefly explain toothed wheel concept with advantages and disadvantages of Gear drives
4.8 List classification of Gears
4.9 Define and explain terms used in gears
4.10 Solve simple problems on gears involving exact centre distance, number of teeth on meshing gears, velocity ratio and power transmitted
4.11 Briefly give introduction to gear trains
4.12 With sketches explain different types of gear trains
4.13 Solve simple problems on simple and compound gear trains involving number of teeth on meshing gears, speed of Driver or Follower

5.0 Cams

    5.1 Briefly give introduction about cams

    5.2 List and explain with sketches, classification of cams

    5.3 List and explain with sketches, classification of followers

    5.4 Define and explain terms used in radial disc cams

    5.5 Draw and explain displacement diagram for the follower with Uniform velocity, simple harmonic motion and uniform acceleration and retardation motions

    5.6 Calculate velocity and acceleration during out stroke and return stroke of follower during SHM and UARM

    5.6 Draw the profile of the cam considering radial and offset for knife edge follower and roller follower during UV, SHM and UARM

6.0 Mechanical Vibrations

    6.1 Briefly explain the vibration phenomenon

    6.2 Define the terms used in vibrations

    6.3 Explain different types of vibrations

    6.4 With sketches explain different types of free vibrations

    6.5 Explain in detail critical or whirling speed of a shaft discuss the equation to determine critical or whirling speed (derivation not required)

7.0 Balancing

    7.1 Discuss the conditions for unbalance and the necessity of balancing

    7.2 Define and explain the static and dynamic balancing

    7.3 Explain in detail balancing of single rotating mass in the same plane of projection

    7.4 Explain in detail balancing of several masses rotating in the same plane of projection

    7.5 Solve simple problem on above conditions both by analytical and graphical methods

8.0 Governors

    8.1 Explain the function of a governor

    8.2 List the types of governors

    8.3 Explain with sketch working principle of centrifugal governor

    8.4 Explain various terms used in governors

    8.5 With sketch explain working of watt governor

    8.6 With sketch explain working of porter governor

Reference Books :

1. Kinematics of Machines---J B K Das, Sapna Publication

2. Theory of machines-------- R.S. Khurmi & J.K.Gupta , S.Chand publication

3 . Theory of machines------- P.L.Ballaney , Khanna publication

4. Theory of machines------- Thomas Bevan ,CBS publication

5. Theory of machines---------Malhothra & Gupta

6. Theory of machines---------S.S .Rattan ,Tata McGraw-Hill publication

7. Theory of machines---------R.K.Bansal ,Laxmi publication

8. Dynamics of Machines----J B K Das, Sapna Publication

Model Question Paper
Mechanical Engineering Board
Fourth Semester
2010-2011
THEORY OF MACHINES

Max.Marks:100   Time: 3Hrs

Note : 1. Question No.1 is compulsory
2. Answer any two full questions from each of the remaining sections
3. Any missing data may be suitably assumed

1. a) Fill in the blanks with appropriate word /words   5x1=5
  i) Hydraulic press is a _____ link.
  ii) Type writer constitutes a _____
  iii) The size of the cam depends on _____ circle.
  iv) The product of diametrical pitch and circular pitch is equal to_____
  v) The brakes are commonly used in cars_____

  b) Describe with a neat sketch single plate clutch .   5

SECTION-I

2. a) Define Theory of machines .   2
  b) Explain three types of constrained motions.   6
  c) Describe with a neat sketch , the crank and slotted lever quick return motion
    mechanism.   7

3. a) Explain with a neat sketch ,Scotch yoke mechanism .   6
  b) What is pivot bearing ? Give its applications.   4
  c) A conical pivot bearing supports a vertical shaft of 200 mm diameter. It is
    subjected to a load of 30 KN. The angle of the cone is 120 degree and the
    co-efficient of friction is 0.025 .Find the power lost in friction, when the speed
    is 140 rpm, assuming uniform pressure condition.   5

4. a) What is the function of clutch ?   2
  b) Differentiate between brake and clutch .   5
  c) A multiple disc clutch has five plates having four pairs of active friction
    surfaces . If the intensity of pressure is not to exceed 0.127 N / sq. mm ,find the
    Power transmitted at 500 rpm .The outer and inner radii of friction surfaces
    Are 125 mm and 75 mm respectively. Assume uniform wear.   8

SECTION-II

5. a) List the types of belt drives .   3
  b) Explain what do you understand by "Initial Tension in a belt" .   2
  c) An open belt running over two pulleys 240 mm and 600 mm diameters connects
    two parallel shafts 3 m apart and transmit 4 kw from the smaller pulley that
    rotatates at 300rpm .The co-efficient of friction between the belt and pulley is 0.3
    and the safe working. Tension is 10 N /mm width. Determine the
     i) minimum width of the belt ,
     ii) initial tension and
     iii) length of belt required .   10

6 a) List the classification of toothed wheels.   2
  b) Explain with a neat sketch ,the compound gear train .   7

c) Draw the nature of displacement, velocity and acceleration diagrams ,when the follower moves with SHM .   6

7 a) Define the following terms related to radial disc cam .
   i) Base circle ii) Prime circle & iii) Pitch circle   3
  b) Why the Roller follower is preferred over the knife edge follower.   2
  c) Draw the profile of the cam with knife edged follower is raised through a distance of 30 mm in 1 / 3 rd of revolution of the cam and is lowered in 1 / 3 rd revolution with equal intervals between these movements .The follower must move with the following data
     Out stroke-----SHM
     Return stroke---Constant acceleration. 80 degree & constant retardation. 40 degree .
10

SECTION-III

8. a) What is the function of a Governor ?   2
    b) Define the following terms used in Governors
       i) Height of the governor
      ii) Mean equilibrium speed
      iii) Sleeve lift   5
    c) Explain with a neat sketch ,the working of Centrifugal governor.   8

9 a) Explain the different types of Free vibrations with sketches .   10
  b) What do you mean by balancing ?   2
  c) Explain the balancing of single rotating mass by a single mass in the same plane   3

10 a) Briefly explain static balancing .   3
   b) A shat carries two rotating masses 5 kg and 2 kg attached at radii 300 mm and 600 mm respectively from axis of rotation .The included angle between two radii is 60 degree ,find the angular position and radius of rotation of balance mass if its mass is 3 kg . If no balance mass is used ,what is the out of balance force on shaft bearing at 400 rpm.   4
   c) Four masses m1,m2 ,m3 & m4 are 200 kg ,300 kg ,240 kg &260 kg respectively. The corresponding radii of rotation are 200 mm , 150 mm ,250 mm ,& 300 mm respectively and the angles between successive masses are 45 degree ,75 degree & 135 degree .Find the position and magnitude of the balance mass required by graphical method , if its radius of rotation is 200 mm .   8

THERMAL ENGINEERING-I

Subject Title	:	**Thermal Engineering-I**
Subject Code	:	**M-**
Hours Per Week	:	**04**
Hours Per Semester	:	**64**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Fundamental of thermodynamics	07	20
2	Laws of perfect gases	04	10
3	Thermodynamic processes in gases	12	30
	SECTION-II		
4	Fuels and combustion	05	15
5	Air Standard Cycles	10	25
	SECTTION-III		
6	Properties of Steam	10	25
7	Vapour power cycles	07	20
8	Industry innovations	05	-
9	Tests	04	-
	Total	**64**	**145**

On the completion of the course the students should be able to:
1. Apply fundamental concepts of thermodynamics to thermodynamic systems and understand various laws of thermodynamics.
2. Understand the laws of perfect gases
3. Understand the various thermodynamic processes
4. Know the different fuels and importance of calorific value of fuel
5. Know the different air standard cycles and their practical significance
6. Understand the various properties of steam and calculate properties of two phase system by using steam tables/ mollier charts.
7. Understand the basic Vapour power cycles

COURSE CONTENTS

1.0   Fundamentals and laws of Thermodynamics.

1.1   Definitions for system - boundary, surrounding, working fluid and state of a system.
1.2   Types of thermodynamic systems – closed, open and isolated systems with examples.
1.3   Properties of system- Intensive and Extensive properties with examples.

1.4   Definitions for properties like pressure (p), Volume (v), Temperature (T), Enthalpy (H), Internal energy (U) Specific heat at constant pressure(cp), specific heat at constant volume(CV) for a gas. and their units.

1.5   Definitions for quasi-static work, flow- work, specific heat.

1.6   Zeroth, first, second laws of thermodynamics, simple problems on conversion of Heat into Work and vice versa.

1.7   Steady flow energy equation (without proof),

2.0   Laws of perfect gases.

2.1   Brief explanation of perfect Gas Laws – Boyle's law, Charle's Law – -Gay-Lussac law-Avogadro's -Joule's law .

2.2   Derive characteristic gas equation - universal gas equation, universal gas constant and their relationship with molecular weight of gas.

2.3   Derivation for an expression showing the relationship between the two specific heats and characteristic gas constant.

2.4   Simple problems on gas equation.

3.0   Thermodynamic processes on gases.

3.1   Types of thermodynamic processes, Constant pressure, Constant volume, Isothermal, Free expansion, Isentropic, Polytrophic and throttling processes & equations representing the processes.

3.2   Concept of Entropy.

3.3   Derivation for work done, change in internal energy and Entropy for the above processes.

3.4   Calculation of heat supplied or rejected during the above processes.

3.5   Simple problems on the above processes.

4.0   Fuels and Combustion.

4.1   Definition of fuel. Types – solid, liquid and gaseous fuels examples and uses of different types of fuels.

4.2   Calorific values (Higher and lower) of fuels, Dulong's formula for calorific value. & calculation of calorific value of a fuel of given chemical composition.

4.3   Bomb calorimeter unit-Description-procedure for determination of C.V. of solid or liquid fuel using Bomb calorimeters.

4.4   Junker's Gas calorimeters unit – Description – determination of gas using Junker's calorimeter.

5.0   Air standard cycles.

5.1   Meaning of air standard cycle-its use-Reversible and irreversible process – reversible and irreversible cycles conditions for reversibility of a cycle.

5.2   Brief description of Carnot cycle with P.V. and T-S diagrams, Air standard Efficiency - Problems on Carnot cycle.

5.3   Brief explanation of Otto cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on Otto cycle.

5.4   Brief description of Diesel cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on Diesel cycle.

5.5 Brief description of Dual cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on dual cycle.

5.5 Reasons for the highest efficiency of Carnot cycle over other cycles working between same temperature limits.

6.0 Properties of steam.

6.1 Formation of steam under constant pressure, dryness, fraction and degree of superheat, specific volume.

6.2 Determination of enthalpy, internal energy, internal latent heat, entropy of wet, dry and superheated steam at a given pressure using steam tables and Mollier chart.

6.3 Simple direct problems on the above using tables and charts.

6.4 Vapour processes – simple problems using tables and charts.

7.0 Vapour Power cycle

7.1 Introduction – carnot cycle,

7.2 Rankine cycle

7.3 Modified rankine cycle

7.4 Simple problems on above

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0 Understand the Fundamentals and laws of Thermodynamics.

1.1 Define the various terms associated with the Thermodynamic System.

1.2 Define the 'State and System'.

1.3 Name the types of thermodynamic Systems.

1.4 Explain the closed system with Examples.

1.5 Explain the open system with examples

1.6 Explain the isolated system with Examples.

1.7 List the thermodynamic Properties of System.

1.8 Define the various thermodynamic properties.

1.9 Write examples for each type of property and its units of measurement.

1.10 State the number of properties required to define the state of a system.

2.10 Define "Specific heat at constant pressure" (C_p)

2.11 Define "Specific heat at constant volume (C_v)

1.11 Define the modes of energy transfers to and from a system.

1.12 Represent the state of a system on a Graph.

1.13 State the Zeroth law of thermodynamics.

1.14 State the first law of thermodynamics.

1.17 Write steady flow energy equation.

1.18 Write non-flow energy equation.

1.15 State the second laws of thermodynamics.

1.16 Solve problems dealing with conversion of heat into work and vice–versa

2.0 Understand the laws of perfect gases.

2.1 Define the term 'Perfect Gas'.

2.2 State "Boyle's Law"

2.3 State "Charle's Law"

2.3 State Gay-Lussac law

2.4 State "Avogadro's Law"

2.5 State "Joule's Law"

2.6   Derive Characteristic gas equation
2.7   Write the Universal Gas Equation
2.8   State relationship between characteristic gas constant (R), Universal gas constant (G) and molecular weight (M)
2.9   Derive the relationship connecting the two specific heats and Characteristic gas constant (R)
2.10   Solve simple problems using gas laws

3.0   Understand Thermodynamic Processes on gases.

3.1   List out the different thermodynamic processes on gases.
3.2   Derive expression for work done in Constant pressure process
3.3   Derive expression for work done in Constant volume process.
3.4   derive expression for work done in isothermal process.
3.5   Derive expression for work done in a polytrophic process.
3.6   Derive expression for work done in an isentropic process.
3.7   Explain free expansion process
3.8   Explain throttling process.
3.9   Compute the change in internal energy of gas during above process.
3.10   Write the relationship between heat supplied, internal energy and work done during above process
3.11   Derive the expression for change of Entropy for the above processes
3.12   Sketch pressure- volume and temperature - Entropy diagram for the above processes.
3.13   Solve simple problems on the above processes.

4.0   Know the fuels and combustion.

4.1   Define the term fuel.
4.2   Name different types of fuels with examples.
4.3   Compare solid, liquid and gaseous fuels
4.4   Outline the applications of different fuels.
4.5   Define "Higher Calorific Value" of a fuel.
4.6   Define "Lower Calorific Value" of a fuel.
4.7   Re-write Dulong's formula for calorific value from chemical composition of a fuel.
4.8   Estimate the calorific value using the above formula.
4.9   Explain with line diagram the components of a Bomb-Calorimeter.
4.10   Narrate the sequence of procedure for the determination of calorific value using Bomb calorimeter.
4.11   Explain the working principle of Junker's Gas Calorimeter with a line diagram.
4.12   Narrate the sequence of procedure in the determination of C.V. of a gaseous fuel with Junker's Calorimeter.

5.0   Appreciate the study of air standard cycles

5.1   Define the term 'Air Standard cycle'
5.2   Define the term 'Reversible Cycle'.
5.3   State the assumptions made in Air standard cycle
5.4   Explain with a line diagram the Working of Carnot cycle.
5.5   Derive the formula for the air standard efficiency of a Carnot cycle.
5.6   Solve simple problems on Carnot Cycle.
5.7   Explain the working of Otto Cycle with help of a line diagram.
5.8   Derive the formula for air standard Efficiency of Otto Cycle.

5.9   Solve simple problems on Otto Cycle.

5.10   Explain the working of a Diesel cycle with line diagrams.

5.11   Derive the formula for Air Standard Efficiency of Diesel Cycle.

5.12   Solve the simple problems on Diesel Cycles.

5.13   Derive the formula for Air Standard Efficiency of Dual cycle

5.14   Solve the simple problems on dual Cycles.

5.15   State the reasons for Carnot cycle being highly efficient than any other cycle working between the same temperature limits.

6.0   Understand the Properties of Steam

6.1   Define the various properties of steam

6.2   Compute the enthalpy, internal energy and entropy at given pressure.

6.3   Use of the steam tables

6.4   Interpret the data in steam tables to calculate enthalpy and entropy.

6.5   Compute the above values using Mollier chart.

6.6   Solve simple problems on the above.

6.7   Identify the various thermodynamic processes (Expansion & Compression of vapors)

6.8   Compute the work done, internal energy, enthalpy and entropy in each of the above processes.

6.9   Represent the above process on T-S and H-S diagrams

7.0   Understand the Vapour power cycles.

7.1   Explain with P-V and T-S diagram of Carnot cycle

7.2   Know the limitations of carnotcycle

7.3   Know flow diagram of simple rankine cycle

7.4   Derive an expression for efficiency of carnot cycle

7.5   Derive an expression for efficiency of rankine cycle

7.6   Understand the concept of Modified rankine cycle

7.7   Simple problems on above.

REFERENCES

1. **"Fundamental of thermodynamics"** by Richard E Snnatag,Claus Borgnakke,Gordon J Vanwylen, Wiley Student edition, 6th Ed.,

2. **" Basic and applied thermodynamics"** by P.K.Nag ,Tata McGraw hill New delhi 2009

3. **"Heat engines(Vol-I & Vol-II)"** by Patel and Karmachandani

4. **"I.C.Engine Fundamentals"** by Hey wood

5. **"Thermal Engineering "** "by R.S.Khurmi

6. **"Thermal Engineering"** by P.L.Balaney

7. **"Thermodynamics applied to heat engines"** by Lewitt.

8. **" Heat engines"** by Pandya and shah

9. **" Thermodynamics "** Robert Ballmer , Jaico Publishing House.

DERARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING
FOURTH SEMESTER
MODEL QUESTION PAPER
THERMAL ENGINEERING-I

Time: 3Hrs   **Max marks: 100**
Note:
1.Section-I is compulsory
2. Answer any **six full** questions from Section **-II, Section-III, and Section**-IV
Choosing at least **TWO** from each section

SECTION I

1 A) Fill in the blanks with appropriate words:-   **1X5**
I)   The Second law of thermodynamics defines_____.
ii)   The work done in constant volume process is _____
iii) _____ calorimeter is used for measuring calorific value of solid fuel
iv)   The Value of gas constant(R) is _____.
v)   The enthalpy of dry saturated steam _____with the increase in pressure
  B) Write a note on Junkers gas calorimeter   **5**

SECTION II

2 a) Define the following properties
      i) Specific weight ii) Enthalpy iii) Density   **6**
  b) Explain with Example open and close system.   **5**
  c) State the Zeorth law of thermodynamics   **4**
3 a)   Name the variables which controls the physical properties of perfect gas   **5**
  b) Derive the relation between two specific heats   **5**
  c)   A cylinder contain 3 kg of air at pressure of 300 bar and temperature of 27°C.Find
      the volume of air occupied by gas Assume R of air 287 J/Kg°K.   **5**
4 a) How polytrophic process differ from adiabatic process   **3**
  b) Derive an expression for work done during adiabatic process.   **5**
  c) An ideal gas at 30°C and 1 bar is compressed adiabatically from 5m3 to 1m3.
      Find the temperature, Pressure and the work done. Take γ-1.4   **7**

SECTION III

5 a) State the second law of thermodynamics   **5**
  b) What are the limitations of first law of thermodynamics   **4**
  c) A cyclic heat engine operates between a source temperature of 800°C and sink
      temperature of 30°C.What is the least rate of heat rejection per KW net out put
      of the engine.   **6**
6 a) State the assumption made in air standard cycles   .   **4**
  b) Derive the air standard efficiency of diesel cycle   **6**
  c)   A diesel engine has a compression ratio of 14 and cutoff takes place at6 %.find
      the air standard efficiency   **5**
7 a) State the conditions for reversibility   **4**
  b) Derive an expression for external work done during evaporation when the
      Steam is wet   **5**
  c) Dry saturated steam at a pressure of 10 bar is expanded isentropically to a pressure of
      0.7 bar, Using mollier diagram determine enthalpy drop   **6**

SECTION IV

8 a) Define the term Entropy **2**

b) Determine the entropy of 1 Kg of wet steam at a pressure of 10 bar and of dryness fraction 0.9 **7**

c) Explain how wet, dry, superheated steam are produced **6**

9 a) Distinguish between Higher calorific value and Lower calorific value of a fuel . **3**

b) Explain modified rankine cycle **5**

c) A simple rankine cycle works between boiler pressure of 3Mpa and condenser Pressure of 4 Kpa.The steam is dry saturated before throttling in the turbine Determine i) Rankine cycle efficiency ii)Work ratio iii) Specific fuel consumption **7**

10 Write short note on any **three** of the following **5x3=15**

       i) Rankine cycle

      ii) Constant pressure process

      iii) Extensive and Intensive properties

      iv) Bomb calorimeter

MANUFACTURING TECHNOLOGY - II

Subject Title	:	**Manufacturing Technology-II**
Subject Code	:	**M-**
Hours Per Week	:	**04**
Hours Per Semester	:	**64**

TOPIC ANALYSIS:

Sl.No	Major Topics	Hours	Weightage of Marks
	SECTION-I		
1	Shaper, Planer & Slotter	09	24
2	Grinding & Surface finishing	10	25
	SECTION-II		
3	Milling machine	10	25
4	Modern Machining	08	20
	SECTION-III		
5	Jigs and Fixtures	05	15
6	Plastic processing	05	15
7	Powder metallurgy	05	15
8	Cutting fluids and coolants	03	06
9	Industry institute interaction	05	
10	Test and Revision	04	
	Total	64	145

Objectives :

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

1. Understand the various Rectilinear machine tools like Shaper, Planer & Slotter, their uses, mechanisms & applications.
2. Understand the concepts of grinding, their techniques & super finishing processes & applications.
3. Understand milling machines, their construction, operations, indexing methods & milling cutters.
4. Understand Non-conventional machining methods, applications & limitations in manufacturing
5. Understand the importance of jigs & fixtures, methods & applications in manufacturing
6. Understand the plastic processing methods, applications & limitations in manufacturing
7. Understand the concepts of powder metallurgy, methods, process & applications in manufacturing.
8. Understand the importance & purpose of cutting fluids & coolants & their types & uses.

CONTENTS
1.0 Shaper, Planer & Slotter
    1.1 Introduction to Shaper & Classification
    1.2 Specifications of Shaper
    1.3 Principal parts of shaper.
    1.4 Shaper Mechanisms &Shaper Operations
    1.5 Cutting Speed, Feed, Depth of cut & Machining time.
    1.6 Simple problems.
    1.7 Introduction to Planer & Classification
    1.8 Specifications of Planer

1.9   Principal parts of Planer

1.10 Planer Mechanisms & Operations

1.11 Differences between Planer & Shaper

1.12 Introduction to Slotter & Classification

1.13 Principal parts of Slotter

1.14 Specifications of Slotter

1.15 Slotter Mechanisms & Operations

1.16 Difference between Planer & Slotter.

2.0 Grinding & Surface finishing
- 2.1 Introduction to grinding & Classification
- 2.2 Plain Cylindrical grinding machines
- 2.3 Grinding wheels
- 2.4 Abrasives & classification.
- 2.5 Bond & bonding.
- 2.6 Grit, Grade & Structure of wheels.
- 2.7 Specification of wheels.
- 2.8 Types of grinding wheels.
- 2.9 Selection of grinding wheels.
- 2.10 Mounting of grinding wheels.
- 2.11 Glazing and loading of wheels.
- 2.12 Dressing and truing of wheels.
- 2.13 Balancing of wheels.
- 2.14 Diamond wheels.
- 2.15 Introduction to surface finish.
- 2.16 Surface finishing operations.

3.0 Milling machine
- 3.1 Introduction to milling and classification.
- 3.2 Column and knee type milling machine & copy milling machine.
- 3.3 Milling cutters and classification.
- 3.4 Fundamentals of milling processes
- 3.5 Milling machine operations.
- 3.6 Indexing methods.
- 3.7 Cutting speed, feed, depth of cut and machining time.
- 3.8 Gear hobbing

4.0 Modern machining
- 4.1 Introduction to modern machining.
- 4.2 Differences between conventional and non-conventional methods.
- 4.3 Classification.
- 4.4 Principle of working of - Ultrasonic machining, Electric discharge machining, Abrasive jet machining and Laser beam machining.
- 4.5 Applications, merits and demerits of above methods.

5.0 Jigs and Fixtures
- 5.1 Introduction to jigs and fixtures.
- 5.2 Definition of jig and fixtures.
- 5.3 Types of jigs and fixtures.
- 5.4 Applications & merits of jig and fixture.

6.0 Plastic processing
- 6.1 Introduction to plastics.
- 6.2 Types of plastics.
- 6.3 Plastic processing – Moulding process, compression, transfer, injection & Extrusion.
- 6.4 Principle of thermoforming and calendaring.

7.0 Powder metallurgy

7.1   Basic concepts of powder metallurgy.
7.2   Methods of powder metallurgy.
7.3   Process for powder metallurgy.
7.4   Secondary operations for powder metallurgy.
7.5   Applications, merits and limitations of powder metallurgy.

8.0   Cutting fluids and Coolants
8.1   Introduction.
8.2   Purpose and Properties.
8.3   Coolants and lubricants for different operations.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0   Shaper, Planer & Slotter
1.1   Classify the shapers and explain the same.
1.2   Specifications of Shaper
1.3   Draw the line diagram of standard shaper with parts.
1.4   List the shaper mechanisms and study of hydraulic shaper mechanism.- Crank & Slotted Link mechanism
1.5   List shaper operations.
1.6   Definition of cutting speed, feed, depth of cut & machining time.
1.7   Simple problems.
1.8   Classify the Planers and explain the same.
1.9   Specifications of Planer
1.10 Draw the line diagram of standard planer with parts.
1.11 List the planer mechanisms and study of open and cross belt drive mechanism.
1.12 List planer operations.
1.13 Differences between planer & shaper
1.14 Classify slotter and explain the same.
1.15 Draw the line diagram of slotter with parts.
1.16 Specifications of Slotter
1.17 List slotter mechanisms & operations
1.18 List the differences between planer & slotter.

2.0   Grinding & Surface finishing
2.1   Introduction to grinding & Classification
2.2   Study of plain cylindrical grinding machine.
2.3   Explain grinding wheels
2.4   Explain abrasives & their classification.
2.5   Explain bond & bonding.
2.6   Explain grit, grade & structure of wheels.
2.7   Explain specification of wheels.
2.8   List the types of grinding wheels.
2.9   List the factors for selection of grinding wheels.
2.10 Explain mounting of grinding wheels.
2.11 Explain glazing and loading of wheels.
2.12 Explain dressing and truing of wheels.
2.13 Explain balancing of wheels.
2.14 Short note on diamond wheels.
2.15 Explain lapping, honing, super finishing and electroplating with neat sketches.
2.16 Explain polishing, buffing, pickling and oxidizing.

3.0   Milling machine
3.1   Introduction to milling and classification of milling machines.
3.2   Sketch & Explain – 1) Column & Knee Type Milling Machine 2) Copy Milling machine
3.3   Explain the standard milling cutters & classify the milling cutters.
3.4   Sketch & Explain Up Milling & Down Milling
3.5   Explain different Milling machine operations – plain , end , slot , T , gear cutting, grooves & Splines.

3.6   Explain Direct, Simple, angular & Compound Indexing.
3.7   Define Cutting speed, feed, depth of cut and machining time
3.8   Explain Gear Hobbing
3.9   Simple problems on above Indexing methods

4.0   Modern machining
     4.1   Explain non-conventional / modern machining
     4.2   Explain differences between Conventional & Non-conventional Machining methods
     4.3   Classification of Non-conventional machining methods.
     4.4   Sketch & Explain Ultra sonic machining, Electro Discharge machining, Abrasive Jet Machining & Laser Beam Machining.
     4.5   Explain Applications, merits & demerits of above methods.

5.0   Jigs and Fixtures
     5.1   Explain the jig & fixture
     5.2   Definition of jigs & fixtures, principles of location of jigs.
     5.3   Explain the different types of jigs & fixtures.
     5.4   Explain the various applications of jigs & fixtures.
     5.5   Materials used for jigs & fixtures.

6.0   Plastic processing
     6.1   Explain the importance of plastics in manufacturing process.
     6.2   Explain briefly Polymerization process – Addition Polymerization & Condensation Polymerization
     6.3   Explain briefly the additive agents – Plasticizers, Fillers, Catalysts, Initiators, Dyes & Pigments & solvents.
     6.4   Explain briefly plastic processing -Moulding process, Compression, Transfer, Injection &
     6.5   Extrusion
     6.6   Explain briefly machining of plastics
     6.7   Explain briefly – Calendaring & Blow Moulding of plastics

7.0   Powder metallurgy
     7.1   Explain the concept of powder metallurgy.
     7.2   Explain the methods of metal powder manufacturing – Atomization, Electrolytic deposition, Reduction, Crushing & Milling, Granulation & Shotting.
     7.3   Explain with sketches process for powder metallurgy – Mixing, Compacting & sintering
     7.4   Explain secondary operations -
     7.2   Methods of powder metallurgy.
     7.3   Process for powder metallurgy.
     7.4   Secondary operations for powder metallurgy.
     7.5   Applications, merits and limitations of powder metallurgy.

8.0   Cutting fluids and Coolants
     8.1   Explain importance of cutting fluids and coolants.
     8.2   Explain purpose and Properties.
     8.3   Applications of Coolants and lubricants for different operations.
     8.4   Name different cutting fluids & coolants.

Text Books:
     1. Manufacturing Technology -2 By Mohammed Saifulla Saikh. Sapna Publications.

REFERENCE BOOKS
     1)   Workshop Technology by Hazara choudary VOL - I & VOL – II.
     2)   Production Technology by Dr.P.C.Sharma., S Chand & Co
     3)   Workshop technology by B.S.Raghuvamshi
     4)   Introduction to Manufacturing Processes , P N Rao , Vol 1 & Vol II, Tata Mc Graw Hill Publications
     5)   Production Technology by R.K.Jain.
     6)   Manufacturing Technology I & II , Dr P C Sharma , S Chand & Co

7) Manufacturing Technology - P P Date , Jaico Publishing House
8) Foundry Technology –Dr. Radhakrishna.

MODEL QUESTION PAPER

SUBJECT : **MANUFACTURING TECHNOLOGY** – II   SUBJECT CODE :_____
TIME : THREE HOURS   TOTAL MARKS : 100

_____

Note : 1) **Section – I** is compulsory .
       2) Answer any **TWO FULL QUESTIONS** FROM SECTION – **II, III & IV**

SECTION – I

Q – I) a) State a) Fill in the blanks with appropriate words   **1X5= 5**
     i)   The vertical shaper is also called as _____
     ii) Maximum amount of material is removed in _____ milling machine.
     iii) Laser beam machining is a type of _____ machining.
     iv) _____ is used to guide the tool only.
     v)   _____ is used for carrying away the heat generated between the cutting tool & workpiece.

b) Explain briefly the Jigs & Fixtures   **05**

SECTIO N – II

Q – II) a) Explain with a neat sketch Whithworth Quick Return Mechanism of Shaper.   07
     b) List the various types of bonds used in grinding wheels.   03
     c) Explain briefly Vitrified bonding process   05

Q – III) a) Mention the differences between Shaper & Slotter machines   05
     b) Draw the standard Shaper & list its main parts   05
     c) Explain briefly the surface grinders.   05

Q- I V) a) Explain briefly Dressing & Truing for a grinding wheel   05
     b) Define Honing, Lapping & Super finishing processes   05
     c) List & briefly explain five grinding operations   05

SECTION – III

Q – V) a) Explain with neat sketch Ultra Sonic Machining process   06
     b) List all the indexing methods. Explain Compound Indexing procedure.   06
     c) List the limitations of non-conventional machining processes   03

Q- VI) a) With a block diagram briefly explain Plano-Miller.   05
     b) List the advantages of Non Traditional Machining processes.   05
     b) Explain briefly the procedure of checking Gear Teeth dimensions   05

Q- VII) a) Explain briefly the T Slot cutting operation in Milling machine   05
     b) Sketch Up Milling & Down Milling Processes.   05
     c) Sketch & name the parts of L B M hot working   05

SECTION – IV

Q – VIII) a) List the various properties of cutting fluids. 05

    b) What are the advantages of Powder metallurgy. 05

    c) List the methods of Plastics processing. 05

Q- IX)   a) Explain briefly the Powder Metallurgy process with suitable sketches. 06

    b) Give the classification of lubricants & give applications for each. 06

    c) List the various types of lubricants 03

Q- X)   a) Write short notes on the following : (5 x 3) = 15

    i) List the various types of jigs . Explain briefly any one of them.

    ii) Machining of Plastics

    iii) Explain the basic principles of location for jigs.

FLUID POWER ENGINEERING

Subject Title   :   **Fluid Power Engineering**
Subject Code   :   **M-**
Hours Per Week   :   **04**
Hours Per Semester   :   **64**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION - I		
1	Introduction to Fluid Power Engineering	02	05
2	Fluid Power Fundamentals	03	05
3	Pumps	04	10
4	Valves	04	10
5	Actuators & accessories	06	15
	SECTION - II		
6	Pipes, Hoses and Fittings	04	10
7	Hydraulic Symbols and Design of circuits	08	25
8	Fundamentals of Pneumatics	02	03
9	Pneumatic Components	04	10
10	Pneumatic Symbols as per ISO1219	01	02
	SECTION - III		
11	Design of Pneumatic circuits	07	25
12	Combination circuits	03	10
13	Fluidics/Fluid Logics	04	10
14	Maintenance	02	05
15	Industry Institution Interaction	06	-
16	Tests	04	-
	Total	**64**	**145**

OBJECTIVES
On the completion of the course the students should be able to:
- Know what is fluid power
- Know the importance of fluid power in automation
- Understand the concepts behind hydraulic and pneumatic systems
- Learn transmission of fluid power
- Recognize and use components of hydraulic and pneumatic systems
- Explain the construction and working of fluid system components
- Build a circuit for hydraulic or pneumatic system
- Apply the designed circuit to a real world scenario
- Know the importance of fluid sensors and logic behind these circuits
- Understand the schedule maintenance for fluid system.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1. **Introduction to Fluid Power Engineering**
    1.1   Define Fluid Power Engineering
    1.2   Brief about Historical perspective and general aspects
    1.3   Explain Role of Fluid Power Engineering in today's Industrial Automation
    1.4   Indicate the Elements of Automation and types
    1.5   Clarify the Aims of automation

2. **Fluid Power Fundamentals**
    2.1   Introduction
    2.2   Discus Fluid Power
    2.3   Explain Basic Methods of Transmission of power
    2.4   Briefly describe Fluid Systems

3. Pumps
    3.1   Define Pumps
    3.2   Classify Pumps
        3.2.1   Hydrodynamic
                - Centrifugal pumps, External Gear Pump, Lobe, Vane pumps
                - Axial pumps-
                      piston-axial
                      piston-inline
                      piston-radial

4. **Valves**
    4.1   Sketch and explain pressure control valves-relief valve, balance valve
    4.2   explain pressure reducing valves
    4.3   Discuss the importance of directional control valve
            - what is control?
            - explain the construction of poppet valve, spool valve, construction of 2,3
            and 4 way direction control valve.
    4.4   Flow control valve
            - Understand the significance of non-return/check valves
            - know the construction and working of Non return valve
            - sketch and explain pilot operated sequence valve

5. **Actuators**
    5.1   Define actuators
    5.2   Understand the linear actuators
            - Cylinders
            - Construction and working of cylinders
            - Construction and working of single acting and double acting

    5.2   Know the importance of Rotary actuators
            - Hydraulic Motor
                - Unidirectional
                - Bidirectional
            - explain the construction of

- Gear, vane, piston actuators

6. Accessory Components
    6.1   What are reservoirs?
    6.2   Know the construction, working and uses of different accumulators
            Like – weight loaded, spring loaded, gas loaded.
    6.3   What is role played by Intensifier?
               - explain the construction, working and uses of an intensifier.
    6.4   conductors/pipes; pipe fittings

7. Design of Hydraulic circuits
    - List of components
    - understand and use symbols
    - Introduction to design of hydraulic circuits
    - Create basic hydraulic circuits
    - Meter in circuits
    - Meter out circuits
    - bleed off circuits
    - Accumulator circuits
    - sequencing circuits
    - Regenerative circuits
    -pressure reducing circuits

       E.g.: Hydraulic circuit for a Robot ARM

8. Fundamentals of Pneumatics
    8.1   Define Pneumatics
    8.2   Applications of Pneumatics
    8.3   Gas Laws, Pascal Law

9. Pneumatic Components
    9.1   Air compressors
    9.2   Types of air compressors-
              - reciprocating piston compressor
              - Diaphragm compressor
              - Vane compressor
    9.3   reservoirs/air receiver
    9.4   FRL – unit- construction and working
    9.5   valves
              - direction control valves 2/2, 3/2, 4/2 , 5/2 and 5/3 valve controls
              - manual
              - mechanical
              - pneumatic
              - electro pneumatic
              - combination of any 2

9.6   actuators
         9.6.1   cylinders- single acting and double acting
         9.6.2   air motors- piston motor, gear motor, sliding vane motor

10 Pneumatic Symbols
     10.1   Port markings
     10.2   ports and positions
     10.3   symbols as per ISO1219/ ANSI

11 Pneumatic circuits
     Difference between Hydraulic circuits and pneumatic circuits
     11.1   Basic pneumatic circuit
     11.2   control of double acting cylinder using 4/2 DCV
     11.3   pilot controlled double acting cylinder 4/2 DCV
     11.4   speed control circuit for a double acting cylinder
     11.5   semi-automatic material handling circuit
     11.6   Time delay circuits e.g: Sorting of objects, punching operations, etc

12 Combination circuits
     12.1   advantages of combination
     12.2   hydropneumatic / pneumohydraulic circuits
     12.3   air over oil circuit
     12.4   air over oil intensifier circuit
     12.5   mechanical hydraulic servo system
     12.6   electro hydraulic system
     12.7   comparison of hydraulic, pneumatic and hydropneumatic systems

13 Fluidics/ Fluid Logics
     13.1   Introduction
     13.2   Advantage, disadvantage and application of fluidics
     13.3   fluidic elements
     13.4   classification of fluidic devices
     13.5   fluid logic devices
               - Bi-stable flip flop
               - AND gate
               - OR-NOR gate
     13.6   Fluid Sensors
         -Interruptible sensors
         -Jet Sensors
         -Reflex Sensors
         -Back pressure sensors

14 Maintenance
     14.1   maintenance of hydraulic system
         - common faults in hydraulic system
         - simple visual checks of oil
         - causes of contamination
         - preventive measures

14.2   common problems in pneumatic systems
        -maintenance schedule of pneumatic systems

COURSE CONTENTS

1. **Introduction to Fluid Power Engineering**
    1.1   Fluid Power Engineering
    1.2   general aspects
    1.3   Role of Fluid Power Engineering in today's Industrial Automation
    1.4   Elements of Automation and types
2. **Fluid Power Fundamentals**
    2.1   Introduction
    2.2   Methods of Transmission of power
    2.4   Fluid Systems

3. **Pumps**
    3.1   Pumps
    3.2   Classification of Pumps
        3.2.1   Hydrodynamic
                    - Centrifugal pumps, External Gear Pump, Lobe, Vane pumps
                    - Axial pumps-piston-axial ,piston-inline, piston-radial
4. **Valves**
    4.1   pressure control valves-relief valve, balance valve
    4.2   pressure reducing valves
    4.3   directional control valve
                -poppet valve, spool valve, construction of 2,3 and 4 way dcv.
    4.4   Flow control valve
                - non-return/check valves
                -pilot operated sequence valve
5. **Actuators**
    5.1   actuators
    5.2   Linear actuators
                - Cylinders
                - single acting and double acting

    5.3   Rotary actuators
                - Hydraulic Motor
                    - Unidirectional
                    - Bidirectional
                        -Gear, vane, piston actuators
6. **Accessory Components**
    6.1   Reservoirs
    6.2   Accumulators
                – weight loaded, spring loaded, gas loaded.
    6.3   Intensifier
    6.4   conductors/pipes; pipe fittings

7. **Design of Hydraulic circuits**
    - components

- symbols
- Hydraulic circuits
- Basic hydraulic circuits
- Meter in circuits
- Meter out circuits
- Bleed off circuits
- Accumulator circuits
- sequencing circuits
- Regenerative circuits
-pressure reducing circuits

E.g.: Hydraulic circuit for a Robot ARM

8. **Fundamentals of Pneumatics**
      8.1   Pneumatics
      8.2   Applications of Pneumatics
      8.3   Gas Laws, Pascal Law

9. **Pneumatic Components**
      9.1   Air compressors
      9.2   Types of air compressors
                  - reciprocating piston compressor
                  - Diaphragm compressor
                  - Vane compressor
      9.3   reservoirs/air receiver
      9.4   FRL – unit
      9.5   valves
                  - direction control valves 2/2, 3/2, 4/2 , 5/2 and 5/3
              valve controls
                  - manual
                  - mechanical
                  - pneumatic
                  - electro pneumatic
                  - combination of any 2

      9.6   actuators
              9.6.1   cylinders- single acting and double acting
              9.6.2   air motors- piston motor, gear motor, sliding vane motor

10   **Pneumatic Symbols**
      10.1   Port markings
      10.2   ports and positions
      10.3   symbols as per ISO1219/ ANSI

11   **Pneumatic circuits**
      Hydraulic circuits and pneumatic circuits
      11.1   Basic pneumatic circuit
      11.2   control of double acting cylinder using 4/2 DCV

11.3   pilot controlled double acting cylinder 4/2 DCV
11.4   speed control circuit for a double acting cylinder
11.5   semi-automatic material handling circuit
11.6   time delay circuit

12   **combination circuits**
12.1   advantages of combination
12.2   hydropneumatic / pneumohydraulic circuits
12.3   air over oil circuit
12.4   air over oil intensifier circuit
12.5   mechanical hydraulic servo system
12.6   electro hydraulic system
12.7   comparison of hydraulic, pneumatic and hydropneumatic systems

13   **Fluidics/ Fluid Logics**
13.1   Introduction
13.2   Advantage, disadvantage and application of fluidics
13.3   fluidic elements
13.4   classification of fluidic devices
13.5   fluid logic devices and types
13.6   Fluid Sensors and types of sensors

14   **Maintenance**
14.1   maintenance of hydraulic system
        - common faults in hydraulic system
        - simple visual checks of oil
        - causes of contamination
        - preventive measures
14.2   common problems in pneumatic systems
        -maintenance schedule of pneumatic systems

Text Books: 1.Fluid Power Engineering By R K Hegde & Neeranjan Murthy, Sapna Publishers.

REFERENCES

1. **Hydraulic and Pneumatic Controls-**
   Author: K.S.Sundaram,
   Publisher: S. Chand

2. **Robotics and Industrial Automation**
   Author: R.K. Rajput
   Publisher: S.Chand

3. **Oil Hydraulic and System**
   Author: S.R.Majumdar
   Publisher: McGraw Hill

4. **Pneumatic Systems**
   Author: S.R.Majumdar
   Publisher: McGraw Hill

5. **Pneumatic Controls**
   Author: Joji P
   Publisher: Wiley India Ltd

6. **Pneumatic Systems**
   Author: Sirohi
   Publisher:

7. **Fluid Power with Applications**
   Author: Anthony Esposito

   Publisher: McGraw Hill

8. **Pneumatic Controls**
   Author: **Joji P**
   Publisher: **Wiley India Pvt Ltd.**

9. Hydraulics & Pneumatics – Andrew Parr , Jaico Publishing House.

10. Centrifugal Pumps – Val S Lobanoff & Robert R Ross, Jaico Publishing House

DERARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING
FOURTH SEMESTER
MODEL QUESTION PAPER
FLUID POWER ENGINEERING

Time: 3Hrs   **Max marks: 100**
   Note:
   1.Section I is compulsory
   2. Answer any **six full** questions from **Section II, Section III, and Section IV**
   Choosing at least **two** from each section

SECTION -I
1 A) Fill in the blanks with appropriate words:-   **1X5**
I)   The gear pump is _____type of pump
ii)   A 4/3 valve consists of ____positions ____ports
iii)   According to Pascal law the pressure enclosed fluid is ____through out the practical
        system
iv)   The _____ valves are used to restrict the flow in one direction.
v)   In spool valve, the spools are moving _____within the valve body.
  B)   Explain the basic logics used in fluid logics.   **5**

SECTION -Ii

2 a)   State the importance of Fluid Power in Industrial Automation   5
  b)   List the elements of automation   **5**
  c)   State the Basic Methods of Transmission of power.   **5**

3 a)   Give the classification of pumps   .   **5**
  b)   Sketch and explain external gear pump   **5**
  c)   Explain briefly 4/3 direction control valve.   **5**

4 a)   Define actuators   2
  b)   Explain with a neat sketch Construction and working of a double acting cylinder **8**
  c)   Explain the working of unidirectional hydraulic motor   **5**

SECTION -III
5 a) What are Reservoirs?   2
   b) Explain the function of hydraulic accumulator-spring loaded with a neat sketch. **7**
   c) Explain the working of an intensifier with a neat sketch   .   **6**

6 a)   Define pneumatics and mention applications of pneumatics.   .   **5**
  b)   Sketch and explain reciprocating piston compressor   **6**
  c)   Explain briefly sliding vane motor   **4**

7 a)   Write brief note on ports and positions   **4**

b) Explain the control of double acting cylinder using 4/2 DCV   **6**

c) Sketch and explain Basic pneumatic circuit   **5**

SECTION -IV

8 a) State the advantages of combination of circuits   **5**

  b) Compare Hydraulic and pneumatic systems   **5**

  c) Briefly explain electro hydraulic system   **5**

9 a) State any 3 advantages and 3 disadvantage of Fluid Logic/Fluidics   .   **6**

  b) with an example, the implementation of AND logic   **5**

  c) Briefly explain-Reflex Sensors   4

10 Write short note on any **three** of the following

                                                                                                 5x3=15

        a. common faults in hydraulic system

        b. causes of contamination

        c. Preventive measures.

        d. Maintenance schedule

        e. Common faults in pneumatic system

FLUID POWER LAB

Subject Title : **Fluid Power Lab**

Subject Code :

Periods/Week : **06**

Periods/Semester : **96**

TIME SCHEDULE

S. No.	Name of Experiment	No of Hours allotted
A) Fluid Mechanics and Fluid Machines		
1	Venturimeter	06
2	Notches	06
3	Pipe Friction	06
4	Pelton Wheel	06
5	Kaplan turbine	06
6	Francis turbine	06
7	Reciprocating pump	06
8	Centrifugal Pump	06
9	Jet Pump	03
B)	**Pneumatics Circuits**	40
10	**Industry innovations**	05
11	**Tests and Revisions**	06
	Total	**96**

OBJECTIVES

On Completion of the Course, the student should be able to:

1. Appreciate the practical applications of venturimeter.

2. Appreciate the practical applications of Notches

3. Understand the importance of pipe friction in practical environment.

4. Understand the method of evaluating the performance characteristics of pelton wheel, for a given set of input data.

5. Understand the method of evaluating the performance characteristics of Kaplan turbine, for a given set of input data.

6. Understand the method of evaluating the performance characteristics of Francis turbine for a given set of input data.

7. Understand the method of evaluating the performance characteristics of the reciprocating pump

8. Understand the method of evaluating the performance characteristics of the Centrifugal pump

9. Study the working of a jet pump

10. Prepare simple hydraulic & pneumatic circuits.

11. Compare the performance of hydraulic & pneumatic systems.

12. Identify the faults & suggest remedies in hydraulic & pneumatic circuits.

13. Select proper circuit considering its application

14. Connect different components as per given drawing

15. Perform repairing and replacement of defective components in the circuit

16. Draw the hydraulic and pneumatic circuits using symbols

COURSE CONTENTS

1. Determination of Coefficient of discharge of Venturimeter.

2. Determination of hydraulic coefficients of Rectangular and V-Notch

3. Determination of major losses in pipes due to friction.

4. Draw the performance characteristics for Pelton wheel.

5. Draw the performance characteristics for Kaplan turbine.

6. Draw the performance characteristics for Francis turbine.

7. Draw the performance characteristics for of a reciprocating pump

8. Draw the performance characteristics for Centrifugal pump

9. Study of a jet pump

10. Control of actuators by simple hydraulic and pneumatic circuits.

11. Demonstration of meter in and meter out circuit.

12. Demonstration of sequencing circuit.

13. Demonstration of hydraulic circuit for shaper machine.

14. Demonstration of pneumatic circuit for speed control of double acting cylinders.

15. Demonstration of pneumatic circuit for speed control of pneumatic motor.

16. Study of trouble shooting procedures of various hydraulic and pneumatic circuits.

. **SCHEME OF VALUATION**

Serial no	Description	Marks
1	**Writing procedure** a)One experiment on Fluid mechanics/Machines b)One experiment on Pneumatics	20
2	**Conducting of Experiment** a)One experiment on Fluid mechanics/Machines (Group of Five) b) One experiment on Pneumatics (Individual)	25
3	**Calculation,results,Inference(Both experiments)**	35
4	**Viva**	20
	Total	**100**

EQUIPMENT LIST FOR FLUID POWER ENGINEERING LAB

List of equipments needed for **Fluid Power Engg Lab** :

1. **Bench mounted Test Rig for Venturimeter**
2. **Bench mounted Test Rig for Notches**
3. **Bench mounted Test Rig for Friction through pipes**
4. **Bench mounted Test Rig for Centrifugal Pumps**
5. **Bench mounted Test Rig for Reciprocating Pumps**
6. **Bench mounted Test Rig for Kaplan Turbines**
7. **Bench mounted Test Rig for Francis Turbines**
8. **Bench mounted Test Rig for Pelton Wheel**
9. **Pneumatics Trainer Kit with all standard accessories**

Department of Technical Education

DIPLOMA COURSE IN MECHANICAL ENGINEERING

Fourth Semester

SUBJECT: MACHINE SHOP-II

Contact Hrs/Week: 06   Contact Hrs/Sem: 96

Sl.No.	TOPIC	Hrs Allotted
1	Practice on Drilling machine	14
2	Practice on shaper and slotter	15
3	Practice on planner	09
4	Practice on milling machine	25
5	Practice on grinding machine	12
6	Practice on erection commissioning and maintenance	12
7	Industry Institute Interaction	05
8	Tests an Revision	04
	Total	**96**

Note:1) Item 6 should be taught during the training hours at relevant intervals

2) The practice on lathe Machine tool should not be carried in this shop practice

On the completion of the course the student should be able to:

1.0 **Know the working of Drilling machine, shaper, slotter, planer, milling machine, grinding machines and be in a position to operate the same.**
  1.1 Perform a drilling operation on a radial drilling machine
  1.2 Perform a Shaping, slotting operation on a horizontal shaper and slotter
  1.3 Perform a planning operation s on a planer
  1.4 Perform a milling operation on a column and knee type milling machine
  1.5 Gear teeth should be cut on a round blank by using milling machine(Spur gear teeth only)
  1.6 Perform a grinding operation on work piece only
  1.7 Make use of various measuring instruments for taking dimensions.
  1.8 Produce articles of industrial application such as Spur gear, square headed bolt, V- block

PRACTICE EXERCISES

1.0 **DRILLING EXERCISE** (**Three models**)

  1.1 Preparation of model with two or three different sizes holes for different materials

  1.2 Preparation models of different holes by maintain minimum distance between them

2.0 SHAPING SQUARE(Three models)
2.1   Hexagon on a round bar, key ways, grooves splines,
2.2   Shaping step block cut dovetail to angles 60, 90, 120 degrees.

3.0 SIMPLE PLANNING EXERCISE CUTTING 'T' SLOTS (One model)

4.0 PRACTICES ON MILLING MACHINE (Three models)

4.1 Milling-square-hexagon from round bars with indexing and without indexing

4.2 Milling key ways of different types

4.3 Generation of spur gear teeth on a round bar.

4.4 Milling flutes of a twist drill

4.5 Milling splines and T-slots

5.0 MOUNTING BALANCING AND DRESSING OF GRINDING WHEELS
5.1 Grinding flat surface on a surface grinder using magnetic chuck and clamping devices

5.2 Cylindrical grinding of external surface and internal surface

     using universal grinding machines

5.3 Grinding Cutting tools to the required angles

5.4 Grinding of milling cutters etc, on a tool and cutter grinder

B) SERVICE EXERCISES

1) The dismantling some of the components of drilling machine and service, assemble the same

2) The dismantling some of the components of shaper head and then assemble the same

3) The dismantling some of the components of Milling machines and service, assemble the same

4) Servicing of universal grinding machine

C) Maintenance practice and preparing overhauling of machines in machine shops

SCHEME OF VALUATION

Serial no	Description	Marks
1	Listing of tools & operations required for performing job	05
2	Marking of job	05
3	Operation performed	20
4	Dimensional accuracy of job	15
5	Finishing of job	20
6	One question on servicing aspects of Machine tool	15
7	Viva	20
	Total	**100**

PARAMETRIC MODELING LABORATORY

Subject Title	:	**Parametric Modeling Laboratory**
Subject Code	:	**M-**
Hours Per Week	:	**06**
Hours Per Semester	:	**96**

Objective:

At the end of the course, the student should be able to:

- **Understand what is Machine drawing is all about?**

- **Get hold on Modeling software environments**

- **Start sketching and creating profiles**

- **Know the meaning of constraints and constraining**

- **Realize the nature of Parametric and feature based modeling concepts**

- **Know the bi-directional associatively**

- **Create part model, assemblies and the related drawing views**

- **Be able to produce/create models/drawings as per industry standards**

1. **Introduction** to Machine Drawing-Multi view drawing, Projection System, Drawing Standards-ISO, ANSI, BIS, Introduction to Parametric Modeling software-Understanding parametric modeling technique, knowing the software interface, co-ordinate systems supported.

   Define and understand the following terms:
   Planes and their creation, reference axis, Sketch, Profile, constraints-geometrical and dimensional, need for constraining, fully constrained, under constrained, over constrained.

2. **Part Modeling**:
   Conversions of 2D profiles into 3D models-using extrude/protrude and revolve commands. Cutouts/shell creation, placing holes, rounds/fillets, chamfers, creating rectangular and circular array/patterns, array/patterns along a path/curve, mirroring features, editing of a model, creating internal and external threads. Adding draft,

ribs, thin wall features, lip to models. Creating vents, boss. Creating swept and lofted models.

Using part modeling techniques create the following *Part Models* any 10(see list).

and learn how to generate different Drawing views

Front View

Top View

and Side/Profile view/auxiliary view/section view with annotations.

3. **Model the following machine parts using equations:**
   - Hexagonal Nut and Bolt
   - Solid Muff Coupling
   - Bushed Journal Bearing
   - Foot Step Bearing
   - Knuckle Joint
   - Socket and Spigot joint

4. **Assembly Modeling:**

   Know the assembly environment, setting the assembly environment, types of assembly design approach-bottom-up and top-down assembly.
   Creating assembly and sub-assemblies
   Editing and modifying assembly relationships
   Creating exploded view of the assembly,
   Inserting Bill of Materials,
   Adding Balloons
   Understand Detail drawing
   Know the procedure for detail drawing
   Creation of Production drawing.

   Using assembly modeling techniques create the following:
   - Plummer Block
   - Screw Jack
   - C-clamp
   - Coupling Puller
   - Pipe vice

Scheme of Examination

Sl no	Questions	Marks
1	Create the model and drawing views(any 3) along with dimensions and annotations as per sketch given	30
	OR	
	Create the model and drawing views(any 3) along with dimensions and annotations using equations	30
2	Create the assembly model and drawing with dimension, BOM, Balloons- as per the given sketch	50
3	Viva	20
	Total	**100**

This Lab can be performed using <u>ANY   ONE</u> of the following softwares :
1) **Solid Edge**
2) **UniGraphics**
3) **IronCAD**
4) **CATIA**
5) **ProE**
6) **SolidWorks**
7) **INVENTOR**

DEPARTMENT OF TECHNICAL EDUCATION

DIPLOMA COURSE IN MECHANICAL ENGINEERING (General)
FIFTH SEMESTER
Tentative Scheme of study and Examination (W.E.F 2011-12)

Sl No.	Theory Subject		Contact Hours			Exam. Duration	Scheme of Examination		*I. A. Marks	Total Max. Marks	Min Marks for passing (with IA)
							End. Exam				
			Theory	Pract	Total		Max. Marks	Min. Marks for passing			
1	Basic Management Skills and Indian Constitution.	9ME51	4	-	4	3	100	35	25	125	45
2	Thermal Engineering-II	9ME52	4	-	4	3	100	35	25	125	45
3	Design of machine elements	9ME53	4	-	4	3	100	35	25	125	45
4	Mechatronics	9ME54	4	-	4	3	100	35	25	125	45
	Practical										
5	Mechatronics lab	9ME55P	-	6	6	3	100	50	25	125	60
6	C-Programming and MAT lab	9ME56P	-	6	6	3	100	50	25	125	60
7	CASP	9ME57P	-	6	6	3	50	25	75	125	60
8	Project Work and Industrial visit	9ME58P	-	3	3	**Examination will be at the end of 6th Semester**			25		
	Total		**16**	**21**	**37**		**650**		**250**	**875**	

DEPARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING (General)
SIXTH SEMESTER
Tentative Scheme of study and Examination (W.E.F 2011-12)

Sl No.	Theory Subject	Q P Code	Contact Hours			Exam. Duration	Scheme of Examination		I. A. Marks	Total Max. Marks	Min Marks for passing (with IA)
							End. Exam				
			Theory	Practical	Total		Max. Marks	Min. Marks for passing			
1	Estimating and costing	9ME61	4	-	4	3	100	35	25	125	45
2	Automobile Engineering	9ME62	4	-	4	3	100	35	25	125	45
3	Computer integrated manufacturing	9ME63	4	-	4	3	100	35	25	125	45
4	Elective (Opt Any One)										
	Metal Casting Science and Engineering	9ME64EA									
	Refrigeration and Air-conditioning	9ME64EB	4	-	4	3	100	35	25	125	45
	Power plant engineering	9ME64EC									
	Non conventional Energy resources	9ME64ED									
	Drawing /Practical										
5	Thermal Engineering lab	9ME65P	-	6	6	3	100	50	25	125P	60
6	CNC and Casting Simulation lab	9ME66P	-	6	6	3	100	50	25	125	60
7	Project work (Continuation from 5th Semester)	9ME67P	-	3	3	3	100	50	25	125	60
	Total		**16**	**15**	**31**		**700**		**175**	**875**	

Subject Title : **Basic Management Skills & Indian constitution**

Q P Code :
Hours Per Week : **04**
Hours Per Semester : **64**

BASIC MANAGEMENT SKILLS & INDIAN CONSTITUTION

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Management Skills	09	15
2	Operations Management	12	35
	SECTION-II		
3	Total Preventive Maintenance	04	10
4	Total Quality Management	06	20
5	Safety and Environmental issues	06	20
	SECTTION-III		
6	Indian Constitution	08	20
7	Parliamentary System and procedures	05	10
8	Empowerment of Women	08	15
9	Environmental Awareness and Industry Innovations	03	-
	Tests	03	-
	Total	**64**	**145**

CONTENTS

1. MANAGEMENT SKILLS

1.1 INTERPERSONAL SKILLS.

1.11 Know Thyself/ self –Discovery.
1.12 Know others and understand the perspective of others.
1.13 Intergroup communications.
1.14 Art Of Communications

1.2 TEAM BUILDING and TEAMWORK SKILLS.

1.21 Aspects of team building.
1.22 Team v/s Group.
1.23 Inter group collaboration.

2. OPERATIONS MANAGEMENT
2.1 Production & Productivity
      2.1.1   Stages involved in Product Design
      2.1.2   Factors considered while designing a Product
      2.1.3   Types of Production
      2.1.4   Factors to improve Productivity
2.2 Production, Planning & Control
2.3 Make or Buy Decision
      2.3.1 Criteria considered for make or buy decision
      2.3.2 Analysis for make or buy decision
2.4 Purchasing
      2.4.1 Methods of Purchasing Material or Component
      2.4.2 Steps involved in purchasing of material or component
2.5 Stores Management
      2.5.1 Methods of Storing
      2.5.2 Tools required for Stores Management
      2.5.3   Codification System
2.6   Logistics Management
      2.6.1   Different means of Transportation
      2.6.2   Routing & Delays, Tracing, Packaging & Material Handling, Damage Claims, Demurrage Charges and Insurance Buying
2.7   Inventory & Inventory Control
      2.7.1   Functions of Inventory Control
      2.7.2   Inventory Control Techniques
      2.7.3   Inventory Management Software
2.8   Introduction to MRP and ERP

3. TOTAL PREVENTIVE MAINTENANCE

3.1 Maintenance and concept of TPM
3.2 Economics involved in preventive maintenance
3.3 Techniques of TPM
3.4 Benefits of TPM
3.5 Planned Maintenance and Predictive Maintenance

4. TOTAL QUALITY MANAGEMENT

4.1 Quality and Inspection
- 4.1.1 Factors affecting Quality
- 4.1.2 Relation between Quality & Cost
- 4.1.3 Quality Control

4.2 Concept of TQM
- 4.2.1 Tools and Techniques of TQM

4.3 Quality Management System
- 4.3.1 I.S.O 9000:2000 Quality Standards
- 4.3.2 Procedures and Documentation of ISO 9000 certification

5. SAFETY AND ENVIRONMENTAL ISSUES

5.1 Accident and Safety
5.2 Accident Prevention, Accident Reporting and Crisis Management
5.3 Safety provisions under Indian Factories Act
5.4 Safety Management System-OSHAS 18001
5.5 Environmental issues addressed by organization

6. INDIAN CONSTITUTION

6.1 Indian Constitution-Formation of Constituent Assembly-Framing of the Constitution-Drafting Committee-Contributions of Dr. B R Ambedkar, Chairman of Drafting Committee and the members in drafting a constitution for India.

6.2 Preamble-objectives-Directive principles

6.3 Features of Constitution

6.4 Fundamental Rights

6.5 Fundamental duties

6.6 Amendments for Indian Constitution

6.7 Human Rights

7. PARLIAMENTARY SYSTEMS AND PROCEDURES.

7.1 Government-Meaning-organs-functions.

7.2 Parliament-meaning-Two houses-Lok Sabha-Composition-election-Presiding officer-term-RajyaSabha- Composition-election-Presiding officer-term

7.3 Powers of parliament

7.4 Executive Role - President-Vice President-Prime Minister-Council of Ministers

7.5 Indian Judiciary system-Supreme Court-High Court-subordinate courts

7.6 Constitutional bodies-Election Commission-Public Service Commission-Finance Commission

7.7 Structure of State government- State Legislature-Governor-Chief Minister-Council of Ministers

7.8   Local self government-meaning-Three tier system-Village panchayath-taluk panchayath-Zilla panchayath

7.9   Local bodies-Municipalities and Corporations

8.0   EMPOWERMENT OF WOMEN.

8.1   Concept, Definition and need for Women's Empowerment

8.2   Strategies, approaches, process, levels, principles and indicators for women's empowerment.

8.3   Gender statistics in India – Glaring inequalities

8.4   Women and Development:

       8.4.1 Goals and Objectives of National Policy for Women's Empowerment

       8.4.2 Advancement of Women through Five-Year Plans

       8.4.3 Special Programs for Women's Development.

8.5   Constitutional Provisions towards Women's Rights and Special Legislations for Women.

8.6   Case Studies.

SPECIFIC INSTRUCTIONAL OBJECTIVES
1. MANAGEMENT SKILLS
1.1 INTERPERSONAL SKILLS.

1.11.1 Importance of knowing yourself-Process of knowing yourself.

1.11.2 SWOT analysis-Benefits of SWOT analysis

1.11.3 SWOT analysis grid and questions to complete the grid.

1.12.1 Importance of knowing others-Process of knowing others.

1.13.1 Resolving Win/Lose Situations into win/win through inter group communications.

1.14.1 Defining communication- Special features of communication.

1.14.2 Communication process- Channels of communication.

1.14.3 Formal and informal communication network.

1.14.4 Barriers to communication- Tips of effective communication.

1.14.5 Tips of powerful presentation- Art of public speaking- Importance of public speaking- Benefits of public speaking- Public speaking tips.

1.2 TEAM WORK AND TEAMWORK

1.21.1 Meaning and aspects of team building- Skills needed for teamwork- A model of team building.

1.22.1 Team v/s Group- Characteristics of a effective team- Role of a team leader- Role of a team members- A successful team of nine persons.

1.23.1 Inter group collaboration- Advantages of inter group collaboration.

1.23.2 Difficulties faced in inter-group collaboration.
1.23.3 Factors shaping inter group collaboration.

2. OPERATIONS MANAGEMENT

2.1 Define Production & Productivity
- 2.1.1 Explain various stages involved in product design
- 2.1.2 List factors considered while designing a product
- 2.1.3 Explain Job, Batch & Mass production with their advantages and disadvantages
- 2.1.4 List factors to improve/increase productivity

2.2 State the functions of PPC- planning, routing, scheduling, dispatching and inspection

2.3 State the importance of make or buy decision
- 2.3.1 List the criteria considered for make or buy decision
- 2.3.2 Briefly explain methods of analysis for make or buy decision- Simple cost analysis, Break even analysis & Economic analysis

2.4 Define purchasing
- 2.4.1 Explain briefly different methods of purchasing the material or component.
- 2.4.2 Explain the steps involved in purchasing of Material or Component

2.5 Explain Stores Management
- 2.5.1 Explain different methods of storing
- 2.5.2 Explain briefly Bin Card, Material Issue Requisition, Material Returned Note and Store Ledger
- 2.5.3 Explain advantages and systems of Codification

2.6 Explain Logistics Management
- 2.6.1 Explain different means of transportation
- 2.6.2 Explain Routing & Delays, Tracing, Packaging & Material Handling, Damage Claims, Demurrage Charges and Insurance Buying

2.7 Define Inventory and Inventory Control
- 2.7.1 List important functions of Inventory Control
- 2.7.2 Explain briefly Inventory Control Techniques – ABC, VED, SDE, MNG Analysis
- 2.7.3 List few Inventory Management Softwares

2.8 Describe about MRP & ERP. List the software's used

3. TOTAL PREVENTIVE MAINTENANCE

3.1 Explain Maintenance and explain the concept of TPM
3.2 Explain the economics involved in preventive maintenance
3.3 Describe the techniques of TPM
3.4 List the benefits of TPM
3.5 Explain planned maintenance and predictive maintenance

4. TOTAL QUALITY MANAGEMENT

4.1 Define Quality, Inspection & explain its importance
  4.1.1 List factors affecting quality
  4.1.2 Explain the relation between cost & quality
  4.1.3 Define and Explain quality control
4.2 Explain concept of TQM
  4.2.1 Explain briefly tools & techniques of TQM – Flow charts, Control charts, Histograms, Pareto charts, Check sheets, Scatter diagram, Cause and effect diagram, 5-S, Poka-yoke, Kaizen, Re-engineering and Six-sigma
4.3 Define QMS
  4.3.1 Explain briefly I.S.O 9000:2000 Quality Standards – ISO 9000, ISO 9001 & ISO 9004
  4.3.2 Explain procedures and documentation involved in ISO 9000 series certification

5. SAFETY AND ENVIRONMENTAL ISSUES

5.1 Define accident and safety
5.2 Explain accident prevention, accident reporting and crisis management
5.3 List the safety provisions under Indian Factories Act
5.4 Explain Safety Management System-OSHAS 18001
5.5 Give a brief summary of ISO 14000 series and IS16949 & IS16959 certifications

6. INDIAN COSTITUTION

6.1 Introduction to Indian Constitution
6.2 Discuss the Formation of Constituent Assembly
6.3 Discuss the Contributions of Dr. B R Ambedkar as a Chairman of Drafting Committee and the members in drafting a constitution for India.
6.4 Discuss Preamble and its main objectives
6.5 State the Directive principles
6.6 Discuss the Features of Constitution
6.7 Mention the number of parts, articles, schedules and discuss the article -1
6.8 Discuss Fundamental Rights
6.9 Discuss Fundamental duties
6.10 Explain the Amendment and its procedure
6.11 Discuss Human Rights and its significance

7. PARLIAMENTARY SYSTEM

7.1 Discuss the Parliamentary system of Government.
7.2 Discuss the about:
  7.2.1 Loka Sabha: Composition, election, Presiding officer and term
  7.2.2 RajyaSabha: Composition, election, Presiding officer and term
7.3 Powers of parliament
  7.3.1How law is made, three readings

7.3.2 Diffrence between Bill and act

7.3.3 Administrative control- Explain importance of questioning- concept of Question hour- concept of zero hour

7.3.4 Briefly explain about Confidence motion and Censure motion

7.4 Explain the meaning of the budget

7.5 President-Vice President-Prime Minister-Council of Ministers their appointments and functions

7.6 Discuss the formation and functions of supreme court-High court-Subordinate court.

7.7 Discuss the importance of Constitutional bodies-Election Commission-Public Service Commission-Finance Commission

7.8 Discuss the about state legislature:

7.8.1 Legislative assembly: Composition, election, Presiding officer and term

7.8.2 Legislative council: Composition, election, Presiding officer and term

7.9 Governor-Chief Minister-Council of Ministers their appointments and functions

7.10 Local self government-meaning-Three tier system

7.11 Discuss the formation and functions of Village panchayath-taluk panchayath-Zilla panchayath and urban local bodies such as Municipalities and Corporations

8. Empowerment of Women

8.1 Explain the Concept and Definition of Women's Empowerment.

8.2 Discuss the different strategies, approaches, process, levels, principles and indicators for women's empowerment.

8.3 Discuss the Gender statistics in India – Glaring inequalities.

8.4 Explain Women and Development

8.4.1 List the Goals and Objectives of National Policy-2001 for Women's Empowerment.

8.4.2 Discuss the emphasis given on the Advancement of Women through Five-Year Plans.

8.4.3 List the Various Special Programs for Women's Development from government.

8.5 State Constitutional Provisions towards Women's Rights -Fundamental Rights Article 14, 15, 15(3), 16-Directive of State Policy Article 39,42-Fundamental Duties 51(A)(e) and Reservation of seats Article 243(D)(3), Article 243(T)(3) - explain the following Special Legislation for Women-Dowry Prohibition Act 1961, Domestic Violence Act 2005,Sexual Harassment at Workplace Bill 2006, Equal Remuneration Act 1976,Hindu succession Act,1956, Prenatal diagnostic techniques (regulation and prevention of misuse) act,1994.

8.6 Case Studies.

Reference Books:

1. Soft Skills- by Dr. K. Alex, S Chand & Company Ltd.
1. Total Quality Management- Prof. Dr. H D Ramachandra
2. Industrial Organization and Engineering Economics- T.R.Banga & S C Sharma
2. Total Quality Management- S Raja Ram, M Shivashankar.
3. Industrial management and organizational behavior- K.K.Ahuja
4. Industrial management and engineering economics- O.P.khanna
5. Production and operations management-Dr .K.Aswathappa and Dr.Sreedhar Bhatt- Himalaya publishers
6. Introduction to the Constitution of India- Dr. Durga Das Basu
7. The constitution of India - P.M.Bhakshi- Universal law publishers
8. Our constitution-National Book Trust of India
9. Our Parliament-National Book Trust of India
10. Our Judiciary-National Book Trust of India
11. Empowerment of rural women in India-Hemalatha H.M and Rameshwari Varma,Hema Prakashana.
12. The right to development-centre for development and human rights-Sage Publications.
13. Industrial Engg. &Mgmt Science By- T R Banga & SC Sharma.

MODEL QUESTION PAPER

FIFTH SEMESTER

BASIC MANAGEMENT SKILLS & INDIAN CONSTITUTION

Time: 3Hrs   **Max marks: 100**

Part-I is compulsory and Answer any **two full** questions from **Part-II, Part-III, and Part**-**IV**

PART- I

1. A) Fill in the blanks with appropriate words:-   5X1=5

I)   The Constitution of India came into effect on _____.

ii)   The term of the chairperson of Rajyasabha is_____ years

iii)   _____ is an unforeseen event

iv) The ISO _____ is related with Environmental management systems

v) Increased _____ leads to the benefits for both employer and employee

  B) State the qualities of a good leader   **5**

PART-II

2 a) Explain SWOT analysis-Mention benefits of SWOT analysis   **5**

 b) Explain special features of communication.   **5**

 c) Explain Formal and informal communication network.   **5**

3 a) Explain the motivating factors   **5**

 b) State the qualities of a good leader   **5**
 c) Explain the process of team building   **5**

4 a) State the characteristics of entrepreneur   **5**

 b) Lists the steps involved for setting up small scale/Medium scale industries

 c) Define outsourcing and mention its features   **5**

PART-III

5 a) State the functions of Production planning and Production control   **5**

 b) Define inventory and inventory control   **5**

 c) State the importance of material management   **5**

6 a) Explain the total productive maintenance   .   **5**

 b) List the various types of preventive measures to avoid an accident   **5**

 c) List the factors affecting quality   **5**

7 a) Explain the concept of Total quality management   **5**

 b) List the various types SQC tools   5

 c) State the importance of material management   **5**

PART-IV

8 a) What is a constitution?   **5**
 b) Why Dr. B R Ambedkar is known as architect of Indian Constitution?   5
 c) What is sovereignty?   **5**
9 a) Why is there a need to Economic, social and political justice in India?   5

 b) Explain three tier panchayath system   **5**

c) Mention the salient features of Indian constitution. **5**

10 a) what are the approaches to empowerment of women? 5

   b) List the goals and objectives of national policy for women's empowerment.5

   c) Write a note on dowry prohibition act. 5

Question Bank on Indian Constitution

1. What is a government?
2. What is a constitution?
3. Why constitution is called the rule of the State?
4. Write the importance of the constitution.
5. To draft a constitution to India was the most challenging task. Why?
6. What are the contributions of Dr. B R Ambedkar in drafting a constitution for India?
7. What is the importance of republic day?
8. What is the importance of preamble?
9. Why is preamble said to be the soul of the constitution?
10. What is sovereignty?
11. What is the objective of Socialism?
12. The principle of Secularism is suitable to India. How?
13. Why is India called republic?
14. Why is there a need to Economic, social and political justice in India?
15. Mention the aspects which strengthen the bond of fraternity in India?
16. In the present context unity and integrity are most essential in India. Why?
17. Though Directive principles are not enforceable by law they are important in the constitution. How?

18. Mention the salient features of Indian constitution.
19. How is written constitution, advantageous than unwritten constitution?
20. Indian constitution is one of the lengthiest constitution. Mention the factors to substantiate the statement.
21. State the notable features borrowed from the following constitutions: a) U. S. A. b) England c) Ireland d) Canada.
22. Why is Indian constitution termed as flexible constitution?
23. What is universal Adult Franchise?
24. Write the advantages of single citizenship.
25. Why is Indian judiciary said to be an independent judiciary?

25. What is the importance of Fundamental rights?
27. How can it be said that Fundamental rights are not absolute?
28. Mention the Fundamental rights.
29. Give reasons as to why certain sections of the society are provided concessions and privileges in spite of right to equality.
30. How does cultural and educational right protect the interests of the minorities?

31. Mention the right introduced in 2010 under right to equality what is the importance of it?
32. Name the right that bans child labour and provides protection to women against exploitation.
33. The right to Constitutional remedies is said to be the heart and soul of our constitution. Why is it said so?

34. Rights and Duties are like the two sides of the same coin - Substantiate the statement.
35. Mention a few fundamental duties that you have to follow as a citizen of this country.
36. When and in which the fundamental duties part of the constitution was incorporated?

37. Name the body that has powers to amend the provisions of the constitution in India.
38. What is the procedure followed in parliament to amend the provisions of Fundamental rights and Directive principles?

39. Write the procedures to be followed to amend the constitutional provisions.

THERMAL ENGINEERING-II

Subject Title   :   **Thermal Engineering-II**
Subject Code   :   **M-**
Hours Per Week   :   **04**
Hours Per Semester   :   **64**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Heat engines	10	30
2	Air compressors	06	15
3	Gas turbines and propulsion	03	10
	SECTION-II		
4	Steam generators	06	15
5	Steam nozzles	07	20
6	Steam turbines	08	20
	SECTTION-III		
7	Refrigeration and Air-conditioning	06	15
8	Heat transfer	08	20
9	Environmental concerns and Industry innovations	06	-
10	Tests and revision	04	-
	Total	**64**	**145**

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

1. Comprehend the construction, working and performance of heat engines
2. Understand the construction and working of air compressor
3. Understand the working and applications of Gas turbines& Jet Propulsion
4. Understand the Working of Steam generators
5. Understand the principle and working of steam nozzles
6. Understand the principle and operations of steam turbines
7. Understand the concept of refrigeration and air conditioning
8. Understand the different modes of heat transfer

COURSE CONTENTS

1.0   Heat engines

1.1   Definition – Heat engines
1.2   Classification of heat engines

1.3 Internal combustion engine- definition- classification-main components-operation
1.4 Four-stroke diesel engine and two-stroke diesel engine –principle and working
1.5 Four-stroke petrol engine and two-stroke petrol engine –principle and working
1.6 Testing of IC engines- Formulae for Brake power, Indicated power, Mechanical efficiency, Indicated thermal efficiency, Brake thermal efficiency,Airstandard efficiency, Relative efficiency, Volumetric efficiency
1.7 Concept of Heat balance sheet for an engine
1.8 Simple problems on testing of I.C. engines and heat balance sheet

2.0   Air compressors

2.1 Air compressor-Introduction-classification-technical terms
-Function of compressor- uses of compressed air
2.2 Single stage reciprocating air compressor- construction and working (with line diagram)
2.3 Derive an expression for work done and power required by single stage reciprocating compressor without clearance volume and with clearance volume by using p-v diagram and t-s diagram
2.4 Multi stage compression – advantages of multistage compression
2.5 Two stage reciprocating compressor with intercooler
2.6 Simple problems on calculation of work done and power required.

3.0   Gas turbine and propulsion

3.1 Introduction-classification of gas turbines
3.2 Closed cycle gas turbine-Schematic diagram-explanation-intercooling-reheating
3.3 Open cycle gas turbine-schematic diagram-explanation
3.4 Comparison of open cycle and closed cycle gas turbines.
3.5 Ram–jet engine and turbojet engines-Principle and working
3.6 Rocket engine – its principle of working & application.

4.0   Steam generators

4.1 Steam boiler-selection of steam boiler-classification of boiler –function of boiler
4.2 Low pressure boilers- Sketch and working of Cochran and Babcock and Wilcox boiler
4.3 High pressure boilers- Sketch and working of Lamont and Benson boiler
4.4 Comparison of water tube and fire tube boilers.
4.5 Boiler mountings-Pressure gauge, water level indicator, fusible plug, blow off valve, stop valve, safety valve
4.6 Boiler accessories - feed pump, economizer, and super heater and air pre-heater only.

5.0   Steam nozzles

5.1 Introduction -Types of stem nozzles
5.2 Flow of steam through convergent-divergent nozzle
5.3 Friction in a nozzle

5.4   Discharge of steam through nozzles.
5.5   Critical pressure ratio-Physical significance
5.6   Methods of calculation of cross – sectional areas at throat and exit for maximum discharge.
5.7   Effect of friction in nozzles
5.8   Supersaturated flow through nozzle
5.9   Simple problems of nozzles.

6.0   Steam turbine

6.1   Classification of steam turbines with examples.
6.2   Impulse & reaction turbines.
6.3   Working principle with line diagram of a simple De-Laval turbine – velocity diagram of impulse turbine
6.4   Expression for work done, axial thrust, tangential thrust, blade and diagram efficiency, stage efficiency, nozzle efficiency.
6.5   Methods of reducing rotor speed by compounding (velocity compounding, pressure compounding & pressure - velocity compounding)
6.6   Working principle with line diagram of a Parson's Reaction turbine – velocity diagram of reaction turbine
6.7   Simple problems on single stage impulse turbines (without blade friction) and reaction turbines

7.0   Refrigeration & Air Conditioning

7.1   Introduction - Definition of Refrigeration, units of refrigeration, Coefficient of performance (COP)
7.2   Explanation of vapour compression refrigeration with flow diagram
7.3   Explanation of vapour absorption refrigeration with flow diagram
7.4   Types of refrigerants - properties of good refrigerants
7.5   Air Conditioning- introduction-classification of Air conditioning
7.6   Psychrometry- definition
7.7   Psychometric terms such as dry air, saturated air, dry bulb temperature Wet bulb temperature, dew point temperature, relative humidity, absolute humidity, specific humidity

8.0   Heat transfer

8.1   Introduction
8.2   Methods of heat transfer
8.3   Fourier's law of heat conduction
8.4   Newton law of cooling- Stefan-Boltzmann law of radiation
8.5   Heat transfer by conduction through slab and composite wall
8.6   Radial heat transfer by conduction through a thick cylinder
8.7   Simple problems on above (conduction only)

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0   Comprehend the construction, working and performance of heat engines

1.1   Define Heat engines
1.2   Give the Classification of Heat engines.
1.3   Define internal combustion engines
1.4   Give the Classification of I.C.Engine
1.5   Sketch internal combustion engine indicating the component parts
1.6   Explains the Principle of working of four-stroke and two-stroke diesel engine.
1.7.   Explains the Principle of working of four-stroke and two-stroke petrol engine.
1.8   Give the Formulae for Formulae for Brake power, Indicated power, Mechanical efficiency, Indicated thermal efficiency, Brake thermal efficiency,Airstandard efficiency, Relative efficiency, Volumetric efficiency
1.9   Draw the heat balance sheet for 4 stroke diesel engine on KJ/sec or KJ/min basis
1.10   Simple problems on performance of I.C. engines.

2.0   Understand the construction and working of air compressor

2.1   List the Functions of air compressor
2.2   state the uses of compressed air
2.3   List the types of air compressors.
2.4   Explain Single stage reciprocating air compressor its construction and working (with line diagram)
2.5   Derive an expression for work done and power required by single stage reciprocating compressor without clearance volume and with clearance volume by using p-v diagram and t-s diagram
2.6   Simple problems on calculation of work done and power required.
2.7   Explain multi stage compression
2.8   State the advantages of multistage compression
2.9   Explain two stage reciprocating air compressor with intercooler

3.0   Understand the working and applications of Gas turbines & Jet Propulsion

3.1   Give the Classification of gas turbine
3.2   State the Applications and limitations of gas turbines.
3.3   Explain open cycle gas turbine with schematic diagram
3.4   Explain closed cycle gas turbine with schematic diagram
3.5   Explain closed cycle gas turbine with intercooling and reheating by diagram
3.6   Compare open cycle and closed cycle gas turbines
3.7   Explain with net sketch of Ram–jet engine and turbojet engines
3.8   Explain the principle of working Rocket engine
.
4.0   Understand the Working of Steam generators

4.1   State the function and use of steam boilers.
4.2   Give the classification of steam boilers

4.3   Sketch and explain the working Cochran and Babcock Wilcox Boilers.
4.4   Compare water tube and fire tube boilers.
4.5   Description with line sketches and working of modern high pressure boilers such as Lamont and Benson boilers.

4.6   Explain the function and purpose of boiler mountings - pressure gauge, water level indicator, fusible plug, blow down cock, stop valve, safety valve (without sketch)

4.7   Explain the function and purpose of Boiler accessories - feed pump, economizer, and super heater and air pre-heater only (without sketch)

5.0   Understand the principle and working of steam nozzles

5.1   Introduction
5.2   Explain the types of stem nozzles
5.3   Explain discharge of steam through nozzles
5.4   Derive the Velocity of steam at the exit of nozzle in terms of enthalpy drop
5.5   State the equation for Critical pressure ratio (without derivation) and its physical significance
5.6   Calculation of cross – sectional areas at throat and exit for maximum discharge using mollier chart and steam tables
5.7   Discuss the effect of friction in nozzles
5.8   Explain super saturated flow through nozzles
5.9   Simple problems on nozzles.

6.0   Understand the principle and operations of steam turbines

6.1   Give the classification of steam turbines with examples.
6.2   Differentiate between Impulse & reaction turbines.
6.3   Explain the working principle with line diagram of a simple De-lavel turbine
6.4   Understand the velocity diagram for simple impulse turbine (inlet and out let)
6.5   Give the expression for work done, axial thrust, tangential thrust, blade and diagram efficiency, stage efficiency, nozzle efficiency of impulse turbine
6.6   Discuss the methods of reducing rotor speed
6.7   Discuss velocity compounding, pressure compounding and combined velocity and pressure compounding
6.8   Explain the working principle with line diagram of a Parson's Reaction turbine
6.10   Construction of velocity diagram for a reaction turbine
6.10   Simple problems on single stage impulse turbines (without blade friction) and reaction turbines

7.0   Understand the concept of refrigeration and air conditioning

7.1   Define Refrigeration, unit of refrigeration and C.O.P
7.2   Explain the working of Vapor compression and Vapour absorption refrigeration system with flow diagram
7.3   List the different types and properties of good refrigerants

7.4 Give the Classification of air-conditioning systems and Explanation of each type

7.5 Define the psychometric terms- and dry air, saturated air, Dry bulb temperature, Wet bulb temperature, Dew point temperature, relative humidity, absolute humidity

8.0 Understand the different modes of heat transfer

8.1 State the different methods of heat transfer

8.2 State the Newton law of cooling & Stefan-Boltzmann law of radiation

8.3 State and derive Fourier's law of heat conduction

8.4 Mention the Heat transfer by conduction through slab and composite wall

8.5 Mention Radial heat transfer by conduction through a thick cylinder

8.6 Simple problems on above(Conduction only)

REFERENCES

1. **"Fundamental of thermodynamics"** by Richard E Snnatag,Claus Borgnakke,Gordon J Vanwylen, Wiley Student edition,   6th Ed.,

2. **" Basic and applied thermodynamics"** by P.K.Nag **,**Tata McGraw hill New delhi 2009

3. **"Heat engines(Vol-I & Vol-II)"**by Patel and Karmachandani

4. **"I.C.Engine Fundamentals"** by Hey wood

5. **"Thermal Engineering** "by R.S.Khurmi

6. **"Thermal Engineering"** by P.L.Balaney

7. **"Thermodynamics applied to heat engines"** by Lewitt.

8. **" Heat engines"** by Pandya and shah

9. **"Thermodynamics " Robert Ballmer ,** Jaico Publishing House**.**

DERARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING
FIFTH SEMESTER
MODEL QUESTION PAPER
THERMAL ENGINEERING-II

Time: 3Hrs   **Max marks: 100**

Note:
1.Section-I is compulsory
2. Answer any **six full** questions from Section **-II, Section-III, and Section**-IV
Choosing at least **TWO** from each section

SECTION I

1 A) Fill in the blanks with appropriate words:-   **1X5**
I) The thermal efficiency of two stroke cycle engine _____.a four stroke cycle engine
ii) The volume of the air delivered by the compressor is called _____
iii) _____ refrigerant used in vapour absorption refrigeration system
iv) The gas turbine cycle with regenerator improves _____.
v) The temperature recorded by a thermometer is _____
   B) Write a note on pressure compounding of steam turbine   **5**

SECTION II

2 a) Explain with a line diagram the working of four stroke petrol engine   **6**
  b) An engine uses6.5 Kg of oil/hour of calorific value 30,000Kj/Kg. If the B.P of an engine
     is 22 KW and Mechanical efficiency is 85% calculate:1) Indicated thermal efficiency
     2) Brake thermal efficiency 3) Specific fuel consumption in Kg/B.P/hour   **9**
3 a) An I.C.engine use 6 Kg of fuel having calorific value 44000 KJ/Kg in one hour
     The I.P developed is 18 KW. The temperature of 11.5 Kg cooling water was found to
     rise through 25 degree centigrade. The temperature of 4.2 Kg of exhaust gas with specific
     heat of 1 KJ/Kg K was found to rise through 220 degree centigrade.
     Draw heat balance sheet for the engine   **10**
  b) State the advantages of multistage compression   **5**
4 a) Sketch and explain ram jet engine   **5**
  b) Derive an expression for work done and power required by single stage reciprocating
     compressor without clearance volume with the help of p-v and t-s diagram   **7**
  c) List the uses of compressed air   **3**

SECTION III

5 a) Describe with line diagram closed cycle gas turbine with intercooling   **5**
   b) State the Applications and limitations of gas turbines   **5**
   c) Sketch and explain the working Cochran Boiler   **5**

6 a) Differentiate between water tube and fire tube boilers   **4**
  b) Derive the Velocity of steam at the exit of nozzle in terms of enthalpy drop   **6**
  c) Dry air at pressure of 12 bar and 300 degree centigrade is expanded isentropically
     through a nozzle at pressure of 2 bar. Determine maximum discharge through the nozzle
     of 150mm^2 **5**
7 a) Differentiate between an impulse and reaction steam turbine   **4**

b)   The mean diameter of a single row impulse turbine is 2 metre and the speed is 3000 rpm
     The nozzle angle is 20 and the blade to steam speed at inlet is 0.42. and the blade velocity
     coefficient is 0.80. the blade outlet angle is 3 degree less than the inlet angle.
     steam flow rate is 7 kg /sec. Draw the velocity diagram for blade and
     calculate the power developed and the axial thrust   **11**

SECTION IV

8 a)   State the properties of an ideal refrigerant   **4**
  b)   Explain the vapour compression refrigeration with flow diagram   **5**
  c)   Explain summer and winter air conditioning systems   **6**

9 a)   State the Newton law of cooling   .   **3**
  b)   Derive the equation for heat transfer by conduction through composite wall   **5**
  c) The walls of a room consists of parallel layers in contact of cement, brick, and wood
        of thickness 20 mm, 300mm, and 10mm respectively. Find the quantity of heat the passes
        through each mm^2 of wall/min. If the temperature of air in contact with the wall is
        5 degree centigrade and 30 degree centigrade. The value of K for cement, brick, wood
        Are 0.294, 0.252, and 0.168 W/mK respectively   **7**

10   Write short note on any **three** of the following   **5x3=15**
              i)   Super saturation flow in nozzle
              ii)   Lamont boiler
              iii)   Open cycle gas turbine
              iv)   2-Stroke petrol engine

Design of Machine Elements

Subject Title	:	**Design of Machine Elements**
Subject Code	:	**M-**
Hours Per Week	:	**04**
Hours Per Semester	:	**64**
Exam Hours	:	**03**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Introduction to Machine Design	04	10
2	Design of Bolts and Nuts	08	20
3	Design of Keys and Shafts	10	20
	SECTION-II		
4	Design of Couplings	10	25
5	Design of Screw Jack	10	25
6	Design of Knuckle Joint	08	20
	SECTION-III		
7	Design of Springs	07	15
8	Design of Welded Joints	04	10
9	Tests	03	-
	Total	**64**	**145**

Note: **Use of Design Data hand book is compulsory**.

General Educational Objectives

On completion of the course, the student should be able to
1. To understand the concepts of design.
2. Understand the use and design of Bolt.
3. Understand the function and design of key
4. Understand the design of shaft under different loading conditions.
5. To know the design of muff and flange coupling.
6. To know the basic concepts of power screw and design of screw jack for given load.
7. Understand the design of Knuckle joint for tensile load.
8. To know types and application of springs and to understand design of Helical spring.
9. Understand different types of welded joints and to learn design of welded joints in simple loading.

Content Details

1.0 Introduction to Machine Design.
      1.1 Conventional design procedure.
      1.2 Computer aided design process.
      1.3 Design consideration.
      1.4 Stress strain diagram.
      1.5 Three dimension representation of stress.
      1.6 Factor of safety

2.0 Design of Bolts and Nuts
      2.1 Screw thread terminology.
      2.2 Types of Bolts.
      2.3 Stresses in Bolts.
      2.4 Design of Bolts.
      2.5 Design of studs for cylinder cover.
      2.6 Design of nut.

3.0 Design of Shafts and Keys
      3.1 Types of shafts.
      3.2 Material for shafts.
      3.3 Standard size of shaft.
      3.4 Design of Solid Shafts on strength basis.
      3.5 Design of Solid Shafts on rigidity basis.
      3.6 Design of Shaft subjected to bending.
      3.7 Design of Shaft subjected to combined bending and torsion.
      3.8 Types of keys.
      3.9 Function of key.
      3.10 Forces acting on a sunk key.
      3.11 Design of key.

4.0 Design of Couplings
      4.1 Classification of coupling.
      4.2 Purpose of coupling
      4.3 Design for simple muff coupling.
      4.4 Design of cast Iron flange coupling.

5.0 Design of Screw jack.
      5.1 Define power screw.
      5.2 Purpose of power screw
      5.3 Forms of screw thread profile for power screw.
      5.4 Torque required to raising and lowering load.
      5.5 Efficiency of Screw jack.
      5.6 Self locking.
      5.7 Collar friction.
      5.8 Stresses in power screw.
      5.9 Bearing pressure.
      5.10 General Design procedure and design of screw Jack..

6.0 Design of knuckle Joint.
      6.1 Methods of failures of knuckle joint.
      6.2 Design procedures.
      6.3 Design of knuckle joints for tensile load.

7.0 Design of springs.
      7.1 Application of springs.
      7.2 Types of springs.
      7.3 Material for Helical springs.
      7.4 Terms used in helical springs.
      7.5 Stresses in Helical springs.
      7.6 Energy stored and deflection in springs
      7.7 Design procedure for Helical compression springs.

8.0 Design of Welded Joints.
      8.1 Application of welded joints.
      8.2 Advantages of welded joints.
      8.3 List types of welded joints.
      8.4 Design of butt joints.
      8.5 Design of lap joints

Specific Instruction Objectives

1.0 Introduction
      1.1 Explain the design procedure of machine elements[2].
      1.2 List the application of computer in design process.
      1.3 State the design considerations in machine design[2].
      1.4 Draw and explain Stress strain diagram for mild steel[2].
      1.5 Explain three dimension representation of stress[2].
      1.6 State the Importance of factor of safety, design stress[1].

2.0 Understand the Design of Bolts, and Nuts
      2.1 Describe terms connected to screw thread terminology[1].
      2.2 List the common types of bolts and nuts and their applications[1]
      2.3 Explain the stresses due to screw fastening due to static loading[1]
      2.3.1 Explain the stresses due to tightening forces[1]
      2.3.2Explain the stresses due to external forces by giving value K in problem[1]
      2.3.3 Explain the stresses due to combined forces[1]
      2.4 Solve the Simple problems on bolts and nuts considering only tensile loads
      2.5 Solve Simple problems on Design of studs for cylinder cover
      2.6 Solve Simple Problems on Design of Nuts Based on nut material.

3.0 Understand the Design of shaft and keys.
      3.1Explain types of shaft[1]
      3.2 List types of material for shaft[1]
      3.3 Describe standard size of shaft[1].
      3.4Design of shaft subjected to twisting moment considering strength
      3.5Design of shaft subjected to twisting moment considering rigidity.   [1]
      3.6Design of shaft subjected to bending moment[1]
      3.7Design of shaft subjected to combined twisting and bending moment based on
         Maximum shear stress theory[2] (without BM diagram).Solve only simple problems.
      3.8 List the types of keys[1]
      3.9 State the function of key[1]
      3.10 Explain the forces acting on sunk key[1]
      3.11Solve simple problems on Design of sunk key based on shear and crushing[1]

4.0 Understand Design of Coupling.
      4.1List the different types of shaft couplings[1]
      4.2Explain the requirement of couplings[1]
      4.3Design of plain muff coupling[1]
      4.4Design of unprotected flanged couplings[1]

5.0 Understand the design of screw jack
      5.1 Define power screw[1]
      5.2 List the functions of power screw[1]
      5.3Explain the types of screw threads profile for power screws[1]
      5.4Derive the torque required to raise the load on square threaded screws[1]
      5.5State the Equation for efficiency of square threaded screw[1]
      5.6Explain overhauling and self locking[1]

5.7 Explain Collar friction[1]

5.8 Explain the stresses in power screws, maximum principal stresses[1]

5.9 Explain the bearing pressure[1].

5.10 Solve simple Problems on the design of screw rod, nut, collar, cup, handle ,and body[1]

6.0 Understand design of knuckle Joint

6.1 Explain different methods of failures of knuckle joints[1].

6.2 Design procedure of knuckle joints[1].

6.3 Design of knuckle joints for tensile load, and solve simple problems.

7.0 Understand the design of springs

7.1 State the function of spring[1].

7.2 Explain types of springs - helical and leaf springs[1]

7.3 List the materials for helical springs[1]

7.4 Explain the terms used in helical compression springs[1]

7.5 List the types of stresses in helical springs of circular wire for helical compression springs[1]

7.6 State the Equation for energy stored and deflection for helical compression springs[1].

7.7 Design of helical compression spring of circular cross section[1] and solve simple problems.

8.0 Understand design of welded joints.

8.1 List the applications of welded joints[2]

8.2 List the advantages of welded joints[2]

8.3 List the types of welded joints[2]

8.4 Design for Strength of butt joints[2]

8.5 Design for Strength of lap joint parallel and transverse case only[2]

(NOTE : Superscripts 1 & 2 in the Specific Instructional Objectives indicates the Reference books 1 & 2 respectively as given below)

Additional Guidelines:

1. Use standard notations and symbols as per prescribed Design Data hand book.

2. Use of Design Data hand book is permitted.

3. Drawing of designed part is omitted in the end examination.

4. During class work students are encouraged to draw the orthographic views of designed part using parametric modeling and conventional drawing.

Reference Books :

1. A Text book of Machine Design--------R.S. Khurmi & J.K.Gupta , S.Chand publication

2 . Design Of Machine Elements Vol I, Vol II—J.B.K. Das , P.L. Srinivas Murthy, Sapna Publication.

3. Design Data Hand Book for Mechanical Engineers - K Mahadevan & K Balaveera Reddy

4. Introduction to Machine design – V B Bhandari, Tata- McGraw Hill Publications.

5.Machine Component Design – William Orthwein-JAICO Publication

Design of Machine Elements

Max.Marks:100   Time: 3Hrs

    Note : 1. Answer any two full questions from each section.
           2. Any missing data may be suitably assumed.
           3. Use of Design Data hand book is permitted.

SECTION-I

1. a) Explain Design procedure.   05

    b) A steam engine cylinder has an effective diameter of 350 mm and the maximum steam pressure acting on the cylinder cover is 1.25N/mm^2 .Calculate the number and size of studs required to fix the cylinder cover, assuming the permissible stress in the studs as 33 MPa..   10

2 a) State the applications of computer in design process.   5

   b).Design a bolt from the following details: The initial preload on the bolt is 4 kN and the external force acting on the bolt is 7.5 kN . The value of K for gasket material is 0.5 . The bolt with coarse thread is made of plain carbon steel with yield strength is 375 MPa. Assume factor of safety= 3   10

3. a. Sketch and explain sunk and saddle key.   5

  b.A line shaft rotating at 500 rpm is to transmit 600 kW. The allowable shear stress for the shaft material is 42N/mm^2 .If the shaft carries a central load of 900 N and is simply supported between bearings 3 m apart. Determine the diameter of the shaft. The maximum tensile stress is not to exceed 50 MPa.- 10

SECTION-II

4. . Design a cast iron unprotected flange coupling for a mild steel shaft transmitting 90 kW at 250 rpm. The allowable shear stress in the shaft is 40 MPa and the angle of twist is not to exceed 1 degree in a length of 20 diameters. The allowable shear stress in the coupling is 30 MPa.   20

5. A screw jack is to lift a load of 50 kN through a height of 300 mm. The elastic strength of screw material in tension and compression is 200 MPa and in shear is 120 MPa. The material for the nut is phosphor-bronze having strength 100 MPa in tension,90 MPa in compression,and 80 MPa in shear. The bearing pressure between the nut and the screw is not to exceed 15N/mm^2 . Design screw,nut, handle and cup..   20

6.   Design a knuckle joint to connect two mild steel rods subjected to an axial pull of 100 kN. The allowable stress for rods and pins are 100 MPa, 130 MPa, and 60 MPa in tension, crushing and shear respectively   20

SECTION -III

7.a. State the Engineering applications of spring.   5

  b. A helical spring is to be designed for an operating load range of 90 to 135N. The deflection of the spring for the load range is 8 mm. Assume a spring index 10 and factor of safety 2(Two). Design the spring.   10

8.a. State the purpose of coupling.   5

b. A plate of 50 mm wide and 10 mm thick is to be welded to another plate by means of transverse fillet weld at the ends. If the allowable tensile stress is 100 N/mm^2 , determine the length of weld   10

9.a. Derive an equation for torque required to raise the load in case of screw jack. –   10

  b. A flat sunk key is used to connect a pulley to a 40 mm diameter shaft .The standard cross section
    of the key is 12 x 8 mm .The permissible shear strength for key material is 80 Mpa .Determine the length of the key.   05

MECHATRONICS

Subject Title	:	**Mechatronics**	
Subject Code	:	**M-**	
Hours Per Week	:	**04**	
Hours Per Semester	:	**64**	

TOPIC ANALYSIS

Sl.No	Major Topics	Hours Allotted	Weightage of Marks
	PART-A		
1	Introduction to Mechatronics	04	10
2	Sensors and Transducers	06	16
3	Signal Conditioning and DAQ systems	08	24
	PART-B		
4	Digital Logic	07	20
5	Microprocessors	06	15
6	Input / Output systems	06	15
	PART-C		
7	Programmable Logic Controllers	06	17
8	Communication Systems	07	18
9	Design of Mechatronics Systems	04	10

10	Environmental concerns and Industry Innovations	06	-
	Tests and Revision	04	-
	Total	**64**	**145**

OBJECTIVES

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

1. Appreciate what is Mechatronics is about.

2. Describe the performance of commonly used sensors and evaluate them

3. Explain the requirements for signal conditioning and data acquisition

4. Know the importance of Digital Logic

5. Describe the basic structure of a microprocessor and a microcontroller.

6. Identify the interface requirements and how it can be realized.

7. Understanding the structure of PLC and develop programs using ladder logic

8. Know the importance of communication systems and its interfaces.

9. Finding possible solutions to design problems from Mechatronics point of view.

1.0   **Introduction to Mechatronics**

     1.1   Introduction

     1.2   Systems

     1.3   Measurement Systems

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0   Introduction to Mechatronics

2.0   Sensors and Transducers

2.1   Define sensors and transducers

2.2   Define the terms: range and span, error, accuracy, sensitivity, hysteresis error, non-linearity error, repeatability/reproducibility, stability, dead band/time, resolution, output impedance.

2.3   Explain the sensors for displacement, position and proximity.

2.4   Know the working of pneumatic sensors. And proximity switches

2.5   Explain Hall effect sensors.

2.6   Understand the working of tachogenerator

2.7   Explain temperature measuring sensor

2.8   Sketch and explain strain gauge load cell

2.9   Briefly describe the working of a fluid pressure sensor.

2.10   Sketch and explain piezoelectric sensors.

2.12   Explain turbine meter, Bimetallic strips.2   Explain the working of light sensors.

2.13   Mention the inputting data by switches and explain De-bouncing

3.0 Signal Conditioning

3.1   What is meant by Signal conditioning

3.2   Explain the need for interfacing with a microprocessor

3.3   List out signal-conditioning processes

3.3   What is an operational amplifier

3.4   Briefly explain inverting and non-inverting amplifier.

3.5   Sketch and explain summing, integrating, differential amplifiers.

3.6   Explain the need and working of a logarithmic amplifier

3.7   What is the need of a comparator.

3.8   Explain the necessity of filtering

3.9   Sketch and explain a Wheatstone bridge

3.10   Explain thermocouple compensation

3.11   Define digital signals

3.12   How Analogue signals are converted to digital signals

3.13   What is meant by sampling theorem

3.14   Explain digital to analogue convertors

3.15   List the specifications of an ADC

3.16   What are sample and hold amplifiers

3.17   Sketch and explain a multiplexer

3.18   Need for data acquisition

3.19   Explain a DAQ system

3.20   What is meant by digital signal processing

3.21   Brief about pulse modulation

4.0 Digital Logic

4.1   Explain the need for a digital Logic

4.2   Explain briefly different number systems

4.3   Mention the importance of one's and two's complement

4.4   Explain logic gates-AND, OR, NOT, NAND, NOR, XOR

4.5   Need for combination of gates

4.6   List the laws of Boolean algebra

4.7   Define De-Morgan Laws

4.8   What are Karnaugh Maps

4.9   Explain the simplification of circuits using Karnaugh Maps.

4.10 Mention the applications of logic gates

4.11 what are flip-flops

4.12 sketch and explain the following flip-flops: SR, JK, D

4.13 What are Registers.

5.0 Microprocessors

5.1 Requirement of a microprocessor

5.2 Explain the architecture of a microprocessor.

5.3 Explain different types of memories

5.4 what are microcontrollers and difference between microprocessors and microcontrollers.

5.5 Sketch and explain the microcontroller with a block diagram Intel 8051

5.6 Show the pin configuration of an Intel 8051.

5.7 List the factors considered while selecting a microcontroller for an application.

5.8 Sketch and explain a temperature measurement system

5.9 Explain a Domestic washing machine

6.0 Input / Output systems

6.1 Mention the need for an Interfacing and the way to do it.

6.2 List out the interface requirements

6.3 Explain the terms-buffering, Handshaking, polling and Interrupts

6.4 what is serial interfacing-brief.

6.5 Explain -PIA

6.5 Sketch and Explain interfacing 7-segment display with a decoder.

7.0 Programmable Logic Controllers

7.1 Define: PLC

7.2 Mention the special features of a PLC

7.3 Sketch and Explain the architecture of a PLC

7.4 List the configurations a typical PLC

7.5 Explain input/output processing

7.6 Define programming PLC using Ladder Logics.

7.7 Mention Ladder symbols used for programming

7.8 Explain a switch controlling of a solenoid or temperature control system

7.9 Define logical functions AND, OR, NOR, NAND and XOR with respect to PLC

7.10 what are timers, internal relays and counters-explain with ladder diagrams.

7.11 Explain shift registers with a programming example.

7.12 Need for a master and jumps –functions.

7.13 Explain data comparison with an example-temperature alarm.

7.14 How do you achieve arithmetic operations in a PLC

7.15 Indicate code conversions in a PLC

7.16 Explain conversion of an analogue signal to digital signal with an example

7.17 List the criteria for selection of a PLC

8.0 Communication Systems

8.1 Explain the concept of digital communications

8.2 Explain: centralized/Hierarchical/distributed control

8.3   Describe parallel data transmission and serial data transmission

8.4   What are serial communication modes

8.5   Define Networks and explain different types of networks.

8.6   what are network access control

8.7   Define Broadband and baseband

8.8   What are Protocols and buses.

8.9   Explain different layers of open systems interconnection communication model

8.10 Mention Network Standards.

8.11 Explain-CAN, Prohi-Bus, Field-Bus, Nu-Bus, VXI-bus, I2C Bus, GPIB

9.0   Design of Mechatronics Systems

9.1   Explain Mechatronics Design

9.2   Sketch and explain a timed switch

9.3   Sketch and explain a car park barrier

9.4   Sketch and explain an automatic Camera

<u>**REFERENCE BOOKS**</u>

1. Mechatronics- W. Bolton

2. Digital Electronics – Floyd

3. PLC by W. Bolton

4. Exploring PLC with applications by Pradeep Kumar Srivatsava

Mechatronics

Time: 3Hrs   **Max marks: 100**

Note:1.Section-I is compulsory

2. Answer any **two full** questions from each of the remaining Sections

SECTION I

1. a) Explain the need for a digital Logic

                                                                                                                          05

b) What is an operational amplifier   05

SECTION II

2 a)   Define Mechatronics. Explain open and closed loop control systems   **08**

b)   sketch and explain pneumatic sensors.   0**7**

3 a)   Explain turbine meter, Bimetallic strips.   10

b)   Sketch and explain a Wheatstone bridge   05

4 a)   What is meant by Signal conditioning
        Explain the need for interfacing with a microprocessor   **10**

b) List the specifications of an ADC **05**

SECTION III

5 a) List the laws of Boolean algebra 05

b) Explain the simplification of circuits using Karnaugh Maps. 10

6 a) Explain the architecture of a microprocessor with a block diagram 10

b) Differentiate between microprocessors and microcontrollers. 05

7 a) Explain the terms- Handshaking, polling and Interrupts 06

b) Sketch and Explain interfacing 7-segment display with a decoder. 09

SECTION IV

8 a) Mention Ladder symbols used for programming 0**5**

b) Explain input/output processing 06

c) Give the ladder program for AND logic 04

9 a) Define Networks and explain different types of networks 10

b) Define Broadband and baseband 5

10 a) Explain- Prohi-Bus, Field-Bus   5

   b) Sketch and explain a car park barrier   10

          -------X-------------

Mechatronics laboratory

Subject: Mechatronics lab

Subject Code:

Semester: VI

No. of Hours/week: 06

Total No. Of Hours: 96

PART-A

Design and Simulate the following digital circuits using MultiSim/any digital circuit simulator.

1. Basic Logic Gates
2. Demorgan's Theorem
3. Combination Logic
4. Encoders and Decoders
5. Digital Oscillator
6. Flip-Flops

PART-B

1. Draw the ladder rungs to represent

i.   two switches Normally Open and both have to be closed for the motor to operate.

ii.   Either of the two Normally Open switches to be closed for the coil to be energised

2. Devise a timing circuit that will switch on for 20s and then switch it off.

3. Device a timing circuit that will switch on 10s and off 20s and so on....

4. Device a circuit that can be used to start a motor and then to start a pump after delay of 50s. Then the motor is switched off 10s before the pump is switched off when the pump remains on for 50s.

5. Devise a circuit that can be used with the domestic washing machine to switch on a pump to pump water for 100s into the machine. Then switch on a heater for 50s to heat the water. The heater is switched off and another pump is switched on to empty the water for 100s.

PART-C

Design and Simulate the following systems using Automation Studio/Any equivalent Simulator Software.

1. Design and Simulate a ladder diagram for the forward and reverse movement of

the piston in a pneumatic cylinder. The output O1 and O2 of the PLC are to be connected to the forward and retract coil of the cylinder

2. Design and Simulate a ladder diagram to operate a Garage door.

3. Design and Simulate a ladder diagram for car parking

(Hint: car is to be detected and enter the parking space to a particular location if space is available. If there is no space, a lamp should indicate that parking is full.)

4. Design and Simulate a ladder diagaram to detect a bottle without cap on a conveyer in a bottling plant and indicate the same through an indicator.

Scheme of Valuation:

1. Anyone from Part A   20 marks
2. Anyone from Part B   25 marks
3. Anyone from Part C   30 marks
4. Viva   20 marks
5. Record   05 marks
              Total   100 marks

References:
1. Mechatronics by W.Bolton
2. Exploring PLC with applications by Pradeep Kumar Srivatsava- BPB Publications

System Requirements

1. Computers with latest configurations-cpu-3.0GHz-RAM-2Gb/hdd-

   250Gb/dedicated graphics card1Gb

2. UPS-minimum 7.5 KvA

3. Printers-Laser- 2 nos.

4. LCD projector-2 Nos.

Software Requirements

1. MultiSim– Latest version with 20 user Licences

2. Automation Studio-Latest Educational Version with 20 user Licenses

3. PLC – trainer Kit-5 nos (Siemens/Allen Bradley/Keyence/Fanuc)

C Programming and MatLAB

Subject Title   :   **C programming and MatLab**

Subject Code   :

Periods/Week   :   **06**

Periods/Semester   :   **96**

TIME SCHEDULE

S. No.	Name of Program	
1	Introduction to C programming Need for a computer language, types of computer languages, features of C, Character set	
2	Structure of C program., keywords, statements, standard library functions, pre-processor, main function, comments, variables, data types, operators, assignments, strings, format specifiers, escape sequences, control structures-sequential, conditional, repetitive/looping, arrays-one & two dimensions, user defined functions,	
3	C-Programs: PART-A	
	1. To find Sum and average of 3 real numbers. 2. To find Largest of 3 numbers using if statements 3. to find even or odd using if-else 4. to find whether a number is prime or not 5. finding the roots of the quadratic equation using switch-statement 6. to find sum of the digits of a given number 7. to arrange n-numbers in ascending/descending using Bubble sort technique 8. to find the addition/subtraction of two matrices 9. to find multiplication of two matrices 10. to swap two numbers using user defined functions.	

3	MatLab	PART-B	
	1. Introduction to MatLab 2. Understanding the interface-using the command window 3. using MatLab as a calculator. 4. Using variables, operators and built in functions. 5. Useful commands.		

Matlab programs:

1. A trigonometric identity is given by $\cos^2(x/2)=(\tan x+\sin x)/2.\tan x$ verify that the identity is correct by calculating each side of the equation substituting x=pi/5

2. three forces are applied to a bracket as shown. Determine the total (equivalent) force applied to the barcket.

3. The co-efficient of friction mu can be determined in an experiment by measuring the force F required to move a mass m. when F is measured and m is known the coefficient of friction can be calculated by mu=F/mg (g=9.81 m/sec$^{2)}$ results from measuring F in six tests are given in the table below. Determine the coefficient of friction in each test, and average from all tests.

Test #	1	2	3	4	5	6
Mass m-kg	2	4	5	10	20	50
Force F -N	12.5	23.5	30	61	117	294

4. a cylindrical silo with radius r has a spherical cap roof with radius R. the height of the cylindrical portion is H. write a program in a script file that determines the height H for given values of r, R and the volume V. In addition, the program also calculates the surface area of the silo. Use the program to calculate the height and surface area of a silo with r=30 m , R=45m and volume of 120000 cubic metre.. assign values for r,R and V in the command window.

5. the piston-connecting rod-crank mechanism is used in many engineering   applications. In the mechanism shown in the following fig. The crank is rotating at constant speed of 500 rpm. Calculate and plot the position, velocity and acceleration of the piston for one revolution of the crank. Make the three plots on the same page. Set theta=0 when t=0.

6. create a function file that calculates the trajectory of a projectile. The inputs to the function are the initial velocity and the angle at which the projectile is fired. The outputs from the function are the maximum height and distance. In addition, the function generates a plot of the trajectory. Use the function to calculate the trajectory of a projectile that is fired at a velocity of 230 m/sec at an angle of 39deg.

7. The flight of a model rocket can be modelled as follows. During the first 0.15s the rocket is propelled up by the rocket engine with a force of 16N. The rocket then flies up while slowing down under the force of gravity. After it reaches the apex, the rocket starts to fall back down. When its down velocity reaches 20 m/s a parachute opens(assumed to open instantly) and the rocket continues to move down at a constant speed of 20m/s until it hits the ground. Write a program that calculates and plots the speed and altitude of the rocket as a function of time during the flight.

8. The outside dimensions of a rectangular box(top open) made of aluminium are 24x12x4 inches. the wall thickness of the bottom and the sides is x. derive an expression that relates the weight of the box and the wall thickness x. determine the thickness x for the box that weighs 15 lbs. The specific weight of the alumininum is 0.101 lb/cubic inch.

9. Viscosity mu is property of gases and fluids that characterises their resistance to flow. For most materials viscosity is highly sensitive to temperature. Below is a table that gives the viscosity of SAE 10w oil at different temperatures. Determine an equation that can be fitted to the data.

T ^{0}c	-20	0	20	40	60	80	100	120		
mu(N-s/m^2)	4.0000	.38	.095	.032	0.0150	0.0078	0.0045	0.0032		

2. A safety bumper is placed at the end of a race track to stop out -of- control cars. The bumper is designed such that the force that the bumper applies to the car is a function of the velocity v and displacement x of the front edge of the bumper according to the equation. $F=Kv^3(x+1)^3$ where K=30 s-kg/m^5 is a constant. A car with a mass m of 1500 kg hits the bumper at a speed of 90 km/hr. Determine and plot the velocity of the car as a function of its position for 0<=x<=3 m.

Serial no	Description	Marks
1	One program from part-A writing and execution	15+20
2	One program from part-B writing and execution	15+30
3	**Viva**	20
	Total	**100**

References:

1. C-programming –Refer 17th chapter in Mechatronics by W.Bolton

2. Computer Concepts and Programming-Vikas Guptha

3. Spirit of C-by Mullish Cooper.Jaico Book Publications.

4. MatLab-An Introduction with Applications-by Amos Gilat-Wiley Student Edn

5. MatLab Primer by Dr. Rudra Pratap

System Requirements

1. Computers with latest configurations-CPU-3.0GHz-RAM-2Gb/hdd-250Gb/dedicated

   graphics card1Gb

2. UPS-minimum 7.5 KvA

3. Printers-Laser- 2 nos.

4. LCD projector-2 Nos.

Software Requirements

1. **MatLab software – Latest version with 20 user Licences**

DIPLOMA IN MECHANICAL ENGINEERING

Fifth Semester

Sub: COMMUNICATION AND ANALYSIS SKILL DEVELOPMENT PROGRAMME
(CASP)

HOURS/WEEK: 06   TOTAL HOURS: 96
Competence to be developed in learners:

  I. To present orally any topic of the student's interest to the rest of the class without the assistance of media or any other aid (only talk) for at least 10 minutes creating interest in the listeners and sustaining the interest with a meaningful conclusion.
 II. To prepare a study report on any product/service in comparison with another one that is comparable from technical specification to customer satisfaction.
III. To present with the aid of slides (6 to 10) about the study conducted above to the rest of the class in about 10 minutes with the use of print for information and slides for graphs, pictures, images, video and animations etc.

Note to teachers:

- A teacher may guide only 6 to a maximum of ten students per year. This is to ensure active participation of each learner.
- All 96 hours need NOT be contact hours by the teacher. Students may be encouraged to do activities on their own with peer group to ensure higher level of participation.
- There are ten different tasks to be completed in the course of 96 hours. On completion of each task, record the result and the marks along with the initials of the learner for future reference, inspection and evaluation.
- A few activities are suggested under each task. Teachers can improvise on the list and add more activities as they progress from one batch to another.
- Students should not be compared with each other; instead they must be compared to the standards given against each task.
- The standard suggested is minimum requirement, learners may excel. The services of those who excel may be utilised to guide other learners to reach the suggested minimum.
- The tasks 8, 9 and 10 may be evaluated in the presence of the total group so that learners get the benefit of knowing the inferences made by others and even their presentation style.

Details of tasks must be completed:
(One group consists of maximum 6 nos.)
Task 1 – Communication skills (one to one personal communication).   6 hrs. 5 marks.
      Method of achieving task: Practice in pairs through role play
      Suggested activities:
  1. Telephonic conversation of a customer and supplier.
  2. An Automobile showroom person and a customer.
  3. Negotiation between Machine tool manufacturers and a technical representative of a polytechnic.
  4. Conversation between quality inspectors and the production supervisor of shop floor regarding producing quality components.

      Standards to be met:

- Given a telephone number, a student must be able to call and gather information from the person, sustaining the conversation for about 3 min using proper etiquettes and report on the enquiry made about the product or service. [e.g., call a toll free number to ask details about a product or service]
- Given a situation, a student must be able to talk to a person face to face in simulation, gather information about a product, discuss about it and also negotiate with him in the specified time (here, time can be specified by the teacher as per the need).

Task 2 – Communication exercise (one to many in simulation)   6 hrs. 5 marks.
Method of achieving task: Student should pick a topic and make presentation
Suggested Activities:
1. A very short talk highlighting the features of a two wheeler.
2. A creative advertisement sequence for a consumer product being eco friendly.
3. A debate on increasing the productivity of a manufacturing industry.
4. A panel discussion among students on issues related to cellular manufacturing.

Standards to be met:
- Given a brochure, one must be able to study about the product and understand it in 15 min and talk about it to his group highlighting its features and explain it in about 3 min.
- A student must be able to identify a topic of interest for debate, initiate the debate and carry it on, dividing the group into two based on different perspectives(e.g., For and against the topic)

Task 3 – Listening Skills: 6 hrs. 5 marks.
Method of achieving task: Listen to an advertisement and record the message
Suggested Activities:
1. View an advertisement of a branded product and write down the message behind.
2. Listen to the audio in a promotional CD for about 15 minutes of any chosen product or service. Note down points and discuss among friends.
3. View a CD of an innovative and safety practices observed in manufacturing industry for15 minutes and write down the summary in a paragraph of 20 lines.
4. Listen to a lecture on environmental effects of Thermal power plants and nuclear power plants and write a summary in 200 words.

Standards to be met:
- Given an audio clip or a visual of an advertisement, one must be able to listen carefully and understand it enabling him to write the message behind it in the specified time (say in about 5 min.).
- A student must be able to listen to a lecture or watch a CD for 15 min, noting down the key points and write a summary in 200 words in the next 15 min.
  Note: Hints taken and the summary must be hand written by the student and documented for evaluation.

Task 4 – Reading skills: 6 hrs. 5 marks.
Method of achieving task: Read commercially available literature and make presentation
Suggested activities:

1. Read an article from a magazine about the concept of Just in time and supply chain management techniques in production industry in order to control the inventory and talk to the rest of the group in about 5 minutes.
2. Read an advertisement of a newly released four wheeler by company and elaborate its qualities after collecting information from a different source like the company web site and a few customers.
3. Read an article on designing using CAD from the internet and discuss the merits.
4. Read an article on ERP packages from the internet and discuss the merits relevant to industry
5. Read a note on usage of automated material handling system and storage retrieval system from any technical journal and narrate in the class.

Standards to be met:
- Given an article from a journal or an advertisement from a magazine, one must be able to comprehend it in 15 to 20 min. Later on read it out to an audience, with proper intonation and elaborate it in the next 10 min.
- Given an article from the internet, a student must be able to gather more information from the net about it, understand it and read it out for an audience and narrate it.

Task 5 - Writing Skills: 12 hrs. 10 marks.
Method of achieving task: Prepare a resume in writing& highlighting the skill sets
Suggested activities:
1. Write a resume and a covering letter for three different jobs
   1) Wanted skilled technician for a fabrication industry.
   2) Wanted technician who is proficient in 3D Modelling for a MNC.
   3) Wanted Service Supervisor for Automobile show room
2. Write a synopsis for given topics such as optimising the machining parameters for alloy steel in 100 words.
3. Write a summary on the latest styles & features in domestic washing machine and refrigerator as house hold products.
4. Write an essay on any topic related to Mechanical/Automobile/Mining area for 150 words.

Standards to be met:
- ❖ Given a job advertisement, a student must be able to write a suitable resume and a covering letter in 30 min [Advertisements can be tailor-made by the teacher deliberately to train their students- e.g., two different jobs like a marketing person and an assistant in a Research & Development section and train students to prepare two resume for these jobs highlighting different achievements of the student in co-curricular activities to suit each job]
- ❖ Given a topic, a student must be able to write a synopsis or summary or an essay in about 150 words in the stipulated time.
Note: All these have to be hand written by the learner and documented for evaluation.

Task 6- Knowledge of using Internet: 6 hrs. 5 marks.
Method of achieving task: Use the internet and perform the task identified
Suggested activities:

1. Create an e-mail id and mail to 6 others
    1) Sending simple messages
    2) Forwarding messages with their comments.
2. Sending message with attachments
    1) Adding files as attachments
    2) Adding scanned attachments.
3. Collecting data from net
    1) Advanced welding practices available for underwater applications
    2) Computer aided process planning
4. Forwarding resumes to different jobs.

Standards to be met:
❖ Given an access to internet, one must be able to create an email ID, send mails, forward simple mails and also mails with attachments including scanned attachments and URL (web addresses for direct link). Also, they must be able to collect data from different websites using internet search engines and forward resumes to different job offering companies.
Note: Printouts of the mails, replies received and also the attachments with date and time have to be documented.

Task 7- Oral communication: 12 hrs. 5 marks.
    Method of achieving task: Conduct group discussion on a specific topic and record the discussions
Suggested activities:
1. Debate on current topics like Total quality management
2. Group discussion on latest developments in Fabrication and machining areas.
3. Discussion on qualities required for good entrepreneur.
4. Debate on role of women in managing the industry.

Standards to be met:
❖ Given a topic of relevance, they must be able to form groups and discuss/debate on it. Also one must take cue and participate actively in a group discussion . Encourage students to note down the points of discussion and file the points in the portfolio for evaluation.

Task 8- Data analysis: 18 hrs. 10 marks.
    Method of achieving task: Collecting market data and analysing for meaningful inferences
Suggested activities:
1. Collect data for any two products/machines of two different producers used in manufacturing industry which includes technical details, specifications, cost and customer satisfaction.
2. Use appropriate tools and collect data from authentic sources. Depending on the source decide the number of units for collecting the data.
3. Analyse the data with a view to compare the two products/ machines.
4. Interpret the analysis for meaningful conclusions.
5. Record the whole process for any other person to verify.

Standards to be met:

- ❖ Given two products/equipments/service, one must collect adequate information from an authentic source for each, like the company website or the printed brochure and record the specifications.
- ❖ The maintenance of quality of the product/service needs to be studied from personnel working at different levels in the company (3 -5 in number) for each product/service. A set of questions needs to be prepared for collecting data. The same questionnaire has to be used for collecting data from the personnel mentioned above.
- ❖ One must compare the two products for all the parameters based on the specifications. Also, a market survey has to be done preparing a printed questionnaire of around 5 questions and collecting responses from 20 customers. Then, analyse the data, compare them and interpret the analysis for meaningful conclusions.

  Note: This being a comprehensive task may require few weeks to finish. The data collected and the analysis carried out need to be documented.

Task 9 - Presentation Skills: 12 hrs. 10 marks.

Method of achieving task: report the data collected and analysed through the activities in task 8. Student should present the analysis and inferences of Task 8 for about 10 minutes supported by few slides (6 to 10) of pictures, graphs, images. The text material if any may be printed and given to the audience. Discourage students from using text material in slides.

Standards to be met:
- ❖ One must present the analysis done in task 8 using slides with pictures, graphs, images etc in 10 min. The first slide may contain text only as per need but other slides should preferably have pictures and images. Usage of graphs for comparison and analysis is preferred. Text materials have to be given as handouts to the audience.

Task-10- Pick & Speak: 12 hrs. 5 marks.

Method of achieving task: Pick and speak on any topic at spot

 Suggested activities

 Pick a topic from a lot and student should be allowed to speak for the duration of 2 to 3 minutes without the aid of any other media.

Standards to be met:
- ❖ One must be able to talk extempore for 2 min on any topic picked randomly from the lot, given a time of two minutes for organising his/her thoughts. The topics can be kept simple and general (current events of interest like sporting event or headline of the day). It must be totally an oral activity without the aid of any other media.

Suggested topics for presentation, discussion, and written & other tasks.

- ➢ Window air conditioner
- ➢ Composite materials
- ➢ Hydrogen as alternative fuel
- ➢ Lean manufacturing
- ➢ Power plant safety

- ➤ Alternative materials for manufacturing
- ➤ Laser beam welding.
- ➤ Welding for Medical applications
- ➤ Quality certification standards
- ➤ Latest Mining equipments
- ➤ Comfort air conditioning systems
- ➤ Time and Method study
- ➤ Industrial Waste disposal
- ➤ Preventive maintenance
- ➤ Industrial safety
- ➤ Micro machining
- ➤ Aluminium castings
- ➤ Advantages of design work stations
- ➤ Ultrasonic machining
- ➤ Laser beam machining
- ➤ Plasma arc welding
- ➤ CNC cutting tools
- ➤ Total productivity maintenance
- ➤ CNC Milling and Turning centres
- ➤ Fluid power couplings

FORMAT OF LOG SHEETS *

Sl.No.	Date	Task	Progress of Task	Initials of staff in charge and the student	Evaluation (as suggested in each task)

Signature of Guide   Signature of HOD

- ❖ All documented work as described in each task need to be filed in a portfolio with task no.1 at the bottom and task 10 on top.
- ❖ The log sheet may be filed on top.
- ❖ Learners need to have only one portfolio which contains all original documents. Duplicate copies need not be maintained. This is to ensure the authenticity of data collected and the analysis conducted on the data.

SCHEME OF EVALUATION
(**Total no. of students in one batch for end examination should not exceed 20)**

1. Maintenance of log book   10
2. Evaluation of prepared report on all ten tasks   65
3. End examination:
   A portfolio evaluation is recommended for the end examination evaluating the record of all ten activities of each individual learner for consistency and in case of any inconsistency the learner may be assessed on the criteria given against each task.
   Marks awarded for evaluating the portfolio -   50

                                        Total= 125 marks.

Note to End examination evaluators:
- Check the genuineness and authenticity of all recorded activities.
- The learner may be asked to do one activity of the choice of the examiner which involves listening to instructions, writing a small paragraph of 50 words, reading it and talking for a few minutes.
- The learner may be asked about his satisfaction of the marks awarded and in case of any mismatch the examiner may assess his performance and alter the portfolio assessment (here the benefit of doubt may be in favour of the learner i.e., an improvement may be recorded but in case the examiner feels that the marks awarded is more the same may be retained).
- Do not compare the performance of one student with that of another.
- Always compare the performance to the standard.
- Any one task at random need be checked for each learner.
- Total time taken for the evaluation of a portfolio need not exceed 15 minutes.

- ❖ All documented work as described in each task need to be filed in a portfolio with task no.1 at the bottom and ten on top. The log sheet may be filed on top.
- ❖ Learners need to have only one portfolio which contains all original documents. Duplicate copies need not be maintained. This is to ensure the authenticity of data collected and the analysis conducted on the data.

Recommended text book for the prescribed syllabus:
Ashan Academy (2011), Communication and Analysis skills, Orient Blackswan, Hyderabad.

References:

1. Chakravarthi K. T. & Chakravarthi L. T. (2011), Soft Skills for Managers, biztantra, New Delhi.
2. Alex K., (2009), Soft Skills: S. Chand & company Ltd, New Delhi.
3. Pink M. A. & S. E. Thomas. : Communication Skills, S. Chand & company Ltd, New Delhi.
4. Siddons S. (2008), Presentation Skills, Universities Press, Hyderabad.
5. Adler.: Communication : Goals and Approaches, Cengage Learning.
6. http://en.wikipedia.org/wiki/English_Language_Skills_Assessment
7. http://www.how-to-write-a-resume.org/resume_writing_examples.html
8. http://www.mindtools.com/page8.html
9. http://lorien.ncl.ac.uk/ming/Dept/Tips/present/present.html

In case during the implementation of CASP any teacher has a suggestion to improve the learners competence concerning any one of the ten tasks please feel free to mail to the following addresses: 1) jointdirector.cdc@gmail.com or 2) ecb@vsnl.net

Department of Technical Education, Karnataka
DIPLOMA IN MECHANICAL ENGINEERING
FIFTH & SIXTH SEMESTER
(Final end examination will be in Sixth Semester)
SUBJECT: PROJECT WORK AND INDUSTRIAL VISIT

Contact Hrs/Week: 3 Hrs.   **Contact Hrs: 48 Hrs + 48 Hrs**

As far as possible students should be given application oriented project problems with a view to:

1. Develop an understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the course of study in Mechanical Engineering.
2. Develop an understanding of subject based knowledge given in the classroom in the context of its application at work places.
3. Provide first hand experience to develop confidence amongst the students to enable them to use and apply acquired technical knowledge and skills to solve practical problems of the world of work.
4. Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.
5. Practical exposure to an industrial activity

For the fulfillment of above competencies, polytechnics may establish close linkage with 8-10 relevant organizations for providing such an experience. It is necessary that each organization is visited well in advance by respective teachers and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations.

Each Project batch must have Minimum of 5 students.

Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the comprehension level of the students. The placement of the students for such a practical cum project work should match with the competency profile and interest of students.

Students may be assessed both by industry and polytechnic faculty.

The suggested performance criteria are given below:

a) Punctuality and regularity **(Log book - mandatory and to be produced during IA verification)**
b) Initiative in learning/Demonstration and fabrication of model
c) Level/proficiency of practical skills acquired
d) Originality
e) Scope for patentability
f) Sense of responsibility
g) Self expression/Communication skills

h) Interpersonal skills.
g) Report writing skills
h) Viva voce
Some of suggested projects are given below: These are only guidelines, teacher may take any project related to Mechanical and allied area depending upon the availability of projects. Preference should be given to practical oriented projects.

1) Industrial Visit
Students are required to undergo an industrial visit for period of at least 3(Three) working days, either in V/VI semester. After completion of their visit the reports should be prepared. Each Student should write the report independently in view of his own observation in industry. All days for the visit should be accounted for clearly giving attendance particulars. The concern accompanying staff is to check student presence and access progress periodically

1.1 Industrial report
Students are required to submit a comprehensive report on factory visit with details of the organization where the training was undergone. The comprehensive report should focus on study of plant/ product /process/ along with intensive in-depth study on anyone of the topics such as processes, methods, tooling, plant layout and equipment, highlighting aspects of quality, productivity of the system. Any data, drawings etc should be incorporated with the consent of the Organization. The comprehensive report should be submitted for the end exam for evaluation.

2) Project work
According to the local needs, the following major projects are suggested:
1. Non conventional energy
    - Low Cost Solar Water Heating System for Domestic Purpose
    - Fabrication of Solar cooker
    - Study of Community Biogas Plant
    - Fabricate a thermally efficient wood burning stove
    - Solar lamps
    - Solar powered refrigerator
2. Mechatronics/Material handling area
    - Motorized object lifting jack
    - Key controlled- fork lifter
    - Object counting machine
    - Stepper motor control with selected steps for conveyor belts
    - Robotic arm with gripper
    - Material handling device in X,Y,Z motion control
    - Robotic crane
    - Robotic trolley for material handling
3. Fluid power and control area
        Pneumatic/Hydraulic jack
        Pneumatic/hydraulic crane
        Air compressed spray gun
        Pneumatic transport system

4. Automobile related area
   Regenerative braking system
   Steering controlled headlight
   Engine/motor vibration checker
   Seat belt automatic locking system
   Hydraulic braking
   Electro magnetic shock absorber
   Digital auto speed limiter
5. Motorized wheel chair
6. Design and Fabrication of various types of lab equipments useful to polytechnic
7. Repair and overhauling of various machine tools and lab equipments available at polytechnic
8. Critical Study of existing quality systems and inventory control at industry
9. Mechanical industry fabrication related projects
10. Automatic mopping machine to clean the floor area
11. Automatic milling machine with digital control
12. PCB fabrication
13. Any study project related to Mechanical and allied areas in industry
14. Any project related to industry based problems
15 .Any projects related to low cost automation

The Project Report should consist of following items.
   1. Introduction
   2. Review of Literature
   3. Study Area
   4. Methodology/Design/fabrication/Tests
   5. Result and Discussion
   6. Conclusion and scope for future study
   7. References.

_____

GUIDELINES FOR THE PREPARATION OF PROJECT REPORTS

1. Project reports should be typed neatly in Times New Roman letters with font size 14 for titles and 12 for text on both sides of the paper with 1.5 line spacing on a A4 size paper (210 x 297 mm). The margins should be: Left - 1.5",   Right -   1", Top and Bottom - 0.75".

2. The total number of reports (**Soft bound**) to be prepared are
   ➢ One copy to the department /library
   ➢ One copy to the concerned guide(s)
   ➢ One copy to the candidate.

3. Before taking the final printout, the approval of the concerned guide(s) is mandatory and suggested corrections, if any, must be incorporated.

4. Every copy of the report must contain

  ➢ Inner title page (White)

  ➢ Outer title page with a plastic cover

  ➢ Candidate declaration and Certificate in the format enclosed both from the institution and the organization where the project is carried out.

  ➢ An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

5. The organization of the report should be as follows

1. Inner title page 2. Abstract or Synopsis 3. Acknowledgments 4. Table of Contents 5. List of table & figures (optional)	Usually numbered in roman

Chapters (to be numbered in Arabic) containing Introduction-, which usually specifies the scope of work and its importance and relation to previous work and the present developments, Main body of the report divided appropriately into chapters, sections and subsections.

The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc., and subsections as 2.2.3, 2.5.1 etc.

The **chapter must be left or right justified** (**font size** 16). Followed by the **title of chapter centered** (**font size 18**), **section/subsection numbers along with their headings must be left justified** with **section number and its heading in font size** 16 and **subsection and its heading in font size** 14. The **body or the text** of the report should have font size 12.

The figures and tables must be numbered chapter wise

The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.

Reference or Bibliography: The references should be **numbered serially** in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [3]. The section on references should list them in serial order in the following format.

  1. For textbooks – Dr.Paramar S, Welding process and technology, Khanna publishers, New Delhi, 2 Edition, 2003.

  2. For papers – Y.Javadi and I.sattari, Welding distortion in pipes, Journal of pressure vessels and piping, Vol 85, Aug 2008, pp 337-343

Only SI units are to be used in the report. Important equations must be numbered in decimal form for e.g.

▪ **V = IZ** .... **(3.2)**

All equation numbers should be right justified.

Separator sheets, used if any, between chapters, should be of thin paper

PROJECT EVALUATION:

    1. Relevance of the subject in the present context   10 mark

    2. Literature Review   10 mark

    3. Fabrication of the model/Data collection/repair and

       Overhauling work   40 mark

    4. Results & Discussion   10 mark

    5. Industrial visit report   10 mark

    6. Presentation   20 mark

                      TOTAL   **100 mark**

SESIONAL MARKS EVALUATION:

    1. First review (During the end of V th semester)   25 mark

    2. Second review (During the end of VI th semester)   25 mark

                      TOTAL:50 mark

I A Marks:

Scheme of Evaluation

1	Log record	05
2	Synopsis	10
3	Presentation	10
	Total	**25**

NOTE: 1. Sesional marks to be awarded at the end of *EACH SEMESTER ONLY*

      2.The candidate declaration and certificate sample copy are enclosed here for incorporation in final project

      report

CANDIDATE'S DECLARATION

I, --- a student of Diploma in ----------------------------- Department bearing Reg No---------------------------------------of -- hereby declare that I own full responsibility for the information, results and conclusions provided in this project work titled **"---** "submitted to **State Board of Technical Examinations, Government of Karnataka** for the award of Diploma in ----------------------------------.

To the best of my knowledge, this project work has not been submitted in part or full elsewhere in any other institution/organization for the award of any certificate/diploma/degree. I have completely taken care in acknowledging the contribution of others in this academic work. I further declare that in case of any violation of intellectual property rights and particulars declared, found at any stage, I, as the candidate will be solely responsible for the same.

Date:

Place: **Signature of candidate**

                                                                           Name: --------------------

                                                                           Reg No-------------------

CERTIFICATE

Certified that this project report entitled ---

--**"**which is being submitted

by Mr./Ms. …………………………..………………..., Reg. No…..……………, a bonafide student of

………………………………….in partial fulfillment for the award of **Diploma in ----------------**

Engineering during the year …………………... is record of students own work carried out under

my/our guidance. It is certified that all corrections/suggestions indicated for internal Assessment have been

incorporated in the Report and one copy of it being deposited in the polytechnic library.

The project report has been approved as it satisfies the academic requirements in respect of Project work

prescribed for the said diploma.

 It is further understood that by this certificate the undersigned do not endorse or approve any

statement made, opinion expressed or conclusion drawn there in but approve the project only for

the purpose for which it is submitted.

Guide(s)
Name and signature

Examiners

Head of Department

Dept. of --------------------

ROADMAP FOR PROJECT GUIDES

1. The project work is proposed to be carried out during the V and VI semesters so that learners prepare during the V semester, do some field work based on the preparation during the mid semester vacation and report the analysis and inferences during the VI semester.
2. The learners would reach a level of maturity by the time they reach V semester and so a meaningful project lasting for a year can be executed by them.
3. To execute the project with involvement needs constant guidance and monitoring of the progress of the learners by the guide.
4. This does not mean teacher has to advice learners.
5. Be confident about the ability of the learner and "intellectually provoke" them with challenging questions. These questions should prompt the learners to search information and update themselves (to be carried out during the first two weeks).
6. Do not feed information to learners. Instead crate a 'cognitive dissonance' (a challenging question or situation that the learner is not able to find an immediate answer but feels the need to search for information to find a solution).
7. Defer judgement on learners and give them identified sources if required like a journal article, book or a web site.
8. Even if the learners report their inability to solve do NOT give or prescribe a solution.
9. Be patient and give time for the learner to construct his knowledge.
10. Give corrective feedback to the learner by challenging his solutions so that his logic is questioned and it develops further.
11. This leads to the first activity viz., literature survey and conceiving a project.
12. During this phase meet the project team in a group and create a healthy competition among the learners to search different sources and synthesise their findings in the group.
13. Aim for bringing out a workable innovative project conceived within the first eight weeks as given in the schedule attached.
14. During these two phases and the third phase the teacher should assess the strengths and weakness of the members of the group and allocate differential work to team members on the remaining tasks to be carried out during the next thirty weeks.
15. This is to ensure active participation of all the members of the team.

16. By the end of the twelfth week finalise the project and a schedule of further activities for each member indicating the time frame in which his activities are to be executed may be made ready. A soft copy of this schedule may be collected from each learner by the guide to follow up.
17. This schedule prepared by each learner need to be documented for checking further progress of the project.
18. The next few phases of the project may require active guidance of the guide especially regarding the sources of collecting data, if a sample data is to be collected the number of units has to be decided, collating the data/fabricating, tryout/analysis and finally coming out with meaningful conclusions or models or application.
19. Data like models, designs, technical specifications, source code, protocols and original records need be collected from one authentic source as there will not be any variation. The teacher may guide the learners to authentic source.
20. Data having limited variability like product/service quality, processes and standards, procedures need to be collected from a sample as there is a variation. The number of units from whom (source) the data is to be collected is called sample. The sample needs to be representative of the expected variation. The decision on the size of the sample and the number of units need guidance from the teacher. For example, data regarding the quality of a product/service need be collected from 3 to 5 personnel at different levels of a service provider or dealers of a product. The numbers given are suggestive but a guide based on his experience has to make valid suggestions.
21. Data having a wide range of variation like customer satisfaction where the customers are members of the public need a larger number of units to accommodate the diversity. A tool like questionnaire with predetermined questions need to be prepared, tried out on a small sample and finalise the questions. Data may be collected from at least 30 units. This number is suggested to apply statistical analysis for meaningful conclusions. Guides may decide on the sample size depending on the accessibility of data.
22. The intention of the above three points viz., 19, 20 and 21 is to ensure objectivity in data collection i.e., to reduce the subjectivity of the human mind.
23. All the above activities need to be completed before three to four weeks before the end of V semester (refer the spread sheet related to scheduling).
24. The learners may be instructed to collect data objectively with identified sample during the next 4 to six weeks which includes the mid semester holidays. This would enable the learners to visit the field and collect data without the constraint of reporting to institution and attending classes on a regular basis.
25. The collected data need to be organised and entered to spread sheets or similar formats for analysis. Qualitative data may be converted to quantitative using a rating scale or similar data organisation procedures.
26. The result of most analysis on spreadsheet could be obtained in tables or graphs as per the requirement.

27. Activities mentioned in points 24, 25 and 26 may be carried out by learners during 4 to 8 weeks after commencement of VI semester.
28. Interpretation of the analysed tables and graphs to arrive at meaningful inference. The guide at this stage may defer his ideas on interpretation allowing the learners to do this. In case the learners err in the process they may be given corrective feedback.
29. A report of the whole process of doing the project may be written, word processed and submitted in triplicate.
30. Guides may contact industries and try to solve their problems so that the learners get a field experience and they get ready for the industry.
31. Innovations and innovative practices may be encouraged among the learners to be pursued as a project. Developing prototypes, (in simulation or real) trying out feasibility of new ideas, changing existing systems by adding modules, combining, assembling new modules and developing new systems may be given higher priority over routine bookish projects.
32. The schedule of events proposed is for an investigative project as a model. Guides may alter the prescribed schedule to suit the kind of innovative projects sited in point No.31 above.
33. Industry personnel may be involved in conceiving, executing and evaluating projects. This gives credibility to the institute and acceptance of learners for absorption into the company.

GUIDELINES TO LEARNERS TO CARRY OUT A TWO SEMESTER PROJECT

1. Carry out the project work through the V and VI semesters. Preparation must be done during the V semester and based on this, field work should be done during the mid semester vacation and reporting of analysis and inferences should be done in the VI semester.
2. You have the ability and the level of maturity needed to conceive an innovative and meaningful project accomplishing which gives you recognition by the industry and empowers you with the power of knowledge.
3. Understand your strength and weakness and make an effort to find the strength and weakness of other peers in the team.
4. Complement each other's strength rather than compete with peers within the team. This will enable you to complete a comprehensive and innovative project relevant to the industrial needs rather than doing a routine copy of what others have done.
5. Seek guidance from the teacher and update him/her about the progress.
6. Be confident about your ability and that of other members of your group. Take extra efforts to collect information, share with your peers and synthesise your knowledge.
7. Question everything including the ideas of your teacher. Accept the ideas and instructions which are internally consistent (logical).
8. Involve actively in group activities and contribute towards the tasks.

9. Do not depend too much on the teacher as a source of information, search on your own and build your knowledge structure. Search for authentic sources like journal articles, books and authentic sites rather than blogs and tweets.
10. Though brief, record your thoughts and activities including searches immediately.
11. Prepare a schedule for your work on a spread sheet and encourage your peers to do the same.
12. Show your schedule and that of others to the teacher and get his feedback.
13. Keep reviewing the schedule every fortnight and take corrective steps if needed. For doing this keep the general guideline schedule given in the curriculum as a backdrop.
14. Tools used for data collection like instruments, testing machines, questions to be asked and software may be tried out and standardised by the twelfth week of the project. Seek the teacher's help who is experienced in doing this.
15. Collect data dispassionately or objectively (without applying your personal prejudice). Complete this task before the VI semester begins.
16. While entering data into the spread sheet ask your peer member to verify. This will ensure accuracy of data entry.
17. Use appropriate mathematics/statistics for calculations. Seek help from external sources (other than your teacher) if required.
18. The results of your analysis need to be graphically represented and documented. You may also add photographs and video clips to increase the validity.
19. This task needs to be completed within 8 weeks after commencement of VI semester.
20. Interpret the data (after analysis) and arrive at meaningful inferences on your own in discussion with your peers. Get it ratified by your teacher. Suggestions from the teacher may be discussed among your peers and incorporated if they are internally consistent.
21. The project report may be word processed (videos, photographs attached in soft copy) and submitted in triplicate two weeks before the end of VI semester.
22. Involve passionately in the team work, make constructive contributions and come out with an industry friendly project which will equip you in your professional development.

ESTIMATION AND COSTING

Subject Title	:	**Estimation and Costing**
Subject Code	:	**M-**
Hours Per Week	:	**04**
Hours Per Semester	:	**64**

TOPIC ANALYSIS

Sl.No	Major Topics	Hours Allotted	Weightage of Marks
	PART-A		
1	Introduction to Estimation and costing	05	15
2	Elements of costs	08	20
3	Indirect expenses and depreciation	05	15
	PART-B		
4	Mensuration and Estimation of materials cost	08	20
5	Mechanical estimation	15	38
	PART-C		
6	Wages and incentives	06	15
7	Introduction to financial management	03	07
8	Project planning and Break even analysis	04	15
9	Environmental concerns and Industry Innovations	06	-
	Tests and Revision	04	-
	Total	**64**	**145**

OBJECTIVES

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

1. Understand the estimation and costing procedure in industries
2. Know the actual costing process and calculation of selling prices
3. Understand the depreciation of equipments, plants and to know the different methods of calculating depreciation
4. Know the procedure for calculating material cost of various components
5. Understand the procedure for estimation of various shops
6. Know the labour wages and incentives
7. Know about basics of financial management
8. Understand the concepts of project planning and breakeven analysis

1.0 Introduction to Estimation and costing

    1.1   Estimation - Definition, Importance and Aims
    1.2   Qualities and functions of an Estimator
    1.3   Source of errors in estimation
    1.4   Constituents of Estimation
    1.5   Costing - Definition and Aims
    1.6   Standard cost and its Advantages
    1.7   Difference between estimation and costing
    1.8   Advantages of efficient costing

2.0 Elements of costs

    2.1   Elements of cost- material, labour, expenses
    2.2   Material - Direct material, indirect material and examples
    2.3   Calculation of Material cost
    2.4   Labour - direct, indirect labour and examples
    2.5   Calculation of labour cost
    2.6   Expenses - direct, indirect expenses and examples
    2.7   Classification of expenses - factory, administrative, selling and distribution expenses and examples
    2.8   Fixed and variable expenses and examples
    2.9   Components of cost - prime cost, factory cost, office cost, total cost
    2.10   Selling price
    2.11   Block diagram to show the relationship between elements and components of cost
    2.12   Simple problems on above
    2.13   Allocation of on-cost - methods and simple problems

3.0 Indirect expenses and depreciation

    3.1   Indirect expenses - depreciation, obsolescence, inadequacy, idleness, repair and maintenance
    3.2   Depreciation - causes, methods of calculating depreciation
    3.3   Simple problems on each method

4.0 Mensuration and Estimation of material cost

    4.1   Area of regular plane figures
    4.2   Volume and surface area of solids (formulae only)
    4.3   Estimation of material costs of step pulley, spindle lathe centre, Rivets, Fly wheel, Crankshaft, Chain link, Wedge and Gib-headed key,

5.0 Mechanical Estimation
    5.1   Estimation in machine shop - Definition of cutting speed, feed, depth of cut
    5.2   Estimation of time for various operations like Turning, Knurling, Facing, Drilling, Boring, Reaming, Threading, Tapping, Milling, Grinding, Shaping and Planning
    5.3   Estimation in sheet metal shop - Sheet material and gauge number, Sheet metal joints, Select suitable formula for estimation

5.4 Estimate the material required for preparation of container open on one side Cylindrical drum, funnel and tray

5.5 Estimation in foundry shop-pattern allowances, estimation of pattern cost, simple problems on C.I pulley and C.I. Wheel

5.6 Estimation in welding shop - estimation of gas welding cost, estimation of arc welding cost - Simple problems

6.0 Wages and incentives

6.1 Definition of wages, normal wages, real wages, living wages, fair wages minimum wages, methods of wage payment

6.2 Incentives - definition of incentive, types of incentives, examples

6.3 Characteristics of a good wage and incentive systems

6.4 Standard time - work measurement

6.5 Bonus system - collective bonus system, group bonus system

7.0 Introduction to financial management

7.1 Definition of terms such as assets, liabilities, current and long term assets and liabilities, capital, income, expenses, gain

7.2 Working capital - definition - net and gross working capital - factors affecting working capital.

7.3 Maintenance of accounts through journal ledger, cash book, balance sheet.

7.4 Transaction with bank - credits, payments overdraft, current account, securities.

8.0 Project planning and Break even analysis

8.1 Concept of project work

8.2 Project planning like market survey, project capacity, selection of site, plant layout, product design, drawing, specification, material requirement operation planning,

8.3 Break even analysis - break event chart, diagram to illustrate break event point, Simple problems on break even analysis

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0 Introduction to Estimation and costing

1.1 Define estimation

1.2 Explain the importance of estimation

1.3 List the aims of estimation

1.4 List the qualities of Estimator

1.5 List the functions of Estimator

1.6 Classify the source of errors in estimation and explain avoidable and un avoidable errors with example

1.7 Mention the constituents of Estimation, explain time allowances only

1.8   Define costing and state its aims
1.9   Define Standard cost and state the advantages of standard cost
1.10   List the differences between estimation and costing
1.11   State the advantages of efficient costing

2.0   Elements of costs

2.1   Mention the elements of cost- material, labour, expenses
2.2   Define: Direct material, indirect material with examples
2.3   Calculation of material cost: Direct material cost and indirect material cost
2.4   Define: direct, indirect labour with examples
2.5   Calculation of labour cost: Direct labour cost and indirect labour cost
2.6   Define- direct, indirect expenses and examples
2.7   Classify indirect expenses-factory, administrative, selling and distribution expenses and examples
2.8   Explain Fixed and variable expenses and examples
2.9   Explain the Components of cost-prime cost, factory cost, office cost, total cost
2.10   Explain Selling price
2.11   Draw the Block diagram to show the relationship between elements and components of cost
2.12   Solve Simple problems on above
2.13   Explain the allocation of on-cost- methods and simple problems

3.0   Indirect expenses and depreciation

3.1   Explain indirect expenses- depreciation, obsolescence, inadequacy, idleness, repair and maintenance
3.2   Define depreciation and state its causes, (Physical and functional)
3.3   Explain methods of calculating depreciation
3.3 Solve simple problems on each method

4.0   Mensuration and Estimation of material cost

4.1   Mention Area of irregular and plane figures with sketches
4.2   Mention Volume and surface area of solids (formulae only)
4.3   Estimate the material costs of step pulley, spindle lathe centre, Rivets, Fly wheel, crankshaft, chain link, wedge and Gib-headed key-Simple problems only

5.0   Mechanical Estimation

5.1   Estimation in machine shop-Define cutting speed, feed, depth of cut
5.2   Estimate the time for various operations like turning, knurling, Facing, Drilling, Boring, Reaming, Threading, Tapping, Milling, Grinding, shaping and planning - Simple problems only

5.3   Estimation in sheet metal shop - explain sheet material and gauge number, Sheet metal joints, select suitable formula for estimation

5.4 Estimate the material required for preparation of container open on one side, Cylindrical drum, funnel and tray (Simple problems)

5.5 Estimation in foundry shop - explain pattern allowances, estimation of pattern cost, simple problems on C.I pulley and C.I. Wheel

5.6 Estimation in welding shop-estimation of gas welding cost, estimation of arc welding cost (Simple problems)

6.0 Wages and incentives

6.1 Define: wages, nominal wages, real wages, living wages and fair wages Minimum wages and Mention methods of wage payment

6.2 Define incentives - Mention types of incentives with examples

6.3 List the characteristics of a good wage and incentive systems

6.4 Define Standard time and work measurement

6.5 Explain the procedure for work measurement

6.5 Explain bonus system - collective bonus system, group bonus system

7.0 Introduction to financial management

7.1 Define: assets, liabilities, current and long term assets and liabilities, capital, income, expenses and gain

7.2 Working capital - definition - Explain net and gross working capital - List the factors affecting working capital.

7.3 Explain the maintenance of accounts through journal, ledger, cash book,

7.4 Explain balance sheet.

7.5 Define: credits, payments, overdraft, current account, securities.

8.0 Project planning and Break even analysis

8.1 Explain the concept of project work

8.2 Explain the steps in project planning - market survey, project capacity, selection of site, plant layout, product design, drawing, specification, material requirement and operation planning.

8.3 Describe break even analysis - Draw break event chart, diagram to illustrate break event point, Solve simple problems on break even analysis

REFERENCE BOOKS

1. Mechanical estimation and costing- T.R.Banga and S.C.Sharma

2. Estimation and costing – by Acharya and Narang

3. Industrial Organisation and Engineering Economics by Banga and Sharma

4. Mechanical Estimation by Malhotra

DERARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING
SIXTH SEMESTER
MODEL QUESTION PAPER
ESTIMATION AND COSTING

Time: 3Hrs   **Max marks: 100**

Note:1.Section-I is compulsory
         2. Answer any **six full** questions from Section **-II, Section-III,**
         and Section-**IV.** Choosing at least **TWO** from each section

## SECTION I

1 a)   Fill in the blanks with appropriate words: -   **1X5**
   i) The expenditure which cannot be charged to particular product during production is
      known as _____
   ii) The lubricating waste and the coolant used during production are _____ materials
   iii) Reduction in the value and efficiency of a machine or asset is known as _____
   iv) The time counted from when the last element of operation has been completed is known
      as _____
   v) The capital which is required to meet the day to day needs _____
   b)   Write a note on pattern allowances   **5**

SECTION II

2 a)   Explain avoidable and unavoidable errors with example   **5**
   b)   Define standard cost and mention the advantages of standard cost   **5**
   c)   State the advantages of efficient costing   **5**

3 a)   Draw the Block diagram to show the relationship between elements and
         Components of cost   **5**
   b)   A small firm is producing 100 pens per day. The direct material cost is found to be
         Rs 160, direct labour cost is Rs 200 and factory overheads are Rs 250. If the selling
         on cost is 40% of the factory cost, what must be the selling price of each pen
         to realise a profit of 14.6% of the selling price?   **10**

4 a)   State the causes for depreciation   **5**
   b)   An industrial plant with an initial value of Rs 2, 00,000 and salvage value of
         Rs 20,000 at the end of 20 years were sold for Rs 1, 45,000 at the 10 years.
         What is the profit or loss, if sinking fund depreciation at 8% compounded
         annually was adopted?   **10**

SECTION III

5 a) Mention the procedure for estimation of material cost.   **5**
   b) Find out the weight of the 10 mild steel spindles as per the dimensions given
        in figure. Calculate the weight of scrap with their turned out from a mild steel
        rod of 25 mm diameter and facing and parting off allowances can be taken
        as 1 mm and 5 mm respectively. Assume that 15 mm length of rod is required
        for grip in the chuck. Density of m s is 7.8 gm/cc.   10
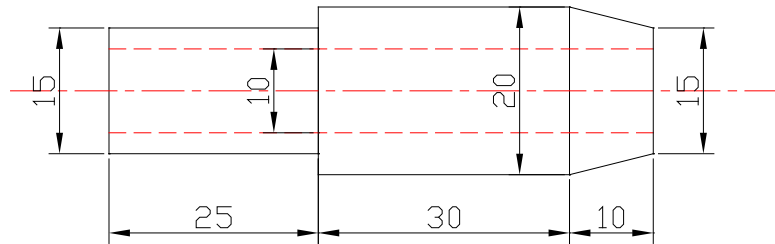
6 a) Define cutting speed and depth of cut **5**
   b) Find the time required to turn a 60 mm dia rod to the dimensions shown
      in the fig. Take cutting speed as 20m/min feed 1.2 mm .All cuts are 3mm deep   10
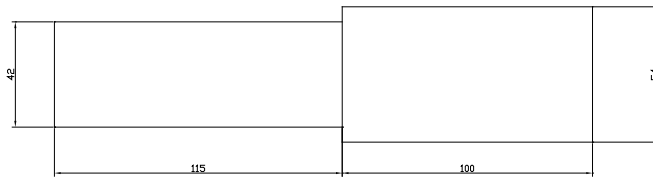
7 a) Explain any two sheet metal joints with simple sketches.   5
   b) A container open on one side of size 0.5X0.5x1m height is to be made from
       plates of 6 mm thickness. Take density of plate metal as 8 gm/cc and joints are
       to be welded. Estimate the cost of the container from the following data.
        Cost of the plate = 30/kg
        Sheet metal scrap = 5% of material
        Cost of labour = 25% of material cost
        Cost of welding material = Rs 20 / metre of weld   10

SECTION IV

8 a) Define working capital and mention the factors affecting working capital   **5**
   b) Find the cost of 2000 C I pulleys as shown in the fig. Its surfaces are to be
       machined after casting. The pattern is supplied by the customer. Following data
       is to be used   .

Cost of metal = Rs 20/kg
Moulds prepared by each worker = 20
Melting charges = 20% of metal cost
Machining allowance on each side = 2 mm
Wages of each moulder = Rs 160 / day
Density of cast iron = 7.2 gm/cc
Overhead charges = 25% of metal cost   10
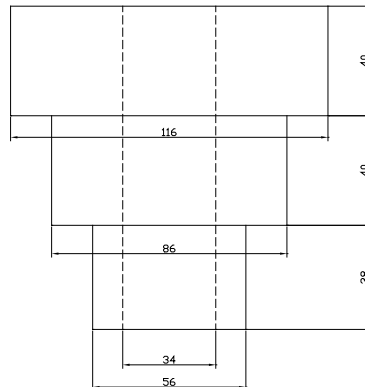
9 a) Define wages and mention the types of wages.   5
   b) Define incentives and explain different types of incentives with examples   5
   c) Mention the characteristics of a good wage and incentive system.   5

10 a) Mention the steps involved in project planning   5
    b) Draw a diagram to illustrate the breakeven point   5
    c) Fixed costs in a factory is Rs 10000/ year and variable costs are Rs 2.00/ unit
        and selling price is Rs 6.00 / unit. Calculate the BEP   5

-------X-------------

AUTOMOBILE ENGINEERING

Subject Title	:	**Automobile Engineering**	
Subject Code	:		
Hours Per Week	:	**04**	
Hours Per Semester	:	**64**	

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Introduction	01	02
2	Basic engine components	10	30
3	Cooling and lubrication system	08	16
	SECTION-II		
4	Fuel feed system	08	16
5	Ignition system	10	30
	SECTION-III		
6	Transmission and steering system	10	30
7	Suspension system	08	16
8	Special vehicles	02	05
9	Environmental awareness and Industry innovations	05	-
10	Tests & Revisions	**04**	
	Total	**64**	**145**

General educational objectives

On completion of the course the students should be able to:
1. Understand the basic structure of automobile.
2. Understand the basic engine components
3. To know the importance of engine cooling and lubrication system.
4. Understand the fuel feed system
5. To know the different ignition systems of automobile
6. To understand the transmission and steering system
7. To understand the suspension system of an automobile
8. To know the different special vehicles.

Content details:

1. Introduction

1.1 Introduction to basic structure of an automobile

2. Basic engine components

2.1 Cylinder block

2.2 Cylinder head

2.3 Gaskets

2.4 cylinder liners, types of cylinder liners

2.5 Piston and piston pin

2.6 piston rings, types of piston rings

2.7 Connecting rod

2.8 Crank shaft

2.9 Cam shaft

2.20 Crankcase

2.21 Engine valves

2.22 Flywheel and Governer

3. Cooling and lubrication system

3.1. The necessity of cooling system

3.2. Types of cooling system-air cooling and water cooling.

3.3. Air cooling system.

3.4. Types of water cooling system –Thermosyphon system and pump circulation system.

3.5. Advantages and disadvantages of air cooling and water cooling systems.

3.6. The components of water cooling system –fan, radiator, pump and thermostat.

3.7. The necessity of lubrication system.

3.8. S.A.E rating of lubrication system.

3.9. Types of lubrication system.

3.10. Petroil lubrication and high pressure lubrication system.

4. Fuel feed system

4.1. Conventional fuels and alternative fuels.

4.2. Cetane and octane numbers.

4.3. Types of carburetors

4.4. Working of simple carburetor.

4.5. Multi point and single point fuel injection systems

4.6. Different fuel transfer pumps

4.7. Working of S.U electrical and A.C mechanical pump

4.8. Fuel filters.

4.9. Fuel injection pump.

4.10. Fuel injectors.

5. Ignition system

5.1. Introduction to ignition system

5.2. Battery Ignition systems and magneto Ignition system

5.3. Electronic Ignition system.

5.4. Construction and working of lead acid battery.

5.5. Elements of charging system

5.6. Elements of starting system.

5.7. Types of lights used in the automobile.

6. Transmission and steering system

6.1. General arrangement of clutch

6.2. Principle of friction clutches

6.3. Constructional details of Single plate clutch

6.4. Constructional details of multi-plate clutch

6.5. Constructional details of centrifugal clutch.

6.6. Necessity for gear ratios in transmission

6.7. Types of gear boxes.

6.8. Working of sliding mesh gear box

6.9. Working of constant mesh gear box.

6.10. Working of propeller shaft

6.11. Working of universal joint

6.12. Working of differential

6.13. Types of rear axle

6.14. Purpose of front axle

6.15. Necessity of steering system

6.16. Caster, camber and king pin inclination.

6.17. Rack and pinion steering system

6.18. Power steering.

7. Suspension system

7.1. Necessity of suspension system.

7.2. Torsion bar suspension systems

7.3. Leaf spring and coil spring suspension system.

7.4. Independent suspension for front wheel and rear wheel.

7.5. Working of telescopic shock absorber.

7.6. Functions of brakes.

7.7. Types of brakes

7.8. Working of internal expanding brake

7.9. Working of disc brake.

8. Special vehicles

8.1. Introduction to Special vehicles.

8.2. Tractor

8.3. Motor grader

8.4. Scrappers

8.5. Excavators

8.6. Duper trucks.

Specific instructional objectives

1. Introduction

1.1 Introduction to basic structure of an automobile

2. Basic engine components
2.0 With sketch explain the construction and working of the following parts
2.1 Cylinder block
2.2 Cylinder head
2.3 Gaskets
2.4 Cylinder liners, types of cylinder liners
2.5 Piston and piston pin
2.6 piston rings, types of piston rings
2.7 Connecting rod
2.8 Crank shaft
2.9 Cam shaft
2.20 Crankcase
2.21 Engine valves
2.22 Flywheel and governer

3. Cooling and lubrication system

3.1. Explain the necessity of cooling system
3.2. Types of cooling system-air cooling and water cooling.
3.3. Explain air cooling system.
3.4. Types of water cooling system –Thermosyphon system and pump circulation system.
3.5. Advantages and disadvantages of air cooling and water cooling systems.
3.6. Explain the components of water cooling system –fan, radiator, pump and thermostat.
3.7. Explain the necessity of lubrication system.
3.8. Explain S.A.E rating of lubrication system.
3.9. State the types of lubrication system.
3.10. Explain Petroil lubrication and high pressure lubrication system.

4. Fuel feed system

4.1. Explain briefly conventional fuels and alternative fuels.

4.2. Explain briefly Cetane and octane numbers.

4.3. State the types of carburetors

4.4. Explain the working of simple carburetor.

4.5. Explain briefly Multi point and single point fuel injection systems

4.6. State different fuel transfer pumps

4.7. Explain the working of S.U electrical and A.C mechanical pump

4.8. Explain briefly Fuel filters.

4.9. Explain briefly fuel injection pump.

4.10. Explain briefly fuel injectors.

5. Ignition system

5.1. Introduction to ignition system

5.2. Explain Battery Ignition systems and magneto Ignition system

5.3. Explain briefly Electronic Ignition system.

5.4. Explain the construction and working of lead acid battery.

5.5. Explain with circuit diagram the elements of charging system

5.6. Explain with circuit diagram the elements of starting system.

5.7. State the different types of lights used in the automobile.

6. Transmission and steering system

6.1. Explain the General arrangement of clutch

6.2. Explain the Principle of friction clutches

6.3. Explain the Constructional details of Single plate

6.4. Explain the Constructional details of multi-plate

6.5 Explain the Constructional details of centrifugal clutch.

6.6. Explain the necessity for gear ratios in transmission

6.7. Mention the different types of gear boxes.

6.8. Explain with sketch the working of sliding mesh gear box

6.9. Explain with sketch the working of constant mesh gear box.

6.10. Explain with sketch the working of propeller shaft

6.11. Explain with sketch the working of universal joint

6.12 Explain with sketch the working of differential

6.13. State the different types of rear axle

6.14. Explain the purpose of front axle

6.15. Explain the necessity of steering system.

6.16. Explain caster, camber and king pin inclination.

6.17. Explain Rack and pinion steering system

6.18. Explain briefly power steering.

7. Suspension system

7.1. Explain the necessity of suspension system.

7.2. Explain Torsion bar suspension systems

7.3. Explain briefly leaf spring and coil spring suspension system.

7.4. Explain briefly independent suspension for front wheel and rear wheel.

7.5. Explain the working of telescopic shock absorber.

7.6. State the functions of brakes.

7.7. State the Types of brakes

7.8. Explain the working of internal expanding brake

7.9. Explain the working of disc brake.

8. Special vehicles

8.1. Introduction to Special vehicles.

8.2 Explain briefly special vehicles like

8.21. Tractor

8.22. Motor grader

8.23. Scrappers

8.24. Excavators

8.25. Duper trucks.

Reference books:

1. Automobile engineering vol I and Vol II by: Kirpal sing

2. Automobile engineering by R.B Gupta

3. Automotive mechanics: Principles and practices by Joseph heitner

4. Automobile engineering Vol I and Vol II by K. M. Gupta.

5. Automotive mechanics by S. Srinivasan, Tata McGraw hill

6. Alternative fuels by S.S Thipse Jaico publications

SUBJECT : **Automobile engineering**   SUBJECT CODE :_____
TIME : THREE HOURS   TOTAL MARKS : 100
_____

Note : 1) **Section – I** is compulsory .
    2) Answer any **two full questions from section – II, III & IV**
    3)

Section – I

Q – 1) a) **Fill in the blanks with appropriate words**   **1X5= 5**
        i) Using the liners in cylinder block_____the life of the cylinder block
        ii) The vibration is more in _____ cooled engines
        iii) Lead Acid battery is used for _____.
        iv) _____ is used for transferring power to back wheel.
        v) _____ is used to spread and level the ground.
b) Explain with line diagram working of internal expanding brake   5 Marks

SECTIO N – II

Q – 2)   a) State the functions of piston rings   5 Marks
    b) Distinguish between dry liner and wet liner   5 Marks
    c) State the different valves and explain any one   5 Marks

Q – 3) a) Explain briefly the pump circulation system   5 Marks
    b) State the advantages and disadvantages of air cooling over water cooling system
                              4 marks
    c) Explain briefly high pressure lubrication system   6 Marks

Q- 4) a) Distinguish between Octane number and Cetane number.   05
    b) State the types of carburetors and with sketch explain the working of simple carburetor

                                        10 marks

SECTION – III

Q – 5)   a) Explain the working of multipoint fuel injection system   05 Marks
    b) Explain the working of battery ignition system   10 Marks

Q- 6)   a) Explain the working of electronic ignition system.   06 Marks
    b) Explain briefly the different lights used in automobile   04 Marks
    b) List the advantages of electronic ignition system   05 Marks

Q- 7) a) Explain briefly the working of multi plate clutch   07 Marks

b) State the different types of gear boxes and explain constant mesh gear box
                                                                08 Marks

SECTION – IV

Q – 8) a) Explain with sketch working of differential with sketch   09 Marks
         b) Explain the Caster, camber and king pin inclination   06 Marks

Q- 9)   a) Explain necessity of suspension system.   04 Marks
          b) Explain with sketch the working of telescopic shock absorber. 08 Marks
          c) List the applications of tractor   03 Marks

Q-10)   a) Write short notes on the following: (5 x 3) = 15
             i) Special vehicles.
             ii) Fuel injector
             iii) Centrifugal clutch
             iv) Disc brake

COMPUTER   INTEGRATED MANUFACTURING

Subject Title   **: Computer Integrated Manufacturing**
Subject Code   **:**
Hours Per Week   **:   04**
Hours Per Semester   **:   64**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	PART - A		
1	Introduction to CIM & Automation	04	10
2	Fundamentals of CAD	06	19
3	Introduction to CNC	05	16
	PART – B		
4	Structure of CNC machines	12	30
5	Programming of CNC machines	08	20
	PART – C		
6	Computer Aided manufacturing	09	24
7	Robotics	10	26
8	Environmental concern and Industry Innovations	05	-
9	Tests & Revisions	**04**	
	Total	**64**	**145**

<u>General educational objectives</u>

On completion of the course, the students should be able to:
1. Understand the basic concepts of CIM and Automation
2. Know the fundamentals of CAD system
3. Know the concept of NC and CNC
4. Understand the basic structure of CNC machines and its components
5. Understand the programming concepts of CNC machines
6. Know the fundamentals of CAM
7. Understand the concept of Robotics and appreciate its role in Industry

Content details:

1. Introduction of CIM and Automation

1.1 Product Cycle and CAD/CAM – Basic concepts and definitions

1.2 CIM – definition, scope and elements of a CIM system

1.3 Automation – definition and elements of an automated system

1.4 Types of automation and levels of automation

1.5 Reasons for Automation (benefits)

2. Fundamental of CAD

2.1 Product design – steps involved in manual design

2.2 Application of computers in design

2.3 Creation of manufacturing database

2.4 CAD system hardware – design workstation, plotters & printers and storage devices

2.5 Benefits of CAD

3 Introduction of CNC

3.1 NC – definition

3.2 Basic components of an NC system

3.3 Applications of NC – Machining applications and non-machining applications

3.3 Motion control systems – PTP and continuous path systems

3.4 CNC – definition and features

3.5 Distributed numerical control (DNC)

3.6 Machining Centers – definition, features and classification

4 Structure of CNC machines

4.1 Machine structure – static, dynamic and thermal loads

4.2 Guide ways – different types

4.3 Drives in CNC – Feed drives, Spindle drives and their requirements

4.4 Motors – servo motors, servo principle and stepper motors

4.5 Mechanical transmission system – Ball screws, rack & pinion, gear box, timing belts and Flexible couplings.

4.6 Spindle bearings – hydrostatic, hydrodynamic and Antifriction bearings

4.7 Measuring systems – types, Rotary encoder and linear scales

4.8 Controls, software and user interface

4.9 Gauging and tool monitoring

4.10 Compensations for machine accuracy

5 Programming of CNC machines

5.1 Introduction to programming

5.2 Types of dimensioning

5.3 Axis and motion nomenclature

5.5 Structure of part program – word addressed format

5.6 Preparatory and miscellaneous functions

5.7 Subroutines

5.8 Canned cycles

5.9 Simple programs on turning, milling and drilling

   (To be taught in detail in CNC programming Lab)

6 Computer aided manufacturing

6.1 CAM – definition and categories of CAM

6.2 Components of a Manufacturing system

6.2 Group technology – definition, part family, part classification and coding (opitz system)

6.3 Applications and benefits of GT

6.4 Cellular manufacturing – concept and definition, types of machine cells

6.5 Flexible manufacturing system – definition, types, components and Applications

6.6 Computer aided process planning – retrieval type CAPP and Generative CAPP

7 Robotics

7.1 Introduction, definition and importance of robots

7.2 Robot Anatomy – joints and links, physical configuration

7.3 Basic robot motions – degrees of freedom

7.4 End effectors – grippers and tools

7.5 Programming of Robots

7.6 Applications of robots.

Specific instructional objectives

1. **Understand the basic concepts of CIM and Automation**
   1.1 Explain the steps involved in product cycle
   1.2 Define CAD, CAM and discuss the role of computers in product cycle
   1.3 Define CIM and discuss the scope of CIM with respect to CAD/CAM
   1.4 Explain the elements of a CIM system
   1.5 Define Automation elements of an automated system
   1.6 Explain the types of automation, levels of automation and reasons for automation

2. **Know the fundamentals of CAD system**
   2.1 Explain the steps involved in manual design process
   2.2 Give the block diagram indicating relation between manual design and CAD
   2.3 Discuss the applications of computers in design
       2.3.1 Geometric modeling
       2.3.2 Engineering analysis
       2.3.3 Design review and Evaluation
       2.3.4 Automated drafting
   2.4 Give the block diagram of common database created for CAD and CAM
   2.5 Discuss the CAD system hardware – design workstation, plotters and printers and storage devices.
   2.6 Discuss the benefits of CAD

3 **Know the concept of NC and CNC**
   3.1 Define NC and explain the basic components of NC
   3.2 Discuss the applications of NC in two areas i.e., machining and non-machining areas
   3.3 Explain the motion control systems of NC i.e., PTP systems and continuous path control systems
   3.4 Define CNC and give the difference between NC and CNC
   3.5 Explain the features of CNC
   3.6 Discuss the distributed numerical control (DNC) with a block diagram
   3.7 Define machining centers and discuss the features of machining centers
   3.8 Discuss the classification of machining centers.

4. **Understand the basic structure of CNC machines and its components**
   4.1 List the basic design factors of machine structure
   4.2 Explain static, dynamic and thermal loads on the machine structure
   4.3 Mention the use of guideways in machine tools
   4.4 Explain frictional guideways with stick-slip phenomenon
   4.5 Explain other types of guideways like Flat, dovetail, Vee and cylindrical type
   4.6 Explain hydrostatic and Aerostatic guideways
   4.7 Explain the role of drives in CNC machines
   4.8 Explain the requirements of feed drives and spindle drives in CNC machines
   4.9 Briefly explain the servo motor with its features and discuss servo-principle

4.10 Explain the stepper motors
4.11 Discuss the role of mechanical transmission system in CNC machines
4.12 Explain ball screws, rack & pinion, gear box, timing belts and flexible couplings
4.13 Discuss the importance of spindle bearings
4.14 Briefly explain hydrodynamic, hydrostatic and antifriction bearings
4.15 Discuss the role of measuring system and its types
4.16 Explain the working principle of rotary Encoder and linear scale
4.17 Outline controls, software and user interface
4.18 Explain gauging and types of tool monitoring systems.
4.19 Explain the various compensations for machine accuracy

5. Understand the programming concepts of CNC machines

5.1 Explain the factors to be considered while writing the part program
5.2 Discuss the co-ordinate system and methods of dimensioning
5.3 Explain axes and motion nomenclature
5.4 Explain structure of part program with block example of word addressed format
5.5 Discuss commonly used preparatory and miscellaneous functions
5.6 Discuss the subroutine programming with an example
5.7 Discuss the concept of canned cycle as applied to turning program
5.8 Write simple programs for turning, milling and drilling applications

6. Know the fundamentals of CAM

6.1 Discuss the role of computers in manufacturing
6.2 Explain the two categories of CAM – manufacturing planning and manufacturing control
6.3 Explain manufacturing systems and give its components
6.4 Define Group technology. Explain part family and discuss opitz system of part classification and coding
6.5 Discuss the applications and benefits of GT
6.6 Explain cellular manufacturing and its objectives
6.7 Explain types of machine cells and layouts
 6.7.1 Single machine cell
 6.7.2 Group machine cell with manual handling
 6.7.3 Group machine cell with semi-integrated handling
 6.7.4 Flexible manufacturing cell
6.8 Define Flexible manufacturing system
6.9 Explain various components of FMS like workstations, material handling systems (AGV's, AS/RS and robots), computer control system and human resources
6.10 Explain different types of FMS
6.11 Discuss the Applications of FMS
6.12 Discuss computer aided process planning
6.13 Explain Retrieval CAPP and Generative CAPP

7. Understand the concept of Robotics and appreciate its role in Industry
    7.1 Define Robots and Discuss the importance of robotics in industry
    7.2 Explain Robot Anatomy
        7.2.1   Explain various joints
        7.2.2   Explain different physical configurations
    7.3 Explain the six degrees of freedom of a robot as applied to arm and wrist
    7.4 Explain the End effectors – various types of grippers and tools
    7.5 Explain different methods of programming of Robots
    7.6 Mention the programming languages used in off-line programming
    7.7 Discuss the applications of robots in industry.

Reference Books:

1. Automation, production systems and Computer integrated manufacturing

   - Mikell P Groover (PHI edition)

2. CAD/ CAM

   - Mikell P Groover and Emory W. Zimmers

3. Mechatronics

   - HMT

4. CAD/CAM

   - P N Rao

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MODEL QUESTION PAPER

SUBJECT : **Computer Integrated Manufacturing**   SUBJECT CODE :_____
TIME : 03 Hrs   TOTAL MARKS : 100

Instructions: 1. Section I is Compulsory

                 2. Answer any TWO full questions each of the remaining sections

Section - I

1. a) What are Canned cycles ? Explain it as applied to turning application.   -- 05

   b) List out the various types of Grippers used as End effectors in Robots.   -- 05

     (Questions for this section are to be taken from Part-B and Part-C only)

Section -II

2. a) Define CIM. Explain the various elements of CIM system with a sketch. -- 06

   b) Explain the different types of Automation. -- 05

   c) Mention the steps involved in manual design process with a block diagram. -- 04

3 a) Explain applications of computers in design process -- 08

  b) Mention any seven benefits of CAD -- 07

4. a) Explain the basic components of NC with a diagram. -- 07

   b) What are the features of CNC ? -- 04

   c) Explain Distributed numerical control with a diagram -- 04

Section – III

5 a) Explain the different loads to be considered while designing machine structure of a CNC

     Machine. -- 09

  b) Explain stick- slip phenomenon in frictional guideways. -- 06

6. a) Differentiate between direct and Indirect measuring system. -- 04

   b) Explain any three compensations for machine accuracy. -- 06

   c) Explain hydrodynamic bearing with a neat sketch. -- 05

7 a) Explain Absolute and Incremental mode of dimensioning -- 06

  b) Write a subroutine program for the given sketch. -- 09

Section – IV

8 a) Define CAM. Discuss the two categories of CAM -- 05

  b) Explain Opitz system of part classification and coding. -- 05

  c) Explain the various components of FMS -- 05

9. a) Explain Retrieval type CAPP with a neat sketch -- 09

  b) Define Robot. Discuss the importance of robots in industry -- 06

10. a) Explain degrees of freedom of a robot with a neat sketch. -- 09

   b) Mention any six applications of Robots. -- 06

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METAL CASTING SCIENCE AND ENGINEERING

Subject Title : METAL CASTING SCIENCE AND ENGINEERING
Subject Code : M-
Hours Per Week : 04
Hours Per Semester : 64

TOPIC ANALYSIS

Sl.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Introduction to Metal Casting	04	10
2	Gating and Risering	10	25
3	Melting and Pouring Practice	07	20
	SECTION-II		
4	Cleaning and Inspection of Castings	08	20
5	Casting Defects and Quality control in Foundries	05	15
6	Mechanisation, Computerisation and Pollution Control of Foundries	06	20
	SECTION-III		
7	Application of CAD/CAM in Foundries	08	20
8	Casting Simulation and Optimization	06	15
9	Environmental concerns and Industry innovations	06	-
10	Tests and Revisions	04	-
	Total	**64**	**145**

OBJECTIVES

On the completion of the course the students should be able to understand:

1. The importance of metal casting science and engineering
2. The concept of casting processes
3. The importance of design of gating and risering of castings
4. The construction and working of melting furnaces
5. The importance of pouring practice
6. The importance of cleaning and inspection of castings
7. The importance of quality in casting industry
8. The importance of mechanisation and computerisation in foundry
9. The application of CAD/CAM in foundries
10. The importance of casting simulation
11. The importance of pollution control in foundries

COURSE CONTENTS

1.0 Introduction to Metal Casting

1.1 Introduction
1.2 Casting - As basic manufacturing process, Importance and Applications
1.3 New casting development
1.4 Casting Processes
    1.4.1 Hierarchical classification of various casting processes
    1.4.2 Continuous Casting, Squeeze Casting and Semi-solid casting process
    1.4.3 Advantages, disadvantage and applications of above mentioned casting processes.

2.0 Gating and Risering

2.1 Introduction
2.2 Elements of Gating system
2.3 Design of Gating system
    2.3.1 Objectives achieved from good gating design
    2.3.2 Turbulence in gating system
    2.3.3 Metal flow rate and velocity calculations
    2.3.4 Design criteria for pouring basin and sprue
    2.3.5 Pouring time
    2.3.6 Design of Runner and Ingate
    2.3.7 Practical rules for Gating practice
2.4 Risering of Castings
2.5 Risering practice for alloys
2.6 Solidification of castings
    2.6.1 Concept of solidification of pure metals and binary alloys
    2.6.2 Solidification rate, Solidification time and Chvorinov's rule
2.7 Progressive solidification, Directional solidification and control of solidification to obtain sound castings

3.0 Melting and Pouring Practice

3.1 Introduction
3.2 Choice or selection of Melting furnace
3.3 Melting furnaces for foundries
    3.3.1 Cupola
    3.3.2 Crucible
    3.3.3 Electric Arc furnace
3.4 Pouring of molten metal and handling tools

4.0 Cleaning and Inspection of Castings

4.1 Introduction
4.2 Methods of cleaning - Fettling, Tumbling, Pickling, Sand and Shot blasting
4.3 Dressing of Castings
4.4 Importance of inspection
4.5 Non-destructive methods of Inspection - Visual inspection, Sound test, Pressure test, Radiographic (X-ray) test, Magnetic particle test, Fluorescent penetrate inspection, and Ultrasonic inspection
4.6 Recent Developments in Inspection and Testing - Thermal Inspection, X-Ray Diffraction Analysis, Image Analysis and Computerized Testing

5.0 Casting Defects and Quality Control in Foundries

5.1 Introduction
5.2 Defects in casting - Causes and Remedies,
5.3 Salvage of Defective Castings
    5.3.1 Factors affecting salvage of castings
    5.3.2 Salvaging techniques
    5.3.3 Repair of Gray Iron, S.G. Iron, Steel, Aluminum alloy and Copper alloy castings
5.4 Quality control in foundries
5.5 Statistical methods in quality control of castings - Sampling inspection and Control Charts
5.6 Statistical process control (SPC) in foundries

6.0 Mechanisation, Computerisation and Pollution Control of Foundries

6.1 Introduction
6.2 Need for Mechanization
6.3 Areas of Mechanization
6.4 Application of Computer and Robots in foundries
6.5 Energy Saving in Foundries
6.6 Pollution Control in Foundries
    6.6.1 Importance of Pollution Control in foundries
    6.6.2 Pollutants produced in different sections of foundry
    6.6.3 Methods to control pollutants produced in a foundry
    6.6.4 Environment standards and certification

7.0 Application of CAD/CAM in Foundries

7.1 Introduction
7.2 Solid modelling techniques
7.3 Model representation and exchange formats
7.4 Computer-aided design of patterns and dies
7.5 Computer-aided manufacture of tooling
7.6 Computer-aided inspection of tooling

8.0 Casting Simulation and Optimization

    8.1 Introduction
    8.2 Casting solidification simulation
    8.3 Mold filling simulation
    8.4 Casting defect prediction by simulation
    8.5 Casting methods design optimization
    8.6 Casting methoding and simulation software packages:
        AutoCAST, Magmasoft, ProCAST, Solidcast, etc.
    8.7 Internet Based Foundry Engineering (E-Foundry)

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.   Introduction to Metal Casting

    1.1 Appreciate the importance of metal casting in engineering
    1.2 State some of major application areas of metal casting in engineering
    1.3 List major metals in use today (by weight) along with their main characteristics and typical applications
    1.4 Explain the major stages in developing a new casting in a foundry
    1.5 Appreciate the special casting processes
    1.6 Explain the Hierarchical classification of various casting processes with the help of flow diagram
    1.7 Explain Continuous casting, Squeeze casting and Semi-solid casting process
    1.8 State the advantages, disadvantages and application of above mentioned casting processes

2.   Gating and Risering

    2.1 Explain the principles of Gating
    2.2 Explain the Requirements, purpose/functions of the gating system
    2.3 Explain with line diagram Pouring Cups and Basins, Sprues and Gates
    2.4 Explain the importance of Design of gating system (objectives achieved from good a good design)
    2.5 Explain the effect of Turbulence in gating system
    2.6 Explain how to calculate Metal flow rate, velocity and Pouring time (simple problems)
    2.7 Explain Design criteria for pouring basin
    2.8 Explain Design of sprue, runner and ingates
    2.9 State the Practical rules for good gating practice
    2.10 Explain how slag and dross are eliminated in case ferrous and non-ferrous alloys (Iron, Copper, Aluminium and Magnesium alloys)
    2.11 Explain the Principles of Risering
    2.12 Explain the difference between open and blind riser
    2.13 Explain how the location of Riser affects the Directional Solidification

2.14 Explain how to increase riser efficiency by Promoting Directional Solidification

2.15 State the aims and general principles of Riser system design

2.16 Explain the importance of riser location and feeding distance for riser system design

2.17 Explain the Concept of solidification of pure metals and binary alloys

2.18 Explain Solidification rate, Solidification time and Chvorinov's Rule

2.19 Explain how to obtain sound castings by controlling Progressive and Directional Solidification

3.   Melting and Pouring Practice

3.1 Understand the melting furnaces and their operations

3.2 Choice or Selection of furnace for melting different metals and alloys

3.3 Explain the construction and operational details of Cupola, Crucible furnace (pit and tilting type) Electric furnace (direct and indirect electric arc furnace)

3.4 State the advantages and disadvantages of above mentioned furnaces

3.5 Explain Cupola charge calculations (simple problems)

3.6 Explain Recent Trends in Cupola melting

3.7 Melt pouring

3.8 Explain different Pouring Equipments used in foundry

3.9 Explain Pouring Practice (including automatic pouring)

4.   Cleaning and Inspection of Castings

4.1 Know the different methods of cleaning and inspection of casting.

4.2 Explain the necessity for cleaning of casting.

4.3 Explain different methods of cleaning

4.4 Explain the need for inspection of casting

4.5 Explain the principle and operation of visual inspection, pressure test, radiographic test, sound test, magnetic particle test, fluorescent penetrate test and ultrasonic inspection.

4.6 Explain Recent Developments in Inspection and Testing of castings

5.   Casting Defects and Quality Control in Foundries

5.1 Identify the different types of casting defects

5.2 State the causes for casting defects and suggest the remedies

5.3 Explain the different techniques for repair of ferrous and non-ferrous casting

5.4 Explain how casting quality can be controlled in different stages of casting process

5.5 Explain how statistical methods can be used in quality control of castings

5.6 Explain how process variations can be controlled through the use of SPC

6.   Mechanisation, Computerisation and Pollution Control of Foundries

6.1 Appreciate the importance of Mechanization of foundries

6.2 List the areas for Mechanization

6.3 Explain the need for Mechanization

6.4 Identify the areas where Computers and Robots can be used in foundry

6.5 Explain the areas where energy conservation programmes can be effectively introduced in a foundry.

7. Application of CAD/CAM in Foundries

7.1 Explain casting features related to product and tooling
7.2 Explain different modelling techniques commonly used in foundries
7.3 State the advantages and limitations of solid modelling systems
7.4 Explain how CAD/CAM helps in improving foundry operations

8. Casting Simulation and Optimization

8.1 Explain how simulation helps in casting quality and yield improvement
8.2 Explain the different software programs used for casting methoding and simulation
8.3 Briefly describe and compare the features of various foundry software
8.4 Explain the major inputs and outputs of various simulation software
8.5 Explain the usefulness of internet communication in casting supply chain

REFERENCES:

1. Principles of foundry technology - P.L.Jain (Tata McGraw-Hill)
2. Metal Casting: Computer Aided Design and Analysis – B.Ravi (PHI)
3. A text book of foundry technology – O.P.Khanna (Dhanpat Rai Publications)
4. Manufacturing Process- I & II & III- By Dr. Radhakrishna K
5. Foundry technology – Sinha and Goel
6. Foundry technology – R.B.Gupta
7. Principles of Metal casting – Heine and Rosenthal.
8. Foundry Technology –Dr. Radhakrishna.

DERARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING
SIXTH SEMESTER
MODEL QUESTION PAPER
METAL CASTING SCIENCE AND ENGINEERING

Time: 3Hrs   **Max marks: 100**

 Note: 1.Section-1 is compulsory
          2. Answer **any two full** questions from each of the remaining sections

Section- 1

1. (A) Fill in the blanks with appropriate words: **5X1=5**

  (¡)   The casting is one of the basic _____ process.
  (ii)   Reducing variability and defects is the essence of _____concept.
  (iii)   The ultrasonic waves are usually generated by _____effect.
  (iv)   The crucibles used in foundries are made of clay and _____materials.
  (v)   The risers promote _____solidification
  (B) Write an explanatory note on Internet Based Foundry Engineering   5

Section- 2

2. a) Give the flow diagram showing the hierarchical classification of various casting processes.   08
   b) List the factors to be considered in the selection of suitable furnace for melting a metal in
      foundry.   07
3. a) Design the gating and risering system for rectangular plate steel casting with
      dimensions of 1000 mm x 1000 mm x 100 mm.   10
   b) Explain the use of chills in achieving directional solidification.   5
4. a) Define Gating ratio.   2
   b) Differentiate between function of top riser and blind riser.   6
   c) Explain in brief the different techniques available for improving casting yield.   7

Section- 3

5. a) With a neat sketch describe the working of pit type crucible furnace.   5
   b) A cupola of 75 cm diameter has melting ratio of 10:1, calculate

        (i) the air required for complete combustion

        (ii) air required to melt 500 kg of iron at this ratio

        (iii)the coke required to melt 500 kg of iron if melting ratio is 8:1

        (iv) the air required to melt 500 kg of iron if melting ratio is 8:1.

        Assume the weight of regular charge of coke as 32 kg   6
   c) State the advantages and disadvantages of direct electric arc furnace.   4
6. a) Explain briefly Quality control as applied to foundries.   5
   b) Explain sampling inspection.   5

c) Explain the ultrasonic method of casting inspection.   5

7. a) Mention the differences between a base feature and a local feature in a casting model.   5
   b) List various tooling features in a sand casting and die casting that need to be solid modelled.   5
   c) Give the relative merits and demerits of solid modeling based on conventional, haptic and virtual
     reality user interface.   5

Section- 4

8. a) Draw a detailed layout of cast iron foundry and indicate the possible areas where computers can
     be used.   9
   b) List the major pollutants emitted/produced in a foundry.   6
9. a) State the functions of various elements that comprise of gating system .   5
   b) Briefly explain control charts for variables as used in foundries.   5
   c) Explain Chvorinov's rule.   5
10. Write short notes on any three of the following :   **5X3=1**5
       a) Directional Solidification   b) Energy saving techniques in foundries
       c) Exothermic sleeves   d) Applications of robots in foundries.

REFRIGERATION AND AIR CONDITIONING

Subject Title : **Refrigeration and air conditioning**
Subject Code : **M-**
Hours Per Week : **04**
Hours Per Semester : **64**

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	PART-A		
1	Introduction to Refrigeration	07	17
2	Refrigeration Cycles	12	31
	PART-B		
3	Refrigeration equipments	08	20
4	Refrigerants and lubricants	04	10
5	Refrigeration flow controls	06	20
	PART-C		
6	Application of Refrigeration	05	10
7	Air conditioning	11	31
8	Refrigeration and Air-conditioning tools	03	06
9	Environmental concerns and Industry innovations	05	-
10	Tests	03	-
	Total	**64**	**145**

OBJECTIVES

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

1. Understand the principle of refrigeration and its effects.
2. Appreciate the concept of various refrigeration systems.
3. Study of refrigeration equipments such as Compresor, condensors and Evaporators
4. Know the different types of refrigerants and lubricants used in refrigeration system
5. Understand working of refrigeration flow control components
6. Appreciate the Application of refrigeration to various areas
7. Appreciate the concept of Air Conditioning and know their types
8. Familiarize the different tools used to install refrigeration system and Air Conditioner

1.0   Introduction to Refrigeration
   1.1   Definition of Refrigeration
   1.2   Refrigerating effect-unit of refrigeration- Coefficient of performance
   1.3   Types of Refrigeration-Ice, dry ice, Steam jet, Throttling, Liquid nitrogen refrigeration

1.4   Carnot refrigeration Cycle
1.5   Air refrigeration- Bell - Coleman cycle, PV& TS diagram
1.6   Advantage and disadvantages in air refrigeration
1.7   Simple problems

2.0   Refrigeration systems
2.1   Basic Components, Flow diagram of working of Vapour compression cycle
2.2   Representation of the vapour compression cycle on P-H, T-S & P-V Diagram
2.3   Expression for Refrigerating effect, work done and power required
2.4   Types of Vapour Compression cycle
2.5   Effects of super heating and under cooling, its advantages and disadvantages
2.6   Simple Vapour absorptions cycle and its flow diagram
2.7   Simple Electrolux system for domestic units
2.8   Comparison of Vapour absorption and vapour compression system
2.9   Simple problems on vapour compression cycle

3.0   Refrigeration equipments
3.1   Compressor - types of compressors, -.Hermetically sealed and Semi hermetically sealed compressor
3.2   Condensers - Air Cooled, water cooled, natural and forced draught cooling system,
3.3   Advantages and disadvantages of air cooled and water cooled condensers
3.4   Evaporators -natural, convection, forced convection types

4.0   Refrigerants and lubricants
4.1   Introduction to refrigerants
4.2   Properties of good refrigerants
4.3   Classification of refrigerants by group number and commonly used refrigerants in practice
4.4   Detection of refrigerants leakage
4.5   Charging the system with refrigerant
4.6   Lubricants used in refrigeration and their properties.

5.0   Refrigerant flow controls
5.1   Capillary tube
5.2   Automatic Expansion valve
5.3   Thermo static expansion valve
5.4   High side and low side float valve
5.5   Solenoid valve
5.6   Evaporator pressure regulator

6.0   Application of refrigeration

6.1   Slow and quick freezing
6.2   Cold storage and Frozen storage
6.3   Dairy refrigeration
6.4   Ice making industry
6.5   Water coolers

7.0 **Air conditioning**
    7.1   Introduction to Air conditioning
    7.2   Factors affecting Air conditioning
    7.3   Psychometric chart and its use
    7.4   Psychometric process-sensible heating and cooling
              Humidifying and dehumidifying
    7.5   Adiabatic saturation process
    7.5   Equipments used in air conditioning cycle
    7.6   Air conditioning units and plants

8.0 **Refrigeration and Air-conditioning tools**

    8.1   **T**ools used in refrigeration and Air conditioner installation
    8.2   Installation procedure
    8.3   Faults in refrigeration and air conditioning system
    8.4   Servicing procedure

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0 Introduction to Refrigeration
    1.1   Definition of Refrigeration
    1.2   Define: Refrigerating effect-unit of refrigeration- Coefficient of performance
    1.3   Explain different types of Refrigeration-such as ice, dry ice, and Steam jet, Throttling, Liquid nitrogen refrigeration
    1.4   Explain with block diagram Carnot refrigeration Cycle
    1.5   Sketch and explain Bell - Coleman cycle with PV& TS diagram
    1.6   State the advantage and disadvantages of air refrigeration system
    1.7   Simple problems on Carnot and air refrigeration cycle

2.0 Refrigeration systems
    2.1   Explain with flow diagram of working of Vapour compression cycle
    2.2   Representation of the vapour compression cycle on P-H, T-S & P-V Diagram
    2.3   Derive an expression for Refrigerating effect, work done and power required
    2.4   Sketch the different types of Vapour Compression cycle
    2.5   Explain the effects of super heating and under cooling, its advantages and disadvantages
    2.6   Sketch and explain Simple Vapour absorptions cycle and its flow diagram
    2.7   Sketch Simple Electrolux system for domestic units
    2.8   Compare the Vapour absorption and vapour compression system
    2.9   Simple problems on vapour compression cycle

3.0 Refrigeration equipments
    3.1   Explain the types of compressors,
    3.2   Explain -.Hermetically sealed - and Semi hermetically sealed compressor
    3.3   Explain Air Cooled, water cooled condensers
    3.4   Explain Natural and forced draught cooling system,

3.3 State the Advantages and disadvantages of air cooled and water cooled condensers
3.4 Explain Natural convection, forced convection types Evaporators

4.0 Refrigerants and lubricants

4.1 Define refrigerants and Lubricants
4.2 State the properties of good refrigerants
4.3 Give the classification of refrigerants by group number
4.4 List the commonly used refrigerants in practice
4.4 Discuss the detection of refrigerants leakage
4.5 Explain how to charge the system with refrigerant
4.6 State the lubricants used in refrigeration and their properties.

5.0 Refrigerant flow controls
5.1 Explain the working of capillary tube
5.2 Sketch and explain Automatic Expansion valve
5.3 Sketch and explain thermo static expansion valve
5.4 Explain with sketch the working of High side and low side float valve
5.5 Describe briefly the working of Solenoid valve
5.6 Explain evaporator pressure regulator

6.0 Application of refrigeration
6.1 Explain the various applications of refrigeration to the modern world with suitable diagram such as
i) Slow & quick freezing
ii) Cold storage and Frozen storage
iii) Dairy refrigeration
iv) Ice making industry
v) Water coolers

7.0 Air conditioning
7.1 Give a brief introduction to Air conditioning
7.2 Mention the factors affecting Air conditioning
7.3 Discuss Psychometric chart & its use
7.4 Explain Psychometric process and plot on psychometric chart
i) Sensible heating and cooling ii) Humidifying and dehumidifying
7.5 Adiabatic saturation process
7.6 List and explain equipments used in air conditioning cycle
7.7 Explain Window air conditioner and packaged air conditioner units

8.0 Refrigeration and Air-conditioning tools
8.1 List the Tools used in refrigeration and Air conditioner installation
8.2 Explain Installation procedure of refrigeration systems
8.3 List the Faults in refrigeration and air conditioning system
8.4 Explain Servicing procedure

REFERENCE BOOKS

1.   Refrigeration and Air Conditioning – by Domakundawar

2.   Refrigeration and Air Conditioning – by Sarao & Gabi

3.   Refrigeration and Air Conditioning – by Dosatt

4.   Refrigeration and Air Conditioning – by M.Zakria Baig

5.   Refrigeration and Air Conditioning – by C.P Arora

6.   Refrigeration and Air Conditioning – by S.S Thipse Jaico publications

DERARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING
SIXTH SEMESTER
MODEL QUESTION PAPER
REFRIGERATION AND AIRCONDITIONING

Time: 3Hrs   **Max marks: 100**

Note:
1.Part-I is compulsory
2. Answer any **six full** questions from **Part-II, Part-III, and Part**-**IV**
Choosing at least **two** from each section

PART- I

1 A) Fill in the blanks with appropriate words:-   **1X5**
I)   The refrigerant used in dairy refrigeration is _____.
ii)   The air refrigerator working on _____cycle
iii)   _____ unit of refrigeration
iv)   The automatic expansion valve is used to control the _____refrigerant.
v)   The motor and compressor mounted on the same casing in_____compressor

   B) Write a note steam jet refrigeration   **5**

PART-II

2 a)   Define the following terms w.r.t refrigeration
        i) Refrigerating effect ii) C.O.P   **4**
  b)   Explain with block diagram Carnot refrigeration Cycle.   **5**
  c)   State the advantage and disadvantages of air refrigeration system.   **6**
3 a)   Explain with flow diagram of working of Vapour compression cycle   .   **8**
  b)   A Refrigeration working on Bell-Coleman cycle operates between pressures
        limits of 1 bar and 8.5 bar. Air is drawn from the cold chamber at 100C and
        it is cooled to 300C before entering the expansion follow the law PV ^ 1.35 = C   7
        Determine theoretical COP of the system
4 a)   Explain with the help of TS and HS diagrams the working of vapour compression   **5**
        Refrigeration system.
  b)   Explain the effects of super heating and under cooling.   **5**
  c)   Differentiate between vapour absorption and vapour compression refrigeration system   **5**

PART-III

5 a)   State the Advantages of air cooled and water cooled condensers   4
   b)   Sketch and explain hermitically sealed compressor   **6**
   c)   Differentiate between natural and forced cooling system   **5**
6 a)   Describe forced convection types Evaporators   .   **4**
  b)   State the properties of good refrigerants.   **6**
  c)   Sketch and explain thermostatic expansion valve   **5**
7 a)   Explain the working of high side float valve   **5**
   b)   State the function of solenoid valve.   **5**
   c)   Describe briefly dairy refrigeration   **5**

PART-IV

8 a)   Explain with schematic diagram water cooler   **5**
   b)   Explain Psychometric chart & its use   **5**
   c)   Describe briefly psychometric process
        a) Sensible heating   b) Adiabatic saturation   **5**
9 a)   Explain installation procedure of refrigeration systems   .   **5**
   b)   State the factors affecting Air conditioning   **5**

c) Describe briefly window air conditioner **5**

10 Write short note on any **three** of the following   **5x3=15**
          i)   Tools used in refrigeration and Air conditioner installation r
          ii)   Packaged air conditioner
          iii)   Cold storage
          iv)   Evaporator pressure regulator
          v)   Air refrigeration system

POWER PLANT ENGINEERING

Subject Title	:	Power plant engineering
Subject Code	:	M
Hours Per Week	:	04
Hours Per Semester	:	64

TOPIC ANALYSIS

SL.No	Major Topics	Hours Allotted	Weightage of Marks
	SECTION-I		
1	Introduction to power plant	03	10
2	Economics of Power plant	05	15
3	Thermal power plant	10	25
	SECTION-II		
4	Hydro power plant	10	25
5	Diesel and gas turbine power plant	10	25
	SECTTION-III		
6	Nuclear power plant	06	15
7	Environmental impact of power plant	05	15
8	Power plant safety	05	15
9	Environmental concerns and Industry innovations	06	
	Tests	04	-
	Total	**64**	**145**

On the completion of the course the students should be able to:
1. Understand power plant engineering and its classification
2. Appreciate and know the economics of power plant
3. Understand the working of thermal power plant and Know the importance of thermal power plant
4. Understand the various components of hydro electric power plant and its importance
5. Understand the working of diesel power plant and gas turbine power plant
6. Understand the working of nuclear power plant
7. Understand the various environmental aspects related to power plant.
8. Understand and appreciate the safety aspects related to power plant

COURSE CONTENTS
1.0   Introduction to Power plant
   1.1   Introduction to power plant
   1.2   Indian Energy scenario
   1.3   Location of power plant
   1.4   Choice of Power plant

      1.5   Classification of power plant

2.0   Economics of power plant

      2.1   Terminology used in power plant: Peak load, Base load, Load factor, Load curve
      2.2   Various factor affecting the operation of power plant
      2.3   Methods of meeting the fluctuating load in power plant
      2.4   Load sharing- cost of power-tariff methods
      2.5   Performance and operating characteristics of power plant

3.0   Thermal power plant

      3.1   Role of thermal power plant in current power generation scenario
      3.2   Selection site for thermal power plant
      3.3   General lay out of a thermal power plant
      3.4   Fuels used in thermal power plant- Fuel handling layout and its methods, stages in coal handling storage.
      3.6   Fuel burning-Stoker firing, Pulverized fuel burning- Pulverization of coal
      3.5.   Ash handling system- Gravity system, pneumatic or vacuum system, electrostatic precipitation(ESP) system.
      3.6   Ash disposal Management and its utilization.
      3.7   Feed water treatment- Mechanical, thermal methods.

4.0   Hydro power plant

      4.1   Introduction to Hydro electric power plant
      4.2   Rainfall, Runoff and its measurement, Hydrograph, flow duration curve
      4.3   Selection of sites for hydro electric power plant
      4.4   General layout of Hydro electric power plant and its working
      4.5   Classification of the plant-Run off river plant, storage river plant, pumped storage plant
      4.6   Advantages and disadvantages of hydro electric power plant

5.0   Diesel and Gas turbine plant

      5.1   The layout of diesel power plant.
      5.2   Components and the working of diesel power plant.
      5.3   Advantages and disadvantages of diesel power plant.
      5.4   Gas turbine power plant-Schematic diagram, components and its working
      5.5   Combined cycle power generation- Combined gas and steam turbine power plant operation (only flow diagram).

6.0   Nuclear power plant

      6.1   Introduction
      6.2   Nuclear power-Radio activity-Radioactive charge-types of reactions

6.3   Working of a nuclear power plant
6.4   Thermal fission Reactors- PWR, BWR and gas cooled reactors
6.5   Advantages and Disadvantages of Nuclear power plant

7.0   Environmental impact of Power plant

7.1   Social and Economical issues of power plant.
7.2   Green house effect
7.3   Acid precipitation-Acid rain, Acid snow, Dry deposition, Acid fog
7.4   Air, water, Thermal pollution from power plants
7.5   Radiations from nuclear power plant effluents

8.0   Power plant safety

8.1   Plant safety concept
8.2   Safety policy to be observed in power plants
8.3   Safety practices to be observed in boiler operation
8.4   Safety in oil handling system
8.5   Safety in Chemical handling system
8.6   Statutory provision related to boiler operation

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0   Understand the power plant engineering and classification
1.1   Give the introduction to power plant
1.2   Discuss the current Indian Energy scenario
1.3   State the factors to be considered for Location of any type power plant
1.4   Explain the Choice of Power plant
1.5   Outline the Classification of power plant

2.0   Economics of power plant
2.1   Define the term: Peak load, Base load, Load factor with respect to power plant
2.2   Explain the concept of load curve
2.3   List the Various factor affecting the operation of power plant
2.4   Explain the Methods of meeting the fluctuating loads in power plant
2.5   State the factors to be considered for Selection of site for the power plant
2.6   Explain the concept of load sharing
2.7   Explain the various tariff methods
2.8   Explain how the performance and operating characteristics of power plant is
        measured

3.0   Thermal power plant
3.1   Discuss the Role of thermal power plant in current power generation scenario
3.2   list the factors to be considered for Selection site for thermal power plant

3.3   With schematic diagram explain the layout of a thermal power plant
3.4   Lists the types of Fuels used in thermal power plant
3.5   Explain Fuel handling layout and its methods
3.6   Explain the various stages in coal handling storage.
3.7   Explain Stoker firing,
3.8   Explain Pulverized fuel burning
3.9   Describe briefly Pulverization of coal
3.10.   Explain the Ash handling system like Gravity system, pneumatic or vacuum system, electrostatic precipitation (ESP) system.
3.11   Explain how the ash being disposed and its utilization.
3.12   Explain the various methods of feed water treatment.

4.0   Hydro power plant
4.1   Out line the importance of Hydro electric power plant
4.2   Discuss: Rainfall, Runoff and its measurement, Hydrograph, flow duration curve
4.3   List the factors considered while selecting of sites for hydro electric power plant
4.4   Draw the layout of Hydro electric power plant and explain its working
4.5   Give the Classification of the plant
4.6   Explain-Run off river plant, storage river plant, pumped storage plant
4.7   State the Advantages and disadvantages of hydro electric power plant

5.0   Diesel and Gas turbine plant
5.1   Draw the layout of diesel power plant.
5.2   List the Components and explain the working of diesel power plant.
5.3   List the Advantages and disadvantages of diesel power plant.
5.4   Explain with schematic diagram the working of gas turbine power plant
5.5   List the components of the gas turbine power plant.
5.5   Explain with flow diagram the operation of combined gas and steam turbine power plant operation.

6.0   Nuclear power plant
6.1   Out line the importance of nuclear power plant
6.2   Explain: Nuclear power-Radio activity-Radioactive charge-types of reactions
6.3   Explain with schematic diagram the working of a nuclear power plant
6.4   Explain the following type's thermal fission Reactors
            i) Pressurized water reactors ii) Boiling water reactor
            iii) Gas cooled reactors
6.5 State the advantages and disadvantages of Nuclear power plant

7.0   Environmental impact of Power plant

7.1   List the Social and Economical issues of with respect to power plant.
7.2   Explain Green house effect
7.3   Explain: Acid rain, Acid snow, Dry deposition, Acid fog
7.4   Explain Air, water, Thermal pollution from power plants

7.5   Explain how the radiations produced by nuclear power plant effluents will harm the environment

8.0   Power plant safety

8.1   Explain briefly about the plant safety concept
8.2   Discuss the Safety policy to be observed in power plants
8.3   List the Safety practices to be observed in boiler operation
8.4   List the Safety practices to be followed in oil handling system
8.5   List the Safety procedure to be followed in Chemical handling system
8.6   Discuss the Statutory provision related to boiler operation

REFERENCE BOOKS
1 Power plant Engineering-P.K.Nag Tata McGraw hill.
2 Power plant Engineering-Morse.
3 Power plant Engineering-Domkundawar.
4 Power plant Engineering-P.C.Sharma
5 Power plant Engineering-Rajput
6 Power plant Engineering-Gaffert.
7 Power plant Theory and design-P.I.potter-Ronald press.
8 Modern Power plant Engineering-J.weismen-,R .Ekart
9 Power Station Engineering& Economy-Skrotzki
10 The Elements of Nuclear Power plant-Bennet, Thomson

DERARTMENT OF TECHNICAL EDUCATION
DIPLOMA COURSE IN MECHANICAL ENGINEERING
SIXTH SEMESTER
MODEL QUESTION PAPER
POWER PLANT ENGINEERING

Time: 3Hrs   **Max marks: 100**

Note:

1.Part-I is compulsory

2. Answer any **six full** questions from **Part-II, Part-III, and Part**-**IV**

Choosing at least **two** from each section

PART- I

1 A) Fill in the blanks with appropriate words:-   **1X5**

I)   The fuel used in thermal power plant is _____.

ii) The moderator are used in nuclear reactor to control the_____ neutrons

iii) _____ standby plants to hydro and steam power plant

iv) The nuclear power plant is not suitable for _____.load condition

v)   In steam power plant the generation power is _____

B) Write a note on Indian energy scenario.   **5**

PART-II

2 a) How the power plant are classified   **5**

b) State the factors to be considered for locating the power plant.   **5**

c) List the Various factor affecting the operation of power plant   **5**

3 a) Define the term: Peak load, Base load, Load factor with respect to power plant.   **5**

b) Explain the Methods of meeting the fluctuating loads in power plant.   **5**

c) How the load curve has plotted? State its significance   **5**

4 a) With schematic diagram explain the layout of a thermal power plant   **6**

b) Explain Pulverized fuel burning   .   **5**

c) State the various methods of feed water treatment   **4**

PART-III

5 a) Explain electrostatic precipitation (ESP) type ash handling system.   **5**

b) How the ash disposal carried out in thermal power plant   **5**

c) State the Advantages of hydro electric power plant   . **5**

6 a) Describe briefly Hydrograph, and flow duration curve   . **5**

b) Explain-Run off river plant   .   **6**

c) Draw the layout of Hydro electric power plant   **4**

7 a) List the components of the gas turbine power plant.   **4**

b) List the Advantages and disadvantages of diesel power plant.   **4**

c) Explain with flow diagram the operation of combined gas and steam turbine
   power plant operation.   **7**

PART-IV

8 a)   Explain the working of diesel power plant   **5**
   b)   State the importance of nuclear power plant   **5**
   c)   Explain the working of Pressurized water reactors   **5**

9 a)   List the Social and Economical issues of with respect to power plant   .   **5**
   b)   Explain how the radiations produced by nuclear power plant were harmful
        to environment   **5**
   c)   List the Safety practices to be observed in boiler operation   **5**

 10   Write short note on any **three** of the following   **5x3=15**
              i)   Thermal pollution from power plants
              ii)   Statutory provision related to boiler operation
              iii)   Boiling water reactor
              iv)   Power plant safety concept.
              v)   Stages in coal handling

NON-CONVENTIONAL ENERGY ENGINEERING

Subject Title : **Non Conventional Energy Engineering**
Subject Code : **M-**
Hours Per Week : **04**
Hours Per Semester : **64**

TOPIC ANALYSIS:

Sl.No	Major Topics	Hours	Weightage of Marks
	SECTION-I		
1	Introduction to Non Conventional Energy Sources	01	05
2	Solar Energy Engineering	12	30
3	Wind Energy Engineering	08	15
	SECTION-II		
4	Ocean Energy Engineering	07	20
5	Geothermal Energy Engineering	06	15
6	Bio based Energy Engineering	06	15
	SECTION-III		
7	Direct Energy Conversion Systems	08	25
8	Energy Storage	06	20
9	Environmental concerns and Industry Innovations	06	-
10	Test and Revision	04	-
	Total	64	145

Objectives :

On completion of the course the students should be able to:
1. Understand the energy demand & supply conditions & appreciate the importance of non-conventional energy sources.
2. Understand Solar energy, its features & its applications.
3. Understand Wind energy, its mechanisms & applications.
4. Understand Bio based energy sources like bio mass & bio gas & their applications.
5. Understand the Ocean thermal & Tidal energy, their features, mechanisms & applications.
6. Understand the Geothermal & hydro thermal energy, its mechanism & applications.
7. Understand the concepts of Direct Energy Conversion systems & their applications.
8. Understand the concepts of Energy Storage & applications.

CONTENTS

           5.4.1   Vapor dominated systems

           5.4.2   Liquid dominated systems

    5.5   Prime movers for geothermal energy conversion

6.0   Bio Energy Engineering

    6.1   Introduction

    6.2   Biomass conversion techniques

    6.3   Biogas Generation.

    6.4   Factors affecting biogas Generation

    6.5   Types of biogas plants

    6.6   Advantages and disadvantages of types of biogas plants

7.0   Direct Energy Conversion Systems

    7.1   Thermo - Electric power

           7.1.1 Basic Principles

           7.1.2 Thermo electric power generator

           7.1.3 Thermo Electric materials & selection of materials.

    7.2   Thermionic Generation

           7.2.1 Introduction

           7.2.2 Thermionic emission & work function

           7.2.3 Basic Thermionic generator.

    7.3   Chemical Energy Sources

           7.3.1 Introduction

           7.3.2 Fuel cells – Principles of operation, classification & Types

           7.3.3 Applications of fuel cells

    7.4   Hydrogen Energy

           7.4.1 Introduction

           7.4.2 Principles of operation

           7.4.3 Applications

8.0   Energy Storage

    8.1   Introduction.

    8.2   Energy Storage systems

    8.3   Mechanical Energy storage

           8.3.1 Pumped Hydroelectric storage

           8.3.2 Compressed Air storage

    8.4   Electrical Storage

           8.4.1 Lead Acid Battery

    8.5   Chemical Storage

           8.5.1 Energy storage via hydrogen

           8.5.2 Ammonia

           8.5.3 Electromagnetic energy storage

SPECIFIC INSTRUCTIONAL OBJECTIVES

1.0 Introduction to Non conventional energy sources

    1.1 Introduction

    1.2 Explain the primary and secondary energy sources , their availability and world energy scenario

    1.3 Mention the types of energy sources - conventional and non- conventional energy sources.

    1.4 Discuss the importance of non-conventional sources.

2.0 Solar Energy Engineering

    2.1 Introduction

    2.2 Explain clearly the solar constant .

    2.3 Know the amount of solar radiation available at earths surface

    2.4 Discuss beam and difussed radiation

    2.5 Know about Solar Radiation Measurements

    2.6 Explain Pyrhelometers and Pyranometers

    2.7 Define solar collector and types of collectors

    2.8 Explain the physical principles of conversion of solar radiation into heat.

    2.9 Explain with sketch a typical falt plate liquid collector and a typical solar air heater or air collector.

    2.10 Mention the applications and advantages of flat plate collectors

    2.11 Explain parabolic focussing collector and non-focussing collector (flat plate collector augmented with mirrors)

    2.12 State the advantages and disadvantages of concentrating collectors over flat plate collectors

    2.13 Explain with sketch solar water heater, air heater, solar cooker , solar pond & solar distillation.

    2.14 Explain the principle of solar electric power generation. (solar photo-voltaic)

    2.15 Explain selective coatings used in solar collectors.

3.0 Wind Energy Engineering

    3.1 Introduction

    3.2 Know about the nature of wind and its characteristics

    3.3 Know briefly about the power & forces on the blades (No derivations)

    3.4 Discuss the conversion of wind energy

    3.5 Discuss the considerations to be made while selecting the site

    3.6 Explain the basic components of Wind energy conversion system (WECS)

    3.7 Explain horizontal and vertical axis wind mills

    3.8 Discuss the application of wind energy

4.0 Ocean Energy Engineering

    4.1 Introduction

    4.2 Discuss the ocean sources of energy

    4.3 Explain the two methods of ocean thermal electric conversion (OTEC) -- open cycle OTEC and closed cycle OTEC.

    4.4 Discuss the site selection for OTEC.

    4.5 Discuss the prospects of OTEC in India

    4.6 Explain the basic principles of tidal power

    4.7 Explain the components of Tidal power plant

    4.8 Give the schematic diagram of tidal power plant

    4.9 Mention the advantages and dis-advantages of tidal power

    4.10 Discuss the prospects of tidal power in India

.
5.0 Geothermal Energy Engineering
    5.1   Give a brief introduction about geothermal energy
    5.2   Discuss the nature of geothermal fields
    5.3   Explain the five categories of geothermal sources.
    5.4   Explain hydrothermal resources -- Vapour dominated systems and liquid dominated systems.
    5.5   Mention the prime movers for geothermal energy conversion.

6.0 Bio Energy Engineering
    6.1   Give a brief introduction about bio energy engineering.
    6.2   Explain clearly the terms Biomass and Biogas
    6.3   Discuss the various biomass conversion processes (Technologies) like thermochemical conversions, fermentation & anaerobic digestion
    6.4   Know the composition of Biogas
    6.5   Discuss biogas processes such as Digestion
    6.6   Know the factors affecting biogas generation
    6.7   Explain the types of biogas plants -- common circular digestet with floating drum and fixed dome digester
    6.8   Mention the advantages and disadvantages of biogas plants

7.0 Direct Energy Conversion Systems
    7.1   Introduction to Direct energy conversion system.
    7.2   Explain the Seebeck effect -- principle of thermocouple.
    7.3   Explain Joule effect, Peltier effect and Thomson effect
    7.4   Explain thermoelectric power generators -
    7.5   Discuss the thermoelectric materials.
    7.6   Discuss thermionic emission and work function
    7.7   Explain basic thermionic generator with sketch
    7.8   Explain the principle of operation of fuel cell
    7.9   Discuss the types of fuel cell
    7.10   Mention the application of fuel cells
    7.11   Briefly Explain the principle of hydrogen production
    7.12   List the applications of hydrogen energy

8.0 Energy Storage
    8.1   Know about the energy storage concepts and devices available .
    8.2   Mention the categories of energy storage systems.
    8.3   Explain pumped hydro-electric energy storage system.
    8.4   Explain compressed air storage
    8.5   Explain Lead -acid battery
    8.6   Explain Chemical energy storage via Hydrogen.

REFERENCE BOOKS
1) Non Conventional Energy Sources – G D Rai, Khanna Publishers
2) Non Conventional Energy Resources - B H Khan, 2nd Edition, Tata Mc Graw Hill Publications
3) Renewable Energy Sources & Emerging Technologies –
   D P Kothari, K C Singal & Rakesh Ranjan , Prentice Hall India Publications.
4) Energy opportunities and social responsibility by Satyesh C. Chakraborty Jaico publications

MODEL QUESTION PAPER

SUBJECT : **Non Conventional Energy Engineering**   SUBJECT CODE :_____

TIME : THREE HOURS   TOTAL MARKS : 100

_____

Note : 1) **Section – I** is compulsory .

      2) Answer any **TWO FULL QUESTIONS** FROM SECTION – **II, III & IV**

SECTION – I

Q – I) a) State a) Fill in the blanks with appropriate words   **1X5= 5**

    i) Coal is an example of _____ source of energy

    ii) Fuel cell is used for _____.

    iii) Lead Acid battery is used for _____ .

    iv) _____ is used for power generation where high velocity winds are available.

    v) Digester process is used in _____ energy production.

b) What are the prospects of non-conventional energy sources in India ?   **05**

SECTIO N – II

Q – II) a) Breifly explain the major conventional energy sources ?   06

    b) Define solar constant. What are the reasons for variation in solar radiation reaching the earth than received at the outside of atmosphere ?   06

    c) Briefly discuss difussed radiation.   03

Q – III) a) What is the difference between pyrheliometer and pyrenometer ? Explain Eppley pyrenometer   06

    b) Explain the principle of conversion of solar radiation into heat.   05

    c) Give the classification of solar collectors   04

Q- I V) a) Explain the working of solar water heater with schematic diagram   07

    b) Explain WECS with a block diagram   08

SECTION – III

Q – V) a) Mention Biomass conversion technologies. Briefly explain biochemical conversion   07

    b) What is the composition of biogas ? Mention the factors affecting the generation of biogas. 08

Q- VI) a) Explain with a schematic diagram the open cycle OTEC   06

    b) What are the basic components of a Tidal thermal power plant ?Explain briefly .   04

    b) List the advantages and limitations of Tidal power sources   05

Q- VII) a) Explain briefly the working of geothermal energy system   07

    b) What are the general categories of geothernal resources ? Explain in brief hydrothermal systems   08

SECTION – IV

Q – VIII) a) List the various energy storage devices   06

    b) With suitable sketch explain thermo electric power generators   09.

Q- IX) a) Explain briefly the Seebeck effect .   06

    b) Explain the working of fuel cell and their applications.   07

    c) List the applications of hydrogen energy devices   02

Q- X) a) Write short notes on the following :   (5 x 3) = 15

    i) Thomson effect .

    ii) Lead acid battery

    iii) Explain the basic principles of Peltier effect   iv) Solar constant

THERMAL ENGINEERING LAB

Subject Title   :   **Thermal Engineering lab**

Subject Code   :

Periods/Week   :   **06**

Periods/Semester   :   **96**

TIME SCHEDULE

S. No.	Name of Experiment	No of Hours allotted
1	Calorific value of Liquid and gaseous fuel by using Bomb calorimeter /Boy's gas calorimeter	06
2	Draw Valve timing diagram for 4-stroke diesel engine	06
3	Draw Port timing diagram for 2-stroke petrol engines	06
4	Conduct Performance test on single cylinder diesel engine at different loads	06
5	Conduct Performance test on petrol engine at different loads	06
6	Conduct morse test to determine the indicated power of individual cylinders	12
7	Conduct a performance test on multi stage reciprocating compressor	12
8	Conduct performance test on refrigeration kit to determine COP of the refrigerator	06
9	Thermal conductivity test on 1) Thick slab 2) Composite wall 3) Thick cylinder	10
10	Study of petrol and diesel engine components and Models	06
11	Study of high pressure boiler with model	03
12	Study of boiler mountings and accessories	06
	Industry innovations	05
	Tests and Revisions	06
	Total	**96**

OBJECTIVES

The main objective of this lab is to know working of various IC Engines. In this lab the students can see various parts of different engines and physically and can understand the engine working in a better manner as compared to theoretical. By under going this lab the students will get enough confident about all the types of IC engines parts, so that they can rectify some sort of problems normally occurring in their automobiles.

On Completion of the Course, the student should be able to:

1. Appreciate the practical applications of Bomb calorimeter /Boy's gas calorimeter
2. Appreciate the Mechanism of valve functioning in 4-stroke diesel engine
3. Appreciate the Mechanism of ports functioning in 2-stroke petrol engine
4. Understand the method of evaluating the performance characteristics of single cylinder diesel engine at different loads and draw the heat balance sheet
5. Understand the method of evaluating the performance characteristics of single cylinder petrol engine at different loads
6. Understand the method of finding the indicated power of individual cylinders of an engine by using morse test
7. Understand the method of evaluating the performance characteristics Multi stage air compressor
8. Understand the method of evaluating the co efficient of performance of refrigerator
9. Understand the method of finding the thermal conductivity of material
10. Study of petrol and diesel engine components and Models
11. Study of high pressure boiler with model
12. Study of boiler mountings and accessories

COURSE CONTENTS

1. Determination of calorific value of liquid and gaseous fuel by using Bomb calorimeter /Boy's gas calorimeter
2. Draw the valve timing diagram of 4-stroke diesel engine
3. Draw the port timing diagram of 2-stroke petrol engine
4. Plot the performance characteristics of single cylinder diesel engine for different loads
5. Draw the heat balance sheet of single cylinder diesel engine
6. Plot the performance characteristics of single cylinder petrol engine for different loads
7. Finding the indicated power of individual cylinders of an engine by using MORSE test
8. Determine the volumetric efficiency of air compressor
9. Determine the co efficient of performance of refrigerator
10. Determine thermal conductivity of thick slab
11. Determine thermal conductivity of composite wall

12. Determine thermal conductivity of thick cylinder

13. Study of petrol and diesel engine components and Models

14. Study of high pressure boiler with model

15. Study of boiler mountings and accessories

SCHEME OF VALUATION

Serial no	Description	Marks

1	**Writing procedure**
	    a) One major experiment
	    b) Individual experiment
		20

2	**Conducting of Experiment**
	    a)Major Experiment
	     (Group of Five)
	    b) Individual experiment
		25

3	**Calculation,results,Inference(Both experiments)**	35
4	**Viva**	20
	Total	**100**

List of Equipments

Serial no	Description	Quantity
1	Bomb calorimeter	1
2	Boys gas calorimeter	1
3	2- Stroke , Single- Cylinder petrol engine test rig	1
4	4 –Stroke , Three – cylinder petrol engine test rig(Morse test)	1
5	4 – Stroke , Single cylinder diesel engine test rig with Exhaust Gas Calorimeter	1
6	2 Stage reciprocating air compressor	1
7	Refrigeration unit	1
8	Thermal Conductivity Apparatus- Thick slab	1
9	Thermal Conductivity Apparatus- Composite wall	1
10	Thermal Conductivity Apparatus- Thick cylinder	1
11	Cut section models – petrol engine and diesel engine	2
12	Boiler models	1

CNC and Casting Simulation LAB

Subject Title   :   **CNC and Casting Simulation lab**

Subject Code   :

Periods/Week   :   **06**

Periods/Semester   :   **96**

TOPIC ANALYSIS

S. No.	Name of Experiment	No of Hours allotted
	Part-A	
1	Study of CNC lathe, milling Setting Machine zero – Tool zero, Job zero, dry run, jog mode	06
2	Study of international standards ISO/EIA/ANSI G-Codes, M-Codes	06
3	Programming – Turning simulator – Milling simulator,	06
4	**Exercise practice** CNC Lathe Develop a part program for step turning and simulate	03
5	Develop a part program for taper turning and simulate	03
6	Develop a part program for circular interpolation and simulate	06
7	Develop a part program for multiple turning operation and simulate	06
8	Develop a part program for thread cutting, grooving and simulate	03
9	Develop a part program for internal drills, boring and simulate	03
10	**Exercise practice** CNC Milling Develop a part program for grooving and simulate	06
11	Develop a part program for drilling (canned cycle) and simulate	06
12	Develop a part program for mirroring with subroutines and simulate	06
13	Develop a part program for rectangular and circular pocketing and simulate	06
	Part-B	
14	Casting Simulation Exercises	18

15	Industry innovations and environmental concerns	06
	Tests and Revisions	06
	Total	**96**

On Completion of the Course, the student should be able to:

1. Appreciate the importance of CNC lathe and CNC Milling machines
2. Understand the codes (G-code and M-Code) used in CNC machines for programming
3. To Develop Programming skills
4. To develop a part program for step turning and simulate
5. To Develop a part program for taper turning and simulate
6. To Develop a part program for circular interpolation and simulate
7. To Develop a part program for multiple turning operation and simulate
8. To Develop a part program for thread cutting, grooving and simulate
9. To Develop a part program for internal drills, boring and simulate

10. To Develop a part program for grooving and simulate on CNC Milling
11. To Develop a part program for drilling (canned cycle) and simulate
12. To Develop a part program for mirroring with subroutines and simulate
13 To   Develop a part program for rectangular and circular pocketing and simulate

14 To learn the use of CASTING simulation softwares

COURSE CONTENTS

1. Study the importance of CNC lathe and CNC Milling machines
2. Write the codes (G-code and M-Code) used in CNC machines for programming
3. Develop Programming skills by using G codes and M-codes
4. Develop a part program for step turning and simulate
5. Develop a part program for taper turning and simulate
6. Develop a part program for circular interpolation and simulate
7. Develop a part program for multiple turning operation and simulate
8. Develop a part program for thread cutting, grooving and simulate
9. Develop a part program for internal drills, boring and simulate

10. Develop a part program for grooving and simulate on CNC Milling
11. Develop a part program for drilling (canned cycle) and simulate

12. Develop a part program for mirroring with subroutines and simulate

13 Develop a part program for rectangular and circular pocketing and simulate

PART-B

Casting Design and Simulation Lab Exercises using any CASTING simulation softwares
(One lab exercise from this part for 30 marks in the final exam)

A. General objectives
Lab Exercise 1: Part modeling and geometry analysis
Lab Exercise 2: Core print design
Lab Exercise 3: Mold cavity layout
Lab Exercise 4: Feeder design and solidification simulation
Lab Exercise 5: Gating design and mold filling simulation
Lab Exercise 6: Casting cost estimation

B. Specific objectives

Lab Exercise 1: Part modeling and geometry analysis
The objective of this exercise is to create a 3D CAD model of a given part, compute its geometric properties, analyze its thickness and shape complexity. All these affect tooling design, manufacture, quality and cost.

Lab Exercise 2: Core print design
The objective of this exercise is to design the core prints to support the core in mold. The following steps are involved:

Lab Exercise 3: Mold cavity layout
The objective of this exercise is to determine the correct combination of mold box and number of cavities to achieve the desired ratio of cast metal to mold material. A low ratio leads to poor utilization of production resources, whereas a high ratio leads to poor quality

Lab Exercise 4: Feeder design and solidification simulation
The objective of this exercise is to design, model and verify the feeding system design for the given casting, to obtain a casting free of solidification shrinkage defects along with the highest possible yield.

Lab Exercise 5: Gating design and mold filling simulation

The objective of this exercise is to design, model and verify the gating channel design for the given casting, to achieve smooth, complete and uniform filling of the mold cavity.

Lab Exercise 6: Casting cost estimation

The objective of this exercise is to estimate the cost of a casting, and to study the effect of various factors on total cost.

Casting Design and Simulation Lab Exercises using AutoCAST

Foundry practice is an essential and integral part of Mechanical Engineering degree and diploma courses. It is usually included in first or second year, and only involves pattern making and sand mould preparation. Most institutes do not have any melting facility, or are reluctant to allow students to melt and pour molten metal in the molds, owing to safety concerns. Thus students never get a practical experience of metal casting. The students are also exposed to metal casting theory, usually as a part of production engineering course in their third year, or as a full elective course. There is however, no casting laboratory experiment to support the theory courses.

Casting simulation lab exercises can be introduced in the syllabus to support the theory, and allow the students to study the effect of various design parameters on casting quality and yield. Six lab turns can be planned: part modeling, core design, mold design, feeder design, gating design and cost estimation. The AutoCAST software developed in IIT Bombay includes all the modules needed for conducting the above exercises. For each lab turn, students submit hand calculations as well as the simulation results, and discuss variations, if any. Each student can be given a unique part in terms of shape and dimensions. The cast metal can also be varied (ex. steel or aluminum). The shapes and their parameters include:

Rectangular block: height, length, width, inner hole length, inner hold width, fillet radius
Hollow cylinder: height, outer diameter, inner diameter, fillet radius
Cruciform: height, arm length, arm width, inner hole length, inner hole width, fillet radius
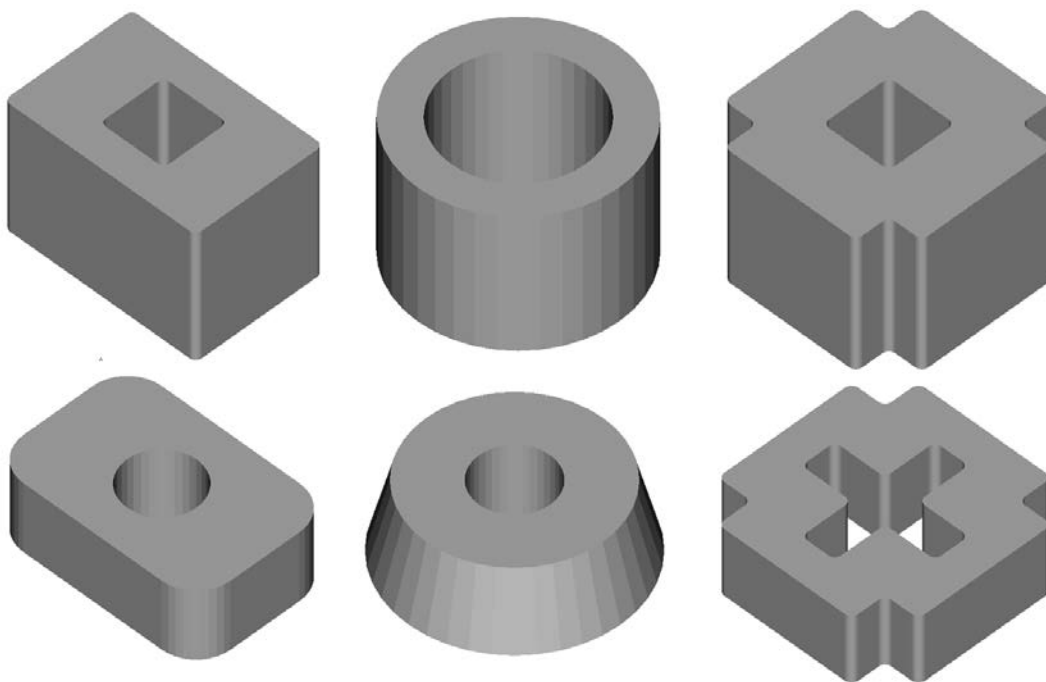
c

Lab Exercise 1: Part modeling and geometry analysis

The objective of this exercise is to create a 3D CAD model of a given part, compute its geometric properties, analyze its thickness and shape complexity. All these affect tooling design, manufacture, quality and cost. The steps include the following:

1. Draw the three orthographic views of the part. Calculate its volume, weight, minimum and maximum wall thickness.
2. Create a 3D CAD model of the part. Compute its volume and weight, and measure wall thickness.
3. Import the part model into AutoCAST, and compute its volume and weight.
4. Compute the minimum and maximum thickness and identify their locations.
5. Compute the shape complexity in terms of various ratios.
6. Prepare a report comparing the hand calculations and computed results.

Viva Questions:
a. Name a few CAD file formats.
b. What is the difference between IGES and STL format?
c. Why is there a difference in volume calculation from IGES and STL file?
d. What are the geometric differences between machined and as-cast part?
e. Are large fillets always desirable in a casting?
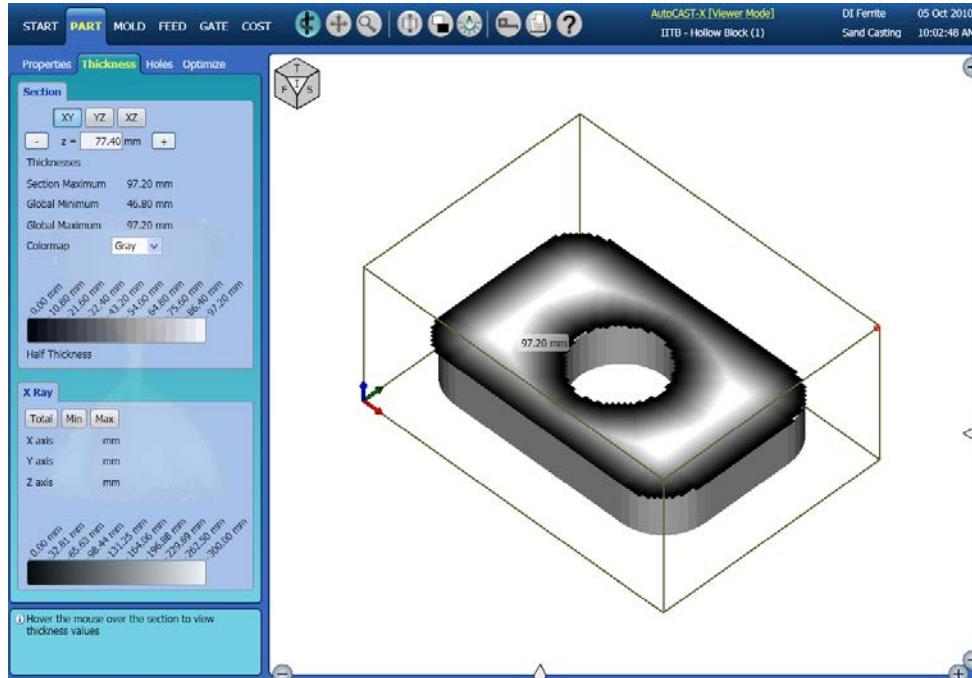
Lab Exercise 2: Core print design

The objective of this exercise is to design the core prints to support the core in mold. The following steps are involved:

1. Calculate the diameter and length of core prints for the given part considering weight balance. Calculate the buoyancy force on the core.
2. Open the previous casting project in AutoCAST. Identify the cored holes.
3. Select the cored hole for print design. Change the diameter and length of each core print if needed.
4. Compute the volume and weight of each core along with its print, and the buoyancy forces.
5. Generate a methods report with the image of the core prints.
6. Prepare a report comparing the hand calculations with the methods report generated by the program.

Viva Questions:
   a. What are the different purposes of core prints?
   b. Is there any difference in buoyancy force for a vertical and horizontal core with the same dimensions?
   c. What is the direction of the net force acting on a core? Is it always up or down?
   d. What happens if a thin core is placed in a thick section of a casting?
   e. What will happen if buoyancy force is too large for a vertical core? What is the remedy?
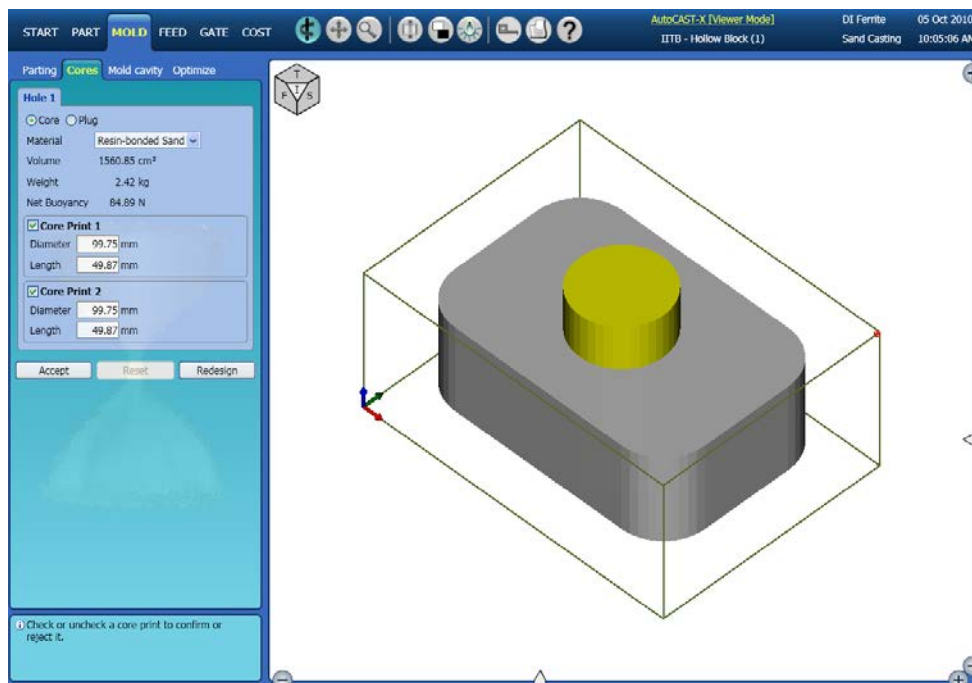
Lab Exercise 3: Mold cavity layout

The objective of this exercise is to determine the correct combination of mold box and number of cavities to achieve the desired ratio of cast metal to mold material. A low ratio leads to poor utilization of production resources, whereas a high ratio leads to poor quality. The following steps are involved:

1. Decide the cavity-cavity and cavity-mold wall gap, to be equal to maximum thickness of part.
2. Decide the maximum number of cavities that can be accommodated in different sizes of mold box. Calculate the ratio of cast metal to mold material for each case.
3. Open the previous casting project in AutoCAST. Select the mold box option, design and model the maximum number of cavities for the mold box.
4. Compute the values of cast metal to mold material ratio for each option (mold box and number of cavities). Select the option with the highest ratio.
5. Generate a methods report with the image of the best mold cavity layout.
6. Prepare a report comparing the hand calculations with the methods report generated by the program.

Viva Questions:
   a. What will happen if cavity-cavity gap is too small? Too large?
   b. What will happen if cavity to mold wall gap is too small?
   c. Why does the ideal cavity-cavity gap depend on part wall thickness?
   d. What is the ideal ratio of cast metal to mold material for steel? For aluminum?
   e. What is the typical strength of green sand and resin-bonded molds?
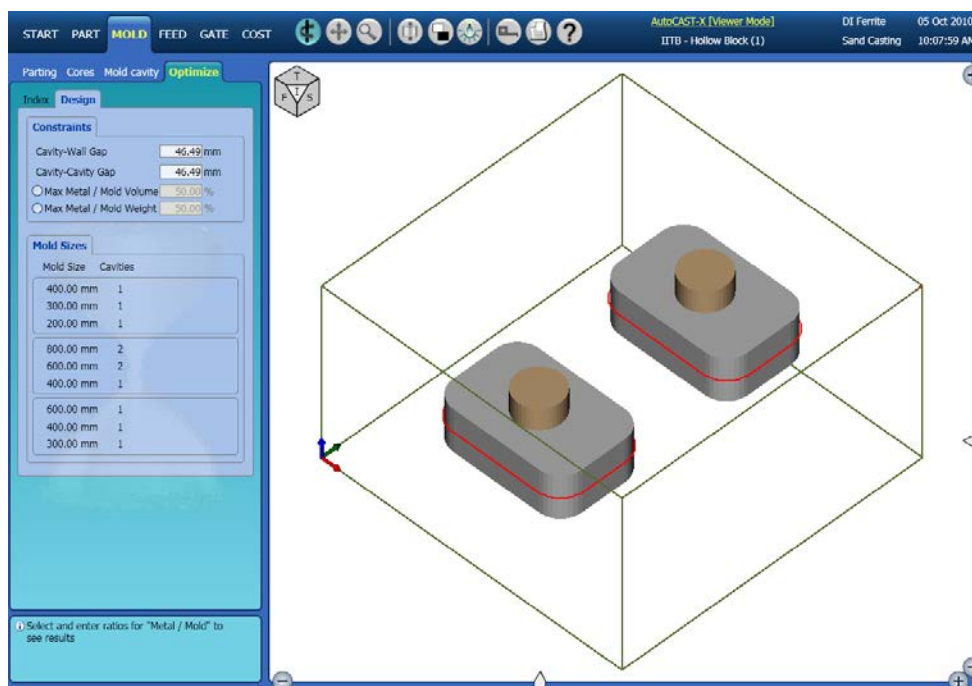
Lab Exercise 4: Feeder design and solidification simulation

The objective of this exercise is to design, model and verify the feeding system design for the given casting, to obtain a casting free of solidification shrinkage defects along with the highest possible yield. The following steps are involved:

1. Design feeder(s) for the given casting based on modulus principle. Estimate the solidification time of the casting.
2. Open the previous casting project in AutoCAST, find the hot spots, specify the feeder type and position, design and model the feeder(s).
3. Verify the feeder design by solidification simulation: shrinkage porosity should shift to the feeder(s). Note down the solidification time.
4. If needed, change the feeder shape and dimensions, and apply feed aids like insulating sleeves and chills. Verify the design by simulation again.
5. Generate a methods report for the best feeder design (best quality and yield).
6. Prepare a report comparing the hand calculations with the methods report.

Viva Questions:
   a. What is the ideal shape of a feeder? Explain why?
   b. What are relative advantages of side and top feeders?
   c. Can you replace all feeders for a casting with chills?
   d. How can you measure the efficiency of a feeder?
   e. What is feeder yield? Why is yield higher for cast iron than for steel?
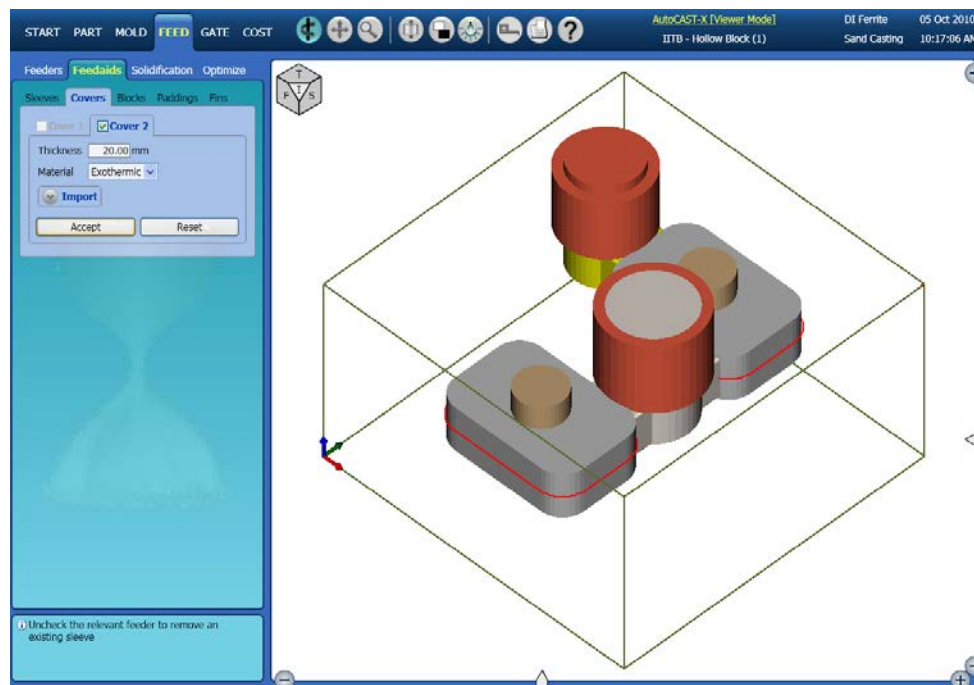
Lab Exercise 5: Gating design and mold filling simulation

The objective of this exercise is to design, model and verify the gating channel design for the given casting, to achieve smooth, complete and uniform filling of the mold cavity. The following steps are involved:

1. Decide the ideal filling time of the casting and design the choke. Decide the locations of sprue, runner(s) and gate(s) and calculate their dimensions.
2. Open the previous casting project in AutoCAST, complete the gating layout, and compute the dimensions of the gating channels.
3. Verify the gating design by mold filling simulation: check the impact velocity of molten metal on the mold walls, vertical velocity in the top portions, and the total filling time.
4. Modify the gating design if needed, and verify by simulation again. Also check the effect of gating on casting solidification.
5. Generate a methods report for the final gating design.
6. Prepare a report comparing the hand calculations with the methods report.

Viva Questions:
   a. What is gating ratio? Compare converging and diverging gating ratios.
   b. What are the roles of sprue, runner and gates in mold filling?
   c. What will happen if filling time is too long or too short?
   d. Why sprue should be tapered down (bottom dia smaller than top dia)?
   e. What are the different casting defects arising out of improper filling of mold cavity?
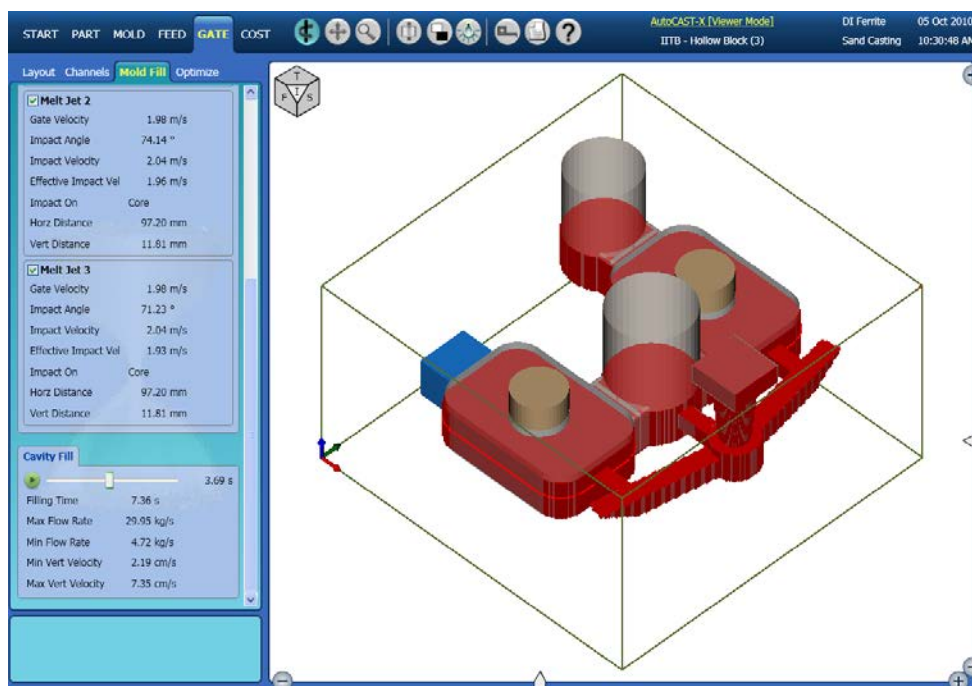
Lab Exercise 6: Casting cost estimation

The objective of this exercise is to estimate the cost of a casting, and to study the effect of various factors on total cost. The following steps are involved:

1. Calculate the cost of tooling, and amortize it over a given order quantity (ex. 1000).
2. Calculate the cost of direct metal (part weight), indirect material (mold and core material weight, considering recycling), energy (melting, other), and labour.
3. Open the previous casting project in AutoCAST, and compute the above costs using the program. Check the values of various cost rates (metal, energy, labour, etc.) and various factors (ex. furnace efficiency), and change their values, if needed.
4. Check the effect of casting rejection and yield on the total cost.
5. Generate a methods report including the cost data.
6. Prepare a report comparing the hand calculations with the methods report.

Viva Questions:
a. What is the approximate cost of melting energy per kg of casting?
b. If the number of cavities per mold is changed, which costs will be affected?
c. Check the difference in costs when mold and core recycling is either zero or 100%.
d. What are the fixed and variable costs in a casting?
e. What are the different ways to reduce the total cost of a casting?
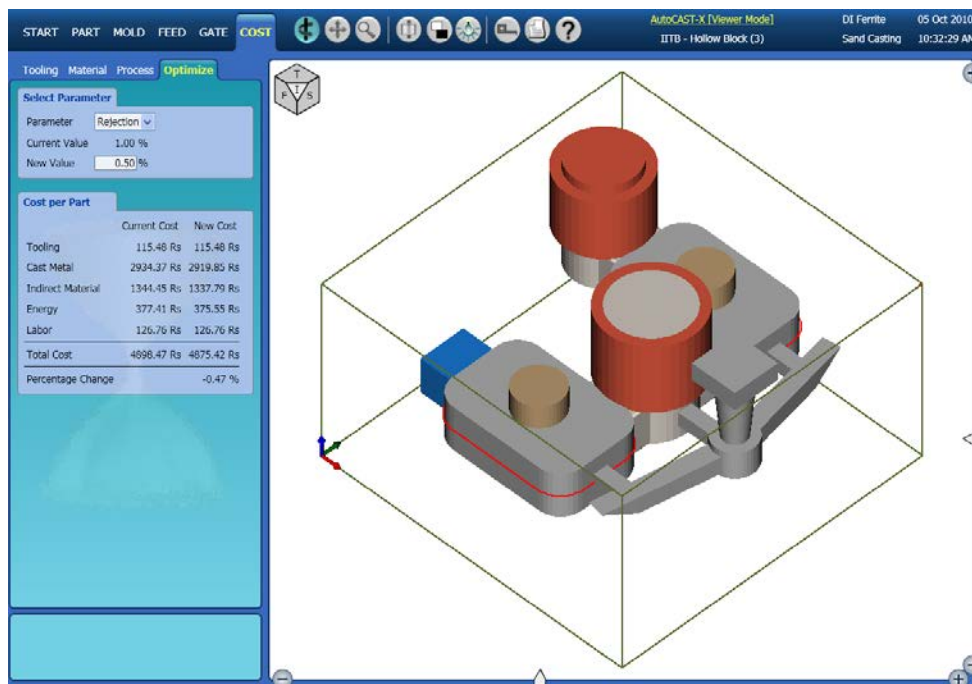
SCHEME OF VALUATION

Serial no	Description	Marks
1	Writing one programme on CNC (Two questions should be given and the student is required to write any one programme and same should be simulated)	20
2	**Simulation** a)CNC b)CASTING SIMULATION(only one exercise)	40 30
3	**Viva**	10
	Total	**100**

Facilities required for imparting training:
1. MS Windows OS (Version 2000 or above)
2. CNC Lathe and Milling simulation softwares
3. 4 Any one Casting simulation software (AutoCAST/ ProCAST/MagmaCAST)
4. Laser jet printer for getting hard copies of student work

System Requirements

1. Computers with latest configurations-CPU-3.0GHz-RAM-2Gb/hdd-250Gb/dedicated graphics card1Gb
2. UPS-minimum 7.5 KvA
3. Printers-Laser- 2 nos.
4. LCD projector-2 Nos.

Contact Hrs/Week: 3 Hrs.   **Contact Hrs: 48 Hrs + 48 Hrs**

As far as possible students should be given application oriented project problems with a view to:

1. Develop an understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the course of study in Mechanical Engineering.
2. Develop an understanding of subject based knowledge given in the classroom in the context of its application at work places.
3. Provide first hand experience to develop confidence amongst the students to enable them to use and apply acquired technical knowledge and skills to solve practical problems of the world of work.
4. Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.
5. Practical exposure to an industrial activity

For the fulfillment of above competencies, polytechnics may establish close linkage with 8-10 relevant organizations for providing such an experience. It is necessary that each organization is visited well in advance by respective teachers and activities to be performed by students are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations.

 Each Project batch must have Minimum of 5 students.

        Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the comprehension level of the students. The placement of the students for such a practical cum project work should match with the competency profile and interest of students.

Students may be assessed both by industry and polytechnic faculty.

The suggested performance criteria are given below:

a) Punctuality and regularity **(Log book - mandatory and to be produced during IA verification)**
b) Initiative in learning/Demonstration and fabrication of model
c) Level/proficiency of practical skills acquired
d) Originality
e) Scope for patentability
f) Sense of responsibility
g) Self expression/Communication skills

h) Interpersonal skills.
g) Report writing skills
h) Viva voce

Some of suggested projects are given below: These are only guidelines, teacher may take any project related to Mechanical and allied area depending upon the availability of projects. Preference should be given to practical oriented projects.

1) Industrial Visit

Students are required to undergo an industrial visit for period of at least 3(Three) working days, either in V/VI semester. After completion of their visit the reports should be prepared. Each Student should write the report independently in view of his own observation in industry. All days for the visit should be accounted for clearly giving attendance particulars. The concern accompanying staff is to check student presence and access progress periodically

1.1 Industrial report

Students are required to submit a comprehensive report on factory visit with details of the organization where the training was undergone. The comprehensive report should focus on study of plant/ product /process/ along with intensive in-depth study on anyone of the topics such as processes, methods, tooling, plant layout and equipment, highlighting aspects of quality, productivity of the system. Any data, drawings etc should be incorporated with the consent of the Organization. The comprehensive report should be submitted for the end exam for evaluation.

2) Project work
According to the local needs, the following major projects are suggested:
1. Non conventional energy
    - Low Cost Solar Water Heating System for Domestic Purpose
    - Fabrication of Solar cooker
    - Study of Community Biogas Plant
    - Fabricate a thermally efficient wood burning stove
    - Solar lamps
    - Solar powered refrigerator
2. Mechatronics/Material handling area
    - Motorized object lifting jack
    - Key controlled- fork lifter
    - Object counting machine
    - Stepper motor control with selected steps for conveyor belts
    - Robotic arm with gripper
    - Material handling device in X,Y,Z motion control
    - Robotic crane
    - Robotic trolley for material handling
3. Fluid power and control area
       Pneumatic/Hydraulic jack
       Pneumatic/hydraulic crane
       Air compressed spray gun
       Pneumatic transport system

4. Automobile related area
        Regenerative braking system
        Steering controlled headlight
        Engine/motor vibration checker
        Seat belt automatic locking system
        Hydraulic braking
        Electro magnetic shock absorber
        Digital auto speed limiter

5. Motorized wheel chair
6. Design and Fabrication of various types of lab equipments useful to polytechnic
7. Repair and overhauling of various machine tools and lab equipments available at polytechnic
8. Critical Study of existing quality systems and inventory control at industry
9. Mechanical industry fabrication related projects
10. Automatic mopping machine to clean the floor area
11. Automatic milling machine with digital control
12. PCB fabrication
13. Any study project related to Mechanical and allied areas in industry
14. Any project related to industry based problems
15 .Any projects related to low cost automation

The Project Report should consist of following items.
1. Introduction
2. Review of Literature
3. Study Area
4. Methodology/Design/fabrication/Tests
5. Result and Discussion
6. Conclusion and scope for future study
7. References.

_____

GUIDELINES FOR THE PREPARATION OF PROJECT REPORTS

1. Project reports should be typed neatly in Times New Roman letters with font size 14 for titles and 12 for text on both sides of the paper with 1.5 line spacing on a A4 size paper (210 x 297 mm). The margins should be: Left - 1.5",   Right -   1", Top and Bottom - 0.75".

2. The total number of reports (**Soft bound**) to be prepared are
   - One copy to the department /library
   - One copy to the concerned guide(s)
   - One copy to the candidate.

3. Before taking the final printout, the approval of the concerned guide(s) is mandatory and suggested corrections, if any, must be incorporated.

4. Every copy of the report must contain

 ➢ Inner title page (White)

 ➢ Outer title page with a plastic cover

 ➢ Candidate declaration and Certificate in the format enclosed both from the institution and the organization where the project is carried out.

 ➢ An abstract (synopsis) not exceeding 100 words, indicating salient features of the work.

5. The organization of the report should be as follows

1. Inner title page 2. Abstract or Synopsis 3. Acknowledgments 4. Table of Contents 5. List of table & figures (optional)	Usually numbered in roman

Chapters (to be numbered in Arabic) containing Introduction-, which usually specifies the scope of work and its importance and relation to previous work and the present developments, Main body of the report divided appropriately into chapters, sections and subsections.

The chapters, sections and subsections may be numbered in the decimal form for e.g. Chapter 2, sections as 2.1, 2.2 etc., and subsections as 2.2.3, 2.5.1 etc.

The **chapter must be left or right justified** (**font size** 16). Followed by the **title of chapter centered** (**font size 18**), **section/subsection numbers along with their headings must be left justified** with **section number and its heading in font size** 16 and **subsection and its heading in font size** 14. The **body or the text** of the report should have font size 12.

The figures and tables must be numbered chapter wise

The last chapter should contain the summary of the work carried, contributions if any, their utility along with the scope for further work.

Reference or Bibliography: The references should be **numbered serially** in the order of their occurrence in the text and their numbers should be indicated within square brackets for e.g. [3]. The section on references should list them in serial order in the following format.

1. For textbooks – Dr.Paramar S, Welding process and technology, Khanna publishers, New Delhi, 2 Edition, 2003.

2. For papers – Y.Javadi and I.sattari, Welding distortion in pipes, Journal of pressure vessels and piping, Vol 85, Aug 2008, pp 337-343

Only SI units are to be used in the report. Important equations must be numbered in decimal form for e.g.

▪ **V = IZ** .... **(3.2)**

All equation numbers should be right justified.

Separator sheets, used if any, between chapters, should be of thin paper

PROJECT EVALUATION:

       1. Relevance of the subject in the present context   10 mark

       2. Literature Review   10 mark

       3. Fabrication of the model/Data collection/repair and

        Overhauling work   40 mark

       4. Results & Discussion   10 mark

       5. Industrial visit report   10 mark

       6. Presentation   20 mark

                TOTAL   100 mark

SESIONAL MARKS EVALUATION:

       1. First review (During the end of V Th semester)   25 mark

       2. Second review (During the end of VI Th semester)   25 mark

                TOTAL:50   mark

NOTE: 1. Sesional marks to be awarded at the end of *EACH SEMESTER ONLY*

       2.The candidate declaration and certificate sample copy are enclosed here for incorporation in final project

       report

CANDIDATE'S DECLARATION

I, --- a student of Diploma in ------------------------------ Department bearing Reg No---------------------------------------of --- hereby declare that I own full responsibility for the information, results and conclusions provided in this project work titled **"--** "submitted to **State Board of Technical Examinations, Government of Karnataka** for the award of Diploma in ----------------------------------.

To the best of my knowledge, this project work has not been submitted in part or full elsewhere in any other institution/organization for the award of any certificate/diploma/degree. I have completely taken care in acknowledging the contribution of others in this academic work. I further declare that in case of any violation of intellectual property rights and particulars declared, found at any stage, I, as the candidate will be solely responsible for the same.

Date:

Place: **Signature of candidate**

Name: --------------------

Reg No------------------

Department of …………………………………………………..

CERTIFICATE

Certified that this project report entitled ---

---"which is being submitted

by Mr./Ms. …………………………..……………….., Reg. No…..……………, a bonafide student of

…………………………………….in partial fulfillment for the award of **Diploma in ----------------**

Engineering during the year ……………………... is record of students own work carried out under

my/our guidance. It is certified that all corrections/suggestions indicated for internal Assessment have been

incorporated in the Report and one copy of it being deposited in the polytechnic library.

The project report has been approved as it satisfies the academic requirements in respect of Project work

prescribed for the said diploma.

It is further understood that by this certificate the undersigned do not endorse or approve any

statement made, opinion expressed or conclusion drawn there in but approve the project only for

the purpose for which it is submitted.

Guide(s)
Name and signature

Examiners
1
2

Head of Department

Dept. of --------------------

ROADMAP FOR PROJECT GUIDES

1. The project work is proposed to be carried out during the V and VI semesters so that learners prepare during the V semester, do some field work based on the preparation during the mid semester vacation and report the analysis and inferences during the VI semester.
2. The learners would reach a level of maturity by the time they reach V semester and so a meaningful project lasting for a year can be executed by them.
3. To execute the project with involvement needs constant guidance and monitoring of the progress of the learners by the guide.
4. This does not mean teacher has to advice learners.
5. Be confident about the ability of the learner and "intellectually provoke" them with challenging questions. These questions should prompt the learners to search information and update themselves (to be carried out during the first two weeks).
6. Do not feed information to learners. Instead crate a 'cognitive dissonance' (a challenging question or situation that the learner is not able to find an immediate answer but feels the need to search for information to find a solution).
7. Defer judgement on learners and give them identified sources if required like a journal article, book or a web site.
8. Even if the learners report their inability to solve do NOT give or prescribe a solution.
9. Be patient and give time for the learner to construct his knowledge.
10. Give corrective feedback to the learner by challenging his solutions so that his logic is questioned and it develops further.
11. This leads to the first activity viz., literature survey and conceiving a project.
12. During this phase meet the project team in a group and create a healthy competition among the learners to search different sources and synthesise their findings in the group.
13. Aim for bringing out a workable innovative project conceived within the first eight weeks as given in the schedule attached.
14. During these two phases and the third phase the teacher should assess the strengths and weakness of the members of the group and allocate differential work to team members on the remaining tasks to be carried out during the next thirty weeks.
15. This is to ensure active participation of all the members of the team.
16. By the end of the twelfth week finalise the project and a schedule of further activities for each member indicating the time frame in which his activities are to be executed may be made ready. A soft copy of this schedule may be collected from each learner by the guide to follow up.
17. This schedule prepared by each learner need to be documented for checking further progress of the project.
18. The next few phases of the project may require active guidance of the guide especially regarding the sources of collecting data, if a sample data is to be collected the number of

units has to be decided, collating the data/fabricating, tryout/analysis and finally coming out with meaningful conclusions or models or application.

19. Data like models, designs, technical specifications, source code, protocols and original records need be collected from one authentic source as there will not be any variation. The teacher may guide the learners to authentic source.

20. Data having limited variability like product/service quality, processes and standards, procedures need to be collected from a sample as there is a variation. The number of units from whom (source) the data is to be collected is called sample. The sample needs to be representative of the expected variation. The decision on the size of the sample and the number of units need guidance from the teacher. For example, data regarding the quality of a product/service need be collected from 3 to 5 personnel at different levels of a service provider or dealers of a product. The numbers given are suggestive but a guide based on his experience has to make valid suggestions.

21. Data having a wide range of variation like customer satisfaction where the customers are members of the public need a larger number of units to accommodate the diversity. A tool like questionnaire with predetermined questions need to be prepared, tried out on a small sample and finalise the questions. Data may be collected from at least 30 units. This number is suggested to apply statistical analysis for meaningful conclusions. Guides may decide on the sample size depending on the accessibility of data.

22. The intention of the above three points viz., 19, 20 and 21 is to ensure objectivity in data collection i.e., to reduce the subjectivity of the human mind.

23. All the above activities need to be completed before three to four weeks before the end of V semester (refer the spread sheet related to scheduling).

24. The learners may be instructed to collect data objectively with identified sample during the next 4 to six weeks which includes the mid semester holidays. This would enable the learners to visit the field and collect data without the constraint of reporting to institution and attending classes on a regular basis.

25. The collected data need to be organised and entered to spread sheets or similar formats for analysis. Qualitative data may be converted to quantitative using a rating scale or similar data organisation procedures.

26. The result of most analysis on spreadsheet could be obtained in tables or graphs as per the requirement.

27. Activities mentioned in points 24, 25 and 26 may be carried out by learners during 4 to 8 weeks after commencement of VI semester.

28. Interpretation of the analysed tables and graphs to arrive at meaningful inference. The guide at this stage may defer his ideas on interpretation allowing the learners to do this. In case the learners err in the process they may be given corrective feedback.

29. A report of the whole process of doing the project may be written, word processed and submitted in triplicate.

30. Guides may contact industries and try to solve their problems so that the learners get a field experience and they get ready for the industry.
31. Innovations and innovative practices may be encouraged among the learners to be pursued as a project. Developing prototypes, (in simulation or real) trying out feasibility of new ideas, changing existing systems by adding modules, combining, assembling new modules and developing new systems may be given higher priority over routine bookish projects.
32. The schedule of events proposed is for an investigative project as a model. Guides may alter the prescribed schedule to suit the kind of innovative projects sited in point No.31 above.
33. Industry personnel may be involved in conceiving, executing and evaluating projects. This gives credibility to the institute and acceptance of learners for absorption into the company.

GUIDELINES TO LEARNERS TO CARRY OUT A TWO SEMESTER PROJECT

1. Carry out the project work through the V and VI semesters. Preparation must be done during the V semester and based on this, field work should be done during the mid semester vacation and reporting of analysis and inferences should be done in the VI semester.
2. You have the ability and the level of maturity needed to conceive an innovative and meaningful project accomplishing which gives you recognition by the industry and empowers you with the power of knowledge.
3. Understand your strength and weakness and make an effort to find the strength and weakness of other peers in the team.
4. Complement each other's strength rather than compete with peers within the team. This will enable you to complete a comprehensive and innovative project relevant to the industrial needs rather than doing a routine copy of what others have done.
5. Seek guidance from the teacher and update him/her about the progress.
6. Be confident about your ability and that of other members of your group. Take extra efforts to collect information, share with your peers and synthesise your knowledge.
7. Question everything including the ideas of your teacher. Accept the ideas and instructions which are internally consistent (logical).
8. Involve actively in group activities and contribute towards the tasks.
9. Do not depend too much on the teacher as a source of information, search on your own and build your knowledge structure. Search for authentic sources like journal articles, books and authentic sites rather than blogs and tweets.
10. Though brief, record your thoughts and activities including searches immediately.
11. Prepare a schedule for your work on a spread sheet and encourage your peers to do the same.
12. Show your schedule and that of others to the teacher and get his feedback.
13. Keep reviewing the schedule every fortnight and take corrective steps if needed. For doing this keep the general guideline schedule given in the curriculum as a backdrop.

14. Tools used for data collection like instruments, testing machines, questions to be asked and software may be tried out and standardised by the twelfth week of the project. Seek the teacher's help who is experienced in doing this.
15. Collect data dispassionately or objectively (without applying your personal prejudice). Complete this task before the VI semester begins.
16. While entering data into the spread sheet ask your peer member to verify. This will ensure accuracy of data entry.
17. Use appropriate mathematics/statistics for calculations. Seek help from external sources (other than your teacher) if required.
18. The results of your analysis need to be graphically represented and documented. You may also add photographs and video clips to increase the validity.
19. This task needs to be completed within 8 weeks after commencement of VI semester.
20. Interpret the data (after analysis) and arrive at meaningful inferences on your own in discussion with your peers. Get it ratified by your teacher. Suggestions from the teacher may be discussed among your peers and incorporated if they are internally consistent.
21. The project report may be word processed (videos, photographs attached in soft copy) and submitted in triplicate two weeks before the end of VI semester.
22. Involve passionately in the team work, make constructive contributions and come out with an industry friendly project which will equip you in your professional development.