PONDICHERRY UNIVERSITY

PUDUCHERRY – 605 014

REGULATIONS, CURRICULUM AND SYLLABUS

DIPLOMA IN ENGINEERING AND TECHNOLOGY

(MECHANICAL ENGINEERING)

SEMESTER PATTERN

NEW SCHEME

FROM 2024 – 2025 ONWARDS

PONDICHERRY UNIVERSITY

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

NEW SCHEME
(To be implemented for the students admitted from the 2024 -2025 onwards)

CHAIR PERSON & CO-ORDINATOR

Dr. K. Suresh Babu – Chairman BoS
Professor & Head,
Centre for Nanoscience and Technology,
Pondicherry University, Puducherry – 605 014

DIPLOMA IN MECHANICAL ENGINEERING

FULL TIME (F200) – PART TIME (P200)

MEMBERS

Dr. P. Thangadurai Professor, Centre for Nanoscience and Technology, Pondicherry University, Puducherry – 605 014	**Dr. D. Bharathi Mohan**, Professor, Department of Physics, Pondicherry University, Puducherry – 605 014
Dr.S.Chockalingam, Principal, Department of Mechanical Engineering, Government Polytechnic College, Minicoy -682559, Lakshadweep	
Dr. D. Candane (External) HOD/ Mechanical Engineering, Karaikal polytechnic college, Karaikal - 609609	**Mr. R. Ramesh** (External) HoD (i/c)- Mechanical Engineering Motilal Nehru Government Polytechnic, Lawspet, Pondicherry

DIPLOMA IN ENGINEERING/TECHNOLOGY
(MECHANICAL ENGINEERING)

(From 2024 – 2025 onwards)

NEW SCHEME

R E G U L A T I O N S

1. Description of the Course:
a. Full Time (3 years)
The Course for the Full Time Diploma in Engineering shall extend over a period of Three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Part Time (4 years)
The course for the Part Time Diploma in Engineering shall extend over a period of 4 Academic years containing of 8 semesters*, the subjects of 3 year full time diploma Courses being regrouped for academic convenience.
* Each Semester will have 16 weeks duration of study with 35 hrs. / Week for Regular Diploma Course and 18 hrs / Week for Part-Time Diploma Course.
The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) Have been revised and revised curriculum is applicable for the candidates admitted from 2020 – 2021 academic years onwards.

2. Condition for Admission:
Condition for admission to the Diploma courses shall be required to have passed in The S.S.L.C Examination of the Board of Secondary Education of Concern State. (Or)
The Anglo Indian High School Examination with eligibility for Higher Secondary Course of Concern State (Or)
The Matriculation Examination of Concern State. (Or)
Any other Examinations recognized as equivalent to the above by the Board of Secondary Education of Concern State.
Note: In addition, at the time of admission the candidate will have to satisfy certain Minimum requirements, which may be prescribed from time to time.

3. Admission to Second year (Lateral Entry):
A pass in HSC (academic) or (vocational) courses mentioned in the Higher Secondary Schools in concern state affiliated to the Higher Secondary Board with Eligibility for university Courses of study or equivalent examination & should have Studied the following subjects. The candidates pass in 2 Years ITI with appropriate Trade or Equivalent examination.

Sl. No	Courses	H.Sc Academic	H.Sc Vocational		Industrial Training Institutes Courses
		Subjects Studied	Subjects Studied		
			Related subjects	Vocational subjects	
1	All the Regular and Sandwich Diploma Courses	Physics and Chemistry as compulsory along with Mathematics / Biology	Maths / Physics / Chemistry	Related Vocational Subjects Theory& Practical	2 years course to be passed with appropriate Trade

- For the Diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practical's may also be taken for arriving the eligibility.

- Branch will be allotted according to merit through counseling by the respective Principal as per communal reservation.

- For admission to the Textile Technology, Leather Technology, Printing Technology, Chemical Technology and Commercial Practice Diploma courses the candidates Studied the related subjects will be given first preference.

- Candidates who have studied Commerce Subjects are not eligible for Engineering Diploma Courses

4. **Age Limit** : **No Age limit.**
5. **Medium of Instruction** : **English**
6. **Eligibility for the Award of Diploma:**

No candidate shall be eligible for the Diploma unless he/she has undergone the Prescribed course of study for a period of not less than 3 academic years in any Institution affiliated to Pondicherry University, when joined in First Year and two years if joined under Lateral Entry scheme in the second year and passed the prescribed examination.

The minimum and maximum period for completion of Diploma Courses are as given below

Diploma Course	Minimum Period	Maximum period
Full time	3 years	6 years
Full time Lateral entry	2 years	5 years
Part time	4 years	7 year

This will come into effect from New Scheme onwards i.e. from the academic year 2024-2025.

7. **Subjects of Study and Curriculum outline:**

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical subjects. The curriculum outline is given in Annexure – I.

8. **Examinations:**

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester. The internal assessment marks for all the subjects will be awarded on the basis of Continuous internal assessment earned during the semester concerned. For each subject 40 marks are allotted for internal assessment. Board Examinations are conducted for 100 marks and reduced to 60.

The total marks for result are 60 + 40 = 100 Marks.

9. Continuous Internal Assessment:

A. For Theory Subjects:
The Internal Assessment marks for a total of 40 marks, which are to be distributed as follows:

i) Subject Attendance   10 Marks
 (Award of marks for subject attendance to each subject Theory/Practical will be as per the range given below)

80% - 83%	2 Mark
84% - 87%	4 Marks
88% - 91%	6 Marks
92% - 95%	8 Marks
96% - 100%	10 Marks

ii) Test   10 Marks
2 Tests each of 2 hours duration for a total of 50
Marks are to be conducted. Average of these
Two test marks will be taken and the marks to be reduced to: **05 Marks**

The Test – III is to be the Model Examination
Covering all the five units and the marks obtained
Will be reduced to: **05 Marks**

TEST	UNIT	WHEN TO CONDUCT	MARKS	DURATION
TEST I	Unit – I & II	End of 6th week	50	2 HRS
TEST II	Unit – III & IV	End of 12th week	50	2 HRS
TEST III	Model Examination: Covering all the 5 Units. (Board Examinations- question paper-pattern).	End of 16th week	100	3 HRS

From the Academic Year 2024 – 2025 onwards.
- Question Paper Pattern for the Test - I and Test – II is as follows.
- The tests should be conducted by proper schedule.
- Retest marks should not be considered for internal assessment.

Without Choice:

Part A Type questions:	6 Questions × 1 mark	06 marks
Part B Type questions:	7 Questions × 2 marks	14 marks
Part C Type questions:	2 Questions × 15 marks	30 marks
	Total	**50 marks**

iii) Assignment: **5 Marks**

For each subject Three Assignments are to be given each for 20 marks and the
Average marks scored should be reduced for **5 marks**

iv) Seminar Presentation **5 Marks**

The students have to select the topics either from their subjects or general subjects which will help to improve their grasping capacity as well as their capacity to express the subject in hand. The students will be allowed to prepare the material for the given topic using the library hour and they will be permitted to present seminar (For First and Second year, the students will be permitted to present the seminar as a group not exceeding six members and each member of the group should participate in the presentation. For the Third Year, the students should present the seminar viii individually.) The seminar presentation is mandatory for all theory subjects and carries 5 marks for each theory subject. The respective subject faculty may suggest topics to the students and will evaluate the submitted materials and seminar presentation. (2 ½ marks for the material submitted in writing and 2 ½ marks for the seminar presentation). For each subject minimum of two seminars are to be given and the average marks scored should be reduced to 5 marks. All Test Papers, Assignment Papers / Notebooks and the seminar presentation written material after getting the signature with date from the students must be kept in safe custody in the department for verification and audit. It should be preserved for one semester after publication of Board Exam results and produced to the flying squad and the inspection team at the time of inspection/verification.

B. For Practical Subjects:
The Internal Assessment mark for a total of 60 marks which are to be distributed as
Follows:-

a) Attendance	: 20 Marks
	(Award of marks same as theory subjects)
b) Procedure/ observation and tabulation/ Other Practical related Work	: 20 Marks
c) Record writing	: 20 Marks
TOTAL	**: 60 Marks**

• All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examinations.

• The observation note book / manual should be maintained for 20 marks. The observation note book / manual with sketches, circuits, programme, reading and Calculation written by the students manually depends upon the practical subject during Practical classes should be evaluated properly during the practical class hours with date.

- The Record work for every completed exercise should be submitted in the subsequent practical classes and marks should be awarded for 20 marks for each exercise as per the above allocation.
- At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks (including Observation and Record writing) and the marks Awarded for attendance is to be added to arrive at the internal assessment mark for the Practical. (60 marks)
- Only regular students, appearing first time have to submit the duly signed bonafide record note book / file during the Practical Board Examinations.

All the marks awarded for Assignments, Tests, Seminar presentation and Attendance should be entered periodically in the Personal Theory Log Book of the staff, who is handling the theory subject.
The marks awarded for Observation, Record work and Attendance should be entered periodically in the Personal Practical Log Book of the staff, who is handling the practical Subject.

10. Communication Skill Practical, Computer Application Practical and Physical Education:
The Communication Skill Practical and Computer Application Practical with more emphasis are being introduced in First Year. Much Stress is given to increase the communication skill and ICT skill of students.
As per the recommendation of MHRD and under Fit India scheme, the Physical education is introduced to encourage students to remain healthy and fit by including physical activities and sports

11. Project Work and Internship:
The students of all the Diploma Courses have to do a Project Work as part of the curriculum and in partial fulfillment for the award of Diploma by the Pondicherry University. In order to encourage students to do Worthwhile and innovative projects, every year prizes are awarded for the best three reviewed twice in the same semester. The project work is approved during the V Semester by the properly constituted committee with guidelines.

a) Internal assessment mark for Project Work & Internship:
Project Review I   …   20 marks
Project Review II   …   20 marks
Attendance   …   20 marks
                                   (Award of marks same as theory subjects)
                                   Total   …   60 marks

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work & Internship in Board Examinations:
Demonstration/Presentation   25 marks
Report   25 marks
Viva Voce   30 marks
Internship Report   20 marks
Total   100* marks
*Examination will be conducted for 100 marks and will be converted to 40 marks

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks.

The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centers / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work & Internship Board examination.

12. Scheme of Examinations:

The Scheme of examinations for subjects is given in Annexure - II.

13. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the Pondicherry University and pass all the subjects prescribed in the curriculum.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than 40% in theory subjects and 50% in practical subjects out of the total prescribed maximum marks including both the Internal Assessment and the University Examinations marks put together, subject to the condition that he/she secures at least a minimum of 40 marks out of 100 marks in the University Theory Examinations and a minimum of 50 marks out of 100 marks in the University Practical Examinations and also earned 122 credits within the maximum duration of course.

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2027 onwards (Joined first year in 2024 -2025) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full Time (lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class with Distinction:

A candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time (lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

First Class:
A candidate will be declared to have passed in **First Class** if he/she secures not less than 60% of the aggregate marks in all the semesters put together and passes all the subjects within the stipulated period of study 2 / 3 / 3½ / 4 years [Full time(lateral entry)/Full Time/Sandwich/Part Time] without any break in study.

Second Class:
All other successful candidates will be declared to have passed in Second Class. The above classifications are also applicable for the Part-Time students who pass out Final Examination from October 2024 /April 2025 onwards (both joined First Year in 2020 -2021)

15. Duration of a period in the Class Time Table:
The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical).

Award of Class based on CGPA

Range of Marks	Grade	Grade Points
91-100	A+	10
81-90	A	9
71-80	B+	8
61-70	B	7
51-60	C+	6
46-50	C	5
40-45	D	4
<40	F	0
Failed due to shortage of Attendance	FR	0

THEORY	MAX	MIN	MIN TO PASS
University Exam	60	24	40
Internal Assessment	40	16	
PRACTICAL	**MAX**	**MIN**	**MIN TO PASS**
University Exam	40	16	50
Internal Assessment	60	24	

End Semester Exam Marks : 60 (40% to pass - 24 marks)
Internal Assessment Marks : 40 (40% to pass - 16 marks)

Award of Class and Rank
7.5 CGPA and Above – First Class with Distinction (No history of Arrear)
6.5 CGPA to 7.4 CGPA - First Class (Within Minimum Duration Passed in All Subjects)
5.5 CGPA to 6.4 CGPA - Second Class (Within Maximum Duration Passed in All Subjects)

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PONDICHERRY UNIVERSITY
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

NEW SCHEME
(Implemented from the Academic year 2024-2025 onwards)

CURRICULUM OUTLINE (FULL TIME)

FIRST SEMESTER

SL. No	Subject code	Subject	Hours per week					
			Theory	Drawing	Tutorial	Practical	Total	Credits
1	GE011T	Communicative English I	3	-	1	-	4	3
2	GE012T	Engineering Mathematics I	4	-	2	-	6	4
3	GE013T	Engineering Physics I	3	-	1	-	4	3
4	GE014T	Engineering Chemistry I	3	-	1	-	4	3
5	GE015T	Engineering Graphics I	3	3	-	-	6	3
6	GE026L	Engineering Physics Practical (semester examination in the second semester)	-	-	-	2	2	2
7	GE027L	Engineering Chemistry Practical (semester examination in the second semester)	-	-	-	2	2	2
8	GE016L	Communication Skill Practical	-	-	-	2	2	2
9	GE017L	Computer Application Practical	-	-	-	2	2	2
			15	3	8	6	32	24
Extra / Co-Curricular Activities	Physical Education		-	-	-	-	2	0
	Library		-	-	-	-	1	0
Total			-	-	-	-	35	24

SECOND SEMESTER

Sl. No	Subject code	Subject	Hours per week				Total	Credits
			Theory	Drawing	Tutorial	Practical		
1	GE021T	Communicative English II	3	-	1	-	4	3
2	GE022T	Engineering Mathematics II	4	-	2	-	6	4
3	GE023T	Engineering Physics II	3	-	1	-	4	3
4	GE024T	Engineering Chemistry II	3	-	1	-	4	3
5	GE025T	Engineering Graphics II	3	2	-	-	5	3
6	GE026L	Engineering Physics Practical	-	-	-	2	2	2
7	GE027L	Engineering Chemistry Practical	-	-	-	2	2	2
8	GE028L	Basics of Industries and Workshop Practical	2	-	-	3	5	2
			18	5	0	9	32	22
Extra / Co-Curricular Activities		Physical Education	-	-	-	-	2	0
		Library	-	-	-	-	1	0
Total			-	-	-	-	35	22

THIRD SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK					Credits
		Theory hours	Tutorial Hour	Drawing hours	Practical hours	Total hours	
ME301T	Strength of Materials	4	1	-	-	5	4
ME302T	Manufacturing Technology - I	3	2	-	-	5	3
ME303T	Measurements and Metrology	3	2	-	-	5	3
ME304T	Thermal Engineering –I	4	1	-	-	5	4
ME305L	Machine Drawing and CAD Practical	-	-	2	2	4	2
ME306L	Manufacturing Technology – I Practical	-	-	-	4	4	2
ME307L	Measurements and Metrology Practical	-	-	-	4	4	2
TOTAL		14	6	2	10	32	20
Extra / Co-Curricular activities							
Library		-	-	-	-	1	-
Physical Education		-	-	-	-	2	-
TOTAL						35	20

FOURTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK					Credits
		Theory hours	Tutorial Hour	Drawing hours	Practical hours	Total hours	
ME401T	Fluid Mechanics and Fluid Power	3	2	-	-	5	3
ME402T	Manufacturing Technology II	3	2	-	-	5	3
EE403T	Electrical Drives and Controls	3	2	-	-	5	3
GE404T	Production and Quality Management	3	2	-	-	5	3
ME405L	Strength of Materials and Fluid Mechanics Practical	-	-	-	4	4	2
ME406L	Manufacturing Technology II Practical	-	-	-	4	4	2
EE407L	Electrical Drives and Control Practical	-	-	-	4	4	2
	TOTAL	12	8	-	12	32	18
Extra / Co-Curricular activities							
Library		-	-	-	-	1	-
Physical Education		-	-	-	-	2	-
TOTAL						35	18

FIFTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK					Credits
		Theory hours	Tutorial Hour	Drawing hours	Practical hours	Total hours	
ME501T	Design of Machine Elements	4	2	-	-	6	4
ME502T	Thermal Engineering – II	4	1	-	-	5	4
Elective I Theory (Choose one out of three)							
ME503T	Computer Integrated Manufacturing	3	2	-	-	5	3
GE504T	Green Energy and Energy Conservation						
ME505T	Mechatronics						
ME506L	Process Automation Practical	-	-	-	4	4	2
ME507L	Thermal Engineering Practical	-	-	-	4	4	2
Elective I Practical (Choose one out of three)							
ME508L	Computer Integrated Manufacturing Practical	-	-	-	4	4	2
GE509L	Green Energy and Energy Conservation Practical						
ME510L	Mechatronics Practical						
GE511L	Entrepreneurship & Startups				4	4	2
TOTAL		11	5	-	16	32	19
Extra / Co-Curricular activities							
Library		-	-	-	-	1	-
Physical Education		-	-	-	-	2	-
TOTAL						**35**	**19**

SIXTH SEMESTER

Subject Code	SUBJECT	HOURS PER WEEK					Credits
		Theory hours	Tutorial Hour	Drawing hours	Practical hours	Total hours	
GE601T	Industrial Engineering and Management	3	3	-	-	6	3
EE602T	E Vehicle Technology & Policy	3	1	-	-	4	3
Elective II Theory (Choose one out of three)							
ME603T	Industrial Robotics and 3D Printing	3	2	-	-	5	3
ME604T	Refrigeration and Air Conditioning						
ME605T	Automobile Technology						
ME606L	Solid Modeling Practical	-	-	-	6	6	2
Elective I Practical (Choose one out of three)							
ME607L	Industrial Robotics and 3D Printing Practical	-	-	-	5	5	2
ME608L	Refrigeration and Air Conditioning Practical						
ME609L	Automobile Technology Practical						
ME610L	Project Work and Internship	-	-	-	6	6	6
TOTAL		9	6	-	17	32	19
Extra / Co-Curricular activities							
Library		-		-	-	1	-
Physical Education		-		-	-	2	-
TOTAL						**35**	**19**

PONDICHERRY UNIVERSITY
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

NEW SCHEME
(Implemented from the Academic year 2024-2025 onwards)

CURRICULUM OUTLINE (PART TIME)

FIRST SEMESTER

Sl. No	Subject code	Subject	Hours per week					
			Theory	Drawing	Tutorial	Practical	Total	Credits
1	GE011T	Communicative English I	3	-	-	-	3	3
2	GE012T	Engineering Mathematics I	4	-	1	-	5	4
3	GE013T	Engineering Physics I	3	-	-	-	3	3
4	GE014T	Engineering Chemistry I	3	-	-	-	3	3
6	GE023L	Engineering Physics Practical (semester examination in the second semester)	-	-	-	2	2	2
7	GE024L	Engineering Chemistry Practical (semester examination in the second semester)	-	-	-	2	2	2
Total			**13**	**0**	**1**	**4**	**18**	**17**

40015 Engineering Graphics I
40001 Communication Skill Practical   will be in the second year
40002 Computer Application Practical

SECOND SEMESTER

Sl. No	Subject code	Subject	Hours per week				Total	Credits
			Theory	Drawing	Tutorial	Practical		
1	GE021T	Communicative English II	3	-	-	-	3	3
2	GE022T	Engineering Mathematics II	3	-	-	-	3	3
3	GE023T	Engineering Physics II	3	-	-	-	3	3
4	GE024T	Engineering Chemistry II	3	-	-	-	3	3
5	GE023L	Engineering Physics Practical (semester examination in the second semester)	-	-	-	2	2	2
6	GE024L	Engineering Chemistry Practical (semester examination in the second semester)	-	-	-	2	2	2
7	GE027L	Basics of Industrial and Workshop practical	-	-	-	2	2	2
Total			**12**	**0**	**0**	**6**	**18**	**18**

40025 Engineering Graphics II
40001 Communication Skill Practical   will be in the second year
40002 Computer Application Practical

THIRD SEMESTER

Subject Code	Subject	HOURS PER WEEK				Credits
		Theory	Tutorial/ Drawing	Practical	Total	
ME301T	Strength of Materials	4	-	-	4	4
ME303T	Measurements and Metrology	3	1	-	4	3
GE015T	Engineering Graphics - I	3	1	-	4	3
GE016L	Communication Skill Practical	-	-	3	3	2
ME307L	Measurements and Metrology Practical	-	-	3	3	2
Total		**10**	**2**	**6**	**18**	**14**

FOURTH SEMESTER

Subject Code	Subject	HOURS PER WEEK				Credits
		Theory	Tutorial/ Drawing	Practical	Total	
ME302T	Manufacturing Technology - I	3	1	-	4	3
ME304T	Thermal Engineering - I	4	-	-	4	4
GE025T	Engineering Graphics - II	3	1	-	4	3
ME306L	Manufacturing Technology – I Practical	-	-	3	3	2
GE017L	Computer Application Practical	-	-	3	3	2
TOTAL		**10**	**2**	**6**	**18**	**14**

FIFTH SEMESTER

Subject Code	Subject	HOURS PER WEEK				Credits
		Theory	Tutorial/ Drawing	Practical	Total	
ME401T	Fluid Mechanics and Fluid Power	3	1	-	4	3
ME501T	Design of Machine Elements	4	-	-	4	4
EE602T	E Vehicle Technology & Policy	3	-	-	3	3
ME305L	Machine Drawing and CAD Practical	-	2	2	4	2
ME405L	Strength of Materials and Fluid Mechanics Practical	-	-	3	3	2
TOTAL		**10**	**3**	**5**	**18**	**14**

SIXTH SEMESTER

Subject Code	Subject	HOURS PER WEEK				Credits
		Theory	Tutorial/ Drawing	Practical	Total	
ME402T	Manufacturing Technology II	3	1	-	4	3
EE403T	Electrical Drives and Controls	3	1	-	4	3
GE601T	Industrial Engineering and Management	3	1	-	4	3
ME406L	Manufacturing Technology II Practical	-	-	3	3	2
EE407L	Electrical Drives and Control Practical	-	-	3	3	2
TOTAL		**9**	**3**	**6**	**18**	**13**

SEVENTH SEMESTER

Subject Code	Subject	HOURS PER WEEK				Credits
		Theory	Tutorial/ Drawing	Practical	Total	
ME502T	Thermal Engineering - II	4	-	-	4	4
Elective-I Theory (Choose one out of three)						
ME503T	Computer Integrated Manufacturing	3	-	-	3	3
GE504T	Green Energy and Energy Conservation					
ME505T	Mechatronics					
ME506L	Process Automation Practical	-	-	3	3	2
ME507L	Thermal Engineering Practical	-	-	3	3	2
Elective-I Practical (Choose one out of three)						
ME508L	Computer Integrated Manufacturing Practical	-	-	3	3	2
ME509L	Green Energy and Energy Conservation Practical					
ME510L	Mechatronics Practical					
GE511L	Entrepreneurship & Startups	-	-	2	2	2
Total		**7**	**-**	**11**	**18**	**15**

EIGHTH SEMESTER

Subject Code	Subject	HOURS PER WEEK				Credits
		Theory	Tutorial / Drawing	Practical	Total	
GE404T	Production and Quality Management	3	1	-	4	3
Elective-II Theory (Choose one out of three)						
ME603T	Industrial Robotics and 3D Printing	3	1	-	4	3
ME604T	Refrigeration and Air Conditioning					
ME605T	Automobile Technology					
ME606T	Solid Modeling Practical	-	-	4	4	2
Elective-II Practical (Choose one out of three)						
ME607L	Industrial Robotics and 3D Printing Practical	-	-	3	3	2
ME608L	Refrigeration and Air Conditioning Practical					
ME609L	Automobile Technology Practical					
ME610L	Project Work and Internship	-	-	3	3	6
TOTAL		**6**	**2**	**10**	**18**	**16**

PONDICHERRY UNIVERSITY
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS
NEW SCHEME
(Implemented from the Academic year 2024-2025 onwards)

Course Name : **All branches of Diploma in Engineering and Technology**
Subject Code : **GE011T**
Semester : **I**
Subject Title : **COMMUNICATIVE ENGLISH – I**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

| Subject | Instructions | | Examination | | | Duration |
| | Hours/ Week | Hours/ Semester | Marks | | | |
			Internal Assessment	Board Examinations	Total	
COMMUNICATIVE ENGLISH – I	4	64	40	100*	100	3 Hrs

*Examinations will be conducted for 100 marks and will be reduced to 60 marks.

Topics and Allocation of Hours

No. of weeks per semester: 16

Unit	Topics	Time (Hrs.)
I	Functional Grammar and Usage	14
II	Vocabulary Enrichment	12
III	Situational English	12
IV	Creative English	14
V	English for Scholarly Presentation/ Fluency	12
Total		**64**

RATIONALE:

• With the advent and supremacy of the Internet, smart phones, e-Commerce and Social Media in global communication, English has metamorphosed itself with new dimensions to get the communicator's thoughts, feelings and interactions dressed in alien colors.

• To execute the tasks in Technical Environment, whether academic, professional or social, proficiency in English plays a vital role and a requisite for communication skills has gained momentum both for e-communication, higher studies abroad and placement in MNCs.

• Amazing and inconceivable developments in technology has led various industries to coin and employ their own new words every day and hence revision of syllabus, especially to cater to the need for essential updated vocabulary has become in evitable.

- In addition to the retention of certain functional grammar parts to attest accuracy in communication, new components such as vocabulary enrichment, situational English, Creative English and English for Scholarly Presentation have been introduced to equip the learners to cope up with revamping technical scenario.

OBJECTIVES:
- At the completion of the study of I and II semesters, the students will be able to
- Apply functional grammar to produce pristine presentations in English.
- Carry out effective interaction with the aid of formation of interrogatives.
- Enrich his/her vocabulary to cater to the needs of changing linguistic requirements.
- Understand and respond to the e-content available elsewhere in academic, professional and social environments.
- Understand and review e-books, movies and TV programmes and post his/her reviews online.
- Execute dialogues with his/her friends, teachers and colleagues in day-to-day situations.
- Describe and interpret visuals, images, and machine drawings, events in books and on the Net. Understand, acquire and employ new structures in scholarly presentations with an exposure to works of Great personalities.
- Communicate effectively with idioms and phrases appropriate to real-life situations.

GE011T - COMMUNICATIVE ENGLISH - I
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Functional Grammar and Usage** Parts of SpeechFunctional Units Use of Main Verb & Auxiliary Verb Application of Tense Forms (Simple Present, Present Continuous, Present Perfect, Simple Past, Past Continuous, Past Perfect, Simple Future, Future Continuous only) Framing Yes / No QuestionsFraming Wh -Questions Application of Active Voice and Passive Voice Use of Prepositions	14
II	**Vocabulary Enrichment** Word Conversion (selective 25 words) Collocation - Noun with Verb, Adjective with Noun (Selective25 Collocations) Homophones (selective 25 homophones)One-word Substitution (Textual) Idiomatic expressions for Daily Life (frequently used 25 expressions) Frequently Used Phrasal verbs (selective 25 Phrasal verbs)	12
III	**Situational English** Dialogue for Day to Day Situations Short Messages for e-Communication Letter Writing for Academic Purpose (Leave Application, Requisition forBonafide Certificate, Applying for TC) Writing the Essentials Comprehension	12
IV	**Creative English** Review Writing (Book / Movie / TV Program)Visual Description Advertisement Writing Word Cloud Transforming Verbal Passage into Graphics	14
V	**English for Scholarly Presentation/ Fluency** "A Snake in the Grass" by R.K. Narayan "Of Parents and Children" by Francis Bacon"On His Blindness" by John Milton "When I Have Fears" by John Keats	12

Reference Books:

Glossaries

https://www.engineering-dictionary.com/
https://techterms.com/definition/
http://dictionary.tamilcube.com/
https://www.lexilogos.com/english/tamil_dictionary.htm

Grammar
1. Just Enough English Grammar Illustrated, Gabriele Stobbe, McGraw-Hill Osborne Media, 2008
2. Visual Guide to Grammar and Punctuation, DK Publishing, 2017
3. English Grammar in Use, Raymond Murphy, Cambridge University Press, 2019
4. Intermediate English Grammar, Raymond Murphy, Cambridge University Press, Second Edition.
5. Essential English Grammar, Raymond Murphy, Cambridge University Press, New edition.

Motivation
1. An Autobiography; Or, The Story of My Experiments with Truth, Mahatma Gandhi, Penguin Books, 2001
2. You Can Win, Shiv Khera, New Dawn Press, 2004
3. Chicken Soup for the Soul, Jack Canfield, Mark Victor Hansen, 2001

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Course Name   :   All branches of Diploma in Engineering and Technology
Subject Code :   GE012T
Semester   :   I
Subject Title :   ENGINEERING MATHEMATICS I

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	Duration
ENGINEERING MATHEMATICS I	6	96	40	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks will be reduced to 60 marks.

TOPICS AND ALLOCATION OF HOURS:

Unit	Topics	Time (Hrs)
I	Algebra	20
II	Complex Number	20
III	Trigonometry	20
IV	Differential Calculus – I	18
V	Differential Calculus – II	18
Total		**96**

GE012T - ENGINEERING MATHEMATICS – I
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ALGEBRA** **MATRICES AND DETERMINANTS:** MATRICES: Definition, Concept and Types of Matrices. DETERMINANTS: Determinant of squre Matrix of order 2 X 2 and 3 X 3 – singular and non – singular Matrices - simple problems. **1.2 APPLICATIONS OF MATRICES AND DETERMINANTS:** Co-factor, Adjoint of Matrix, Inverse of Matrix – Rank of a matrix by Determinant method – Simple problems. **1.3 BINOMIAL THEOREM:** Introduction – Factorial, Permutation and Combinations – Values of nPr and nCr (results only – not for examination). Statement of Binomial theorem for positive integral index - Applications of binomial theorem. Expansion of Binomial - Finding general term – Middle term – Coefficient of x^n and Term independent of x – Binomial Theorem for rational index up to -3.	**20**
II	**COMPLEX NUMBERS** **2.1 ALGEBRA OF COMPLEX NUMBERS** Introduction – Complex Numbers – Conjugates – Algebra of complex numbers (without geometrical proof), Properties of complex conjugates - Modulus and Amplitude - Polar and Euler form of a complex number – Simple problems. Argand Diagram – Collinear points, four points forming square, rectangle, rhombus and parallelogram only - Simple problems. **2.2 DE MOIVRE'S THEOREM** De Moivre's Theorem (Statement & Applications) – related simple problems. **2.3 ROOTS OF COMPLEX NUMBERS** Finding the nth roots of unity – solving the equations of the form $x^n \pm 1 = 0$ where $n \leq 7$ - Simple problems.	**20**
III	**TRIGONOMETRY** **3.1 TRIGONOMETRIC IDENTITIES** Trigonometric Ratios of sum & difference of two angles – Multiple and Sub multiple angles – Functions of 3A angles – Simple problems. **3.2 INVERSE TRIGONOMETRIC FUNCTIONS** Sum and Product Identities - Inverse Trigonometric Functions – Principal value – Properties of Inverse Trigonometric functions – simple problems.	20

IV	**DIFFERENTIAL CALCULUS – I** **4.1 LIMITS** Definition of Limits, Problems using the following results: $\lim_{\theta \to a} = \dfrac{x^n - a^n}{x - a} = na^{n-1}$, $\lim_{\theta \to 0} \dfrac{sin\theta}{\theta} = 1$, $\lim_{\theta \to 0} \dfrac{tan\theta}{\theta} = 1$, ($\theta$ in radians) (results only) **4.2 DIFFERENTIATION** The derivative of Function – Differentiation of constant, $x^n, sinx, cosx, tanx, cotx, secx, cosec\,x, \log x, e^x$ $a^x, \sin^{-1}x, \cos^{-1}x, \tan^{-1}x, \sec^{-1}x, \csc^{-1}x\ and\ \cot^{-1}x$ (Formulae only) – Differentiation Rules: $u \pm v, uv, uvw, \dfrac{u}{v}$ **4.3 DIFFERENTIATION METHODS** Chain rule – Differentiation of Implicit functions – Simple problems.	18
V	**DIFFERENTIAL CALCULUS – II** **5.1 SUCCESSIVE DIFFERENTIATION** Successive differentiation up to second order (parametric form not included). Definition of differential equation, order and degree, formation of differential equation - Simple problems. **5.2 PARTIAL DIFFERENTIATION** Definition - Partial Differentiation of two variables up to second order only –simple problems.	18

Reference Books:
1. Higher Secondary +1 Mathematics volume I&II. Tamil Nadu Text Book Corporation.
2. Higher Secondary +2 Mathematics Volume I&II. Tamil Nadu Text Book Corporation.
3. Engineering Mathematics V. Sundaram, R. Balasubramanian
4. Engineering Mathematics – I C.B.Gupta ,A.K.Malik, New Age International Publishers, 1st Edition – 2008.
5. Differential Calculus S. Balachandra Rao, CK Shantha New Age Publishers
6. Vectors and Geometry GS. Pandey, RR Sharma, New Age International Publishers.
7. Engineering Mathematics – I Guruprasad Samanta, New Age International publishers, 2nd Edition 2015.
8. Engineering Mathematics Reena Garg, Khanna publishing house, New Delhi, Revised edn. – 2018.
9. Engineering Mathematics Volume I P. Kandasamy and K. Thilagavathy, S. Chand & Company Ltd.

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Course Name : **All branches of Diploma in Engineering and Technology**
Subject Code : **GE013T**
Semester : **I**
Subject Title : **ENGINEERING PHYSICS I**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENGINEERING PHYSICS I	4	64	40	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks will be reduced to 60 marks

Topics and Allocation of Hours:

Unit	Topics	Time (Hrs)
I	S I UNITS AND STATICS	13
II	PROPERTIES OF MATTER	13
III	DYNAMICS- I	13
IV	DYNAMICS- II	13
V	SOUND AND MAGNETISM	12
Total		**64**

GE013T - ENGINEERING PHYSICS – I
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**S I UNITS AND STATICS** **1 UNITS AND MEASUREMENTS: -** Unit – Definition – Fundamental Quantities – Definition – Seven fundamental quantities; their SI units and symbol for the units – Supplementary quantities – plane angle and solid angle; their SI units and symbol for the units Derived physical quantities. Dimensional formula for length, mass and time-derivation of dimensional formula for area, volume, density, velocity, momentum, acceleration, force, impulse, work or energy and power. Uses of Dimensional formula. Conventions followed in SI Units Multiples & sub-multiples and prefixes of units – Unit conversions (Horse Power to watt & calorie to joule) – Applications of the method of dimensional analysis. **2 STATICS: -** Scalar and vector quantities – Definitions and examples – Concurrent forces and coplanar forces – Definition – Resolution of a vector into two perpendicular components – Resultant and equilibrant – Definitions – Parallelogram law of forces-statement – Expressions for magnitude and direction of the resultant of two forces acting at a point with an acute angle between them – Lami's theorem – Statement and explanation – Experimental verification of parallelogram law of forces and Lami's theorem. Simple problems based on expressions for magnitude and direction of resultant. Moment of a force – Clockwise and anti-clockwise moments – Principle of moments – Couple – Torque acting due to a Couple – Experimental determination of mass of the given body using principle of moments – Solved problems.	13
II	**PROPERTIES OF MATTER** **2.1 ELASTICITY: -** Elastic and plastic bodies – Definition – stress, strain – Definitions – Hooke's law – statement – three types of strain – Elastic and plastic limit – Young's modulus, Bulk modulus, Rigidity modulus – Definitions – Uniform and non- uniform bending of beams – Experimental determination of the Young's modulus of the material of a beam by uniform bending method – Poisson's ratio – Simple problems based on stress, strain and Young's modulus – Applications of elasticity. **2.2 VISCOSITY: -** Viscosity – Definition – Coefficient of viscosity – Definition, SI unit and dimensional formula – Stream line flow, turbulent flow – Explanation – Critical velocity – Reynolds number – Definition – Experimental comparison of coefficient of viscosity of two low viscous liquids – Terminal velocity – Definition – Experimental determination of coefficient of viscosity of a highly viscous liquid by Stokes method – Practical applications of viscosity – Practical applications of Stoke's law.	13

	2.3 SURFACE TENSION: - Surface tension & angle of contact – Definitions – Expression for surface tension of a liquid by capillary rise method – Experimental determination of surface tension of water by capillary rise method – Practical applications of capillarity. Simple problems based on expression for surface tension – Applications of surface tension – Solved problems.	
III	**DYNAMICS–I** **3.1. STRAIGHT LINE MOTION: -** Introduction-Newton's Laws of motion-Fundamental Equations of motion for objects- horizontal motion-falling freely-thrown vertically upwards. **3.2 PROJECTILE MOTION: -** Projectile motion, angle of projection, trajectory, maximum height, time of flight, and horizontal range–Definitions-Expressions for maximum height, time of flight and horizontal range–Condition for getting the maximum range of the projectile. Path of the projectile (the trajectory) is a Parabola – Simple problems based on expressions for maximum height, time of flight and horizontal range – Examples of projectile motion. **3.3 CIRCULAR MOTION: -** Circular motion, angular velocity, period and frequency of revolutions – Definitions – Relation between linear velocity and angular velocity – Relation between angular velocity, period and frequency – Normal acceleration, centripetal force and centrifugal force – Definitions – Expressions for normal acceleration and centripetal force. Banking of curved paths – Angle of banking – Definition – Expression for the angle of banking of a curved path. $\{\tan\theta = v2 /(r\ g)\}$ – Simple harmonic motion, amplitude, frequency and period – Definition. Simple problems based on the expressions for centripetal force and angle of banking – Applications of centripetal force and centrifugal force Solved Problems.	13
IV	**DYNAMICS–II** **4.1 ROTATIONAL MOTION OF RIGID BODIES: -** Rigid body – Definition – Moment of inertia of a particle about an axis – Moment of inertia of a rigid body about an axis – expressions – Radius of gyration – Definition – Expression for the kinetic energy of a rotating rigid body about an axis – Angular momentum – Definition – Expression for the angular momentum of a rotating rigid body about an axis – Law of conservation of angular momentum – Examples. **4.2 GRAVITATION: -** Newton's laws of gravitation – Acceleration due to gravity on the surface of earth – Expression for variation of acceleration due to gravity with altitude **4.3 SATELLITES: -** Satellites – Natural and artificial – Escape velocity and orbital velocity – Definitions – Expression for escape velocity and Orbital velocity – Polar and Geostationary satellites – Uses of artificial satellites. Simple problems based on the expressions for escape velocity and Orbital velocity.	13

	SOUND AND MAGNETISM	
V	**SOUND AND MAGNETISM** **5.1 SOUND: -** Wave motion – Introduction and definition – Audible range – Infrasonic – Ultrasonics – Progressive waves, longitudinal and transverse waves – Examples – Amplitude, Wave length, period and frequency of a wave – Definitions – Relation between wavelength, frequency and Velocity of a wave – Stationary or standing waves. Vibrations – Free & forced vibrations and resonance – definitions and examples – Laws of transverse vibration of a stretched string – Sonometer – Experimental determination of frequency of a tuning fork. Acoustics of buildings – Echo – Reverberation, reverberation time, Sabine's formula for reverberation time (no derivation) – Coefficient of absorption of sound energy – Noise pollution. Simple problems based on expression for frequency of vibration. Doppler effect – Definition and Applications – Ultrasonic and its uses – SONAR – Solved Problems. **5.2 MAGNETISM: -** Pole strength – Definitions – Magnetic moment, intensity of magnetisation, magnetising field intensity, magnetic induction, Permeability, hysteresis, saturation, retentivity and coercivity – Definitions – Method of drawing hysteresis loop of a specimen using a solenoid – Uses of Hysteresis loop. Simple problems based on intensity of magnetization – Types of magnetic materials and their applications – Solved problems.	12

Reference Books:
1. Physics – Resnick and Haliday – Wisley Toppan publishers–England
2. Engineering Physics – B.L.Theraja – S. Chand Publishers
3. A text book of sound – R.L. Saighal & H.R. Sarna – S.Chand & Co.
4. Mechanics – Narayana Kurup – S. Chand Publishers.

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Course Name	:	**All branches of Diploma in Engineering and Technology**
Subject Code	:	**GE014T**
Semester	:	**I**
Subject Title	:	**ENGINEERING CHEMISTRY I**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours/ Semester	Marks			
			Internal Assessment	Board Examinations	Total	
ENGINEERING CHEMISTRY I	4	64	40	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and will be reduced to 60 marks.

Topics and Allocation of Hours:

Units	Topics	Time
I	**Basic concepts in chemistry** – Atomic Structure and Chemical bonding, Periodic Table, Acids and Bases	14
II	**Surface Chemistry -** Colloids, Nanotechnology, Catalysis	12
III	**Minerals and Metallurgy**– Metallurgy of Iron, Metallurgy of Tungsten and Titanium, Powder Metallurgy	12
IV	**Industrial Chemistry** – Nuclear Chemistry, Cement, Ceramics, Refractories and Glass	14
V	**Chemistry of Engineering Materials** – Polymer, Abrasives, Composite Materials	12
Total		64

RATIONALE:

The subject Engineering Chemistry I lay foundation of all the elements, structure and periodic classification. The latest trends on nano technology, its application on various fields of engineering is also dealt with. It provides basic concepts about minerals and its resources, the metal extraction, heat treatment and powder metallurgy. It also imparts knowledge about few Engineering Materials like cement, ceramics, refractory and glass. It also deals with polymers, abrasives and composite materials.

OBJECTIVES:

The objective of this Course is to make the student:

1. Know about atomic structure, chemical bonding, periodic classification and acids and bases.

2. Learn about surface chemistry, colloidal particles and nano-particles and their application.

3. Know about the mineral resources of Tamil Nadu and the fundamentals of metal extraction, iron and steel manufacture, heat treatment and powder metallurgy.

4. Study about the importance of Engineering Chemistry in industry.

5. Know about Engineering materials like cement, ceramics, refractory, glass, rubber, plastic and composites.

GE014T ENGINEERING CHEMISTRY I
DETAILED SYLLABUS

Contents: Theory

Units	Name of the Topics	Hours
I	**BASIC CONCEPTS IN CHEMISTRY** **1.1** Atomic Structure and Chemical bonding, Periodic Table, Acids and Bases Fundamental particles – proton – electron – neutron – atomic number – mass number – extra nuclear part – filling up of electrons – aufbau principle –s–p–d– f orbital's – electronic configuration – definition of atomic mass, molecular mass, equivalent mass, valency (definitions only) – octet rule – electrovalent bond – sodium chloride formation covalent bond – formation of ammonia. **1.2 Periodic Table** Modern periodic law – periodic classification of elements – features of modern periodic table – properties of s–p–d–f block elements. **1.3 Acids and Bases** Properties of acids and bases – Lewis concept of acids and bases –advantages – pH and pOH – Definition – Numerical problems –Indicator – Definition – Buffer solution – Definition – Types of buffer solution with examples – Application of pH in industries	14
II	**SURFACE CHEMISTRY** **2.1 Colloids** Colloids – Definition – True solution and Colloidal solution – Differences – Types of colloids – Lyophilic and Lyophobic colloids – Differences – Properties – Tyndall effect – Brownian movement – Electrophoresis and Coagulation – Industrial applications of colloids – Smoke Precipitation by Cottrell's method, Purification of water, Cleansing action of soap, Sewage disposal – tanning – and artificial rain. **2.2 Nanotechnology** Nano particles – definition – properties – application of Nanotechnology – Engineering – medicine – biomaterial. **2.3 Catalysis** Catalyst – Definition – Positive – Negative catalyst – Definition – Types of catalysis – Homogeneous and Heterogeneous – Promoter – Catalyst poison – active centre – Definition – Characteristics of a catalyst – Industrial applications of catalysts.	12
III	**MINERALS AND METALLURGY** **3.1 Minerals and Metallurgy** Mineral – Minerals of Tamil Nadu – Sources and Uses (Basic concepts only) - Extraction of iron – Blast furnace – cast iron – steel manufacture – Bessemer converter – heat treatment of steel – hardening – annealing – tempering. **3.2 Metallurgy of Tungsten and Titanium** Extraction and uses of Tungsten and Titanium **3.3 Powder Metallurgy** Definition – Powder metallurgical process – Preparation of Metal Powder - Atomization – Reduction of Metal Oxide – blending – compacting – sintering – finishing – Applications of Powder Metallurgy	12
IV	**INDUSTRIAL CHEMISTRY** **4.1 Nuclear Chemistry**	14

	Nuclear reaction – Differences between nuclear reaction and ordinary chemical reaction – Radioactive decay – alpha emission – beta emission – gamma emission – half-life period – simple problems– Nuclear fission - nuclear fusion – chain reaction - components nuclear reactor, reactor core, nuclear reactor coolant, Control rods, neutron moderator – steam turbine – Application of radioactive isotopes. **4.2 Cement and Ceramics** Definition – Manufacture of Portland Cement – Wet Process – Setting of Cement (No equation) – Ceramics **–** White pottery – Definition – Manufacture of White pottery – Uses – Definition of glazing – purpose – Method – Salt glazing – liquid glazing. **4.3 Refractories and Glass** Definition – requirements of a good refractory – types with examples and uses – uses of silica, fire clay and alumina. Composition of Glass – Manufacture of Glass – annealing of glass – varieties of glass – Optical glass, wind shield glass and Photo chromatic glass.	
V	**CHEMISTRY OF ENGINEERING MATERIALS** **5.1 Polymer** Definition – Natural polymer – Rubber – Defects of natural rubber - Compounding of rubber – Ingredients and their functions – Vulcanization - Plastics – types – Thermoplastics and Thermoset plastics – Differences Mechanical properties of plastics – Polymers in Surgery – Biomaterials –Definition – Biomedical uses of Polyurethane, PVC, Polypropylene and Polyethylene. **5.2 Abrasives** Definition – classification – hardness in Moh's scale – Natural abrasives – Diamond, Corundum, Emery and Garnet. Synthetic abrasives – Carborundum – Boron carbide manufacture – properties and uses. **5.3 Composite Materials** Definition – examples – Classification of composites – Advantages over metals and polymers – General application	12

Reference Books:
1. Introduction to Engineering Chemistry, Shradha Sinha , S S Dara & Sudha Jain, S.Chand Publishers, 2004.
2. S.Chand's Engineering Chemistry, S S Dara, Sudha Jain & Shradha Sinha, 2005.
3. A Textbook of Engineering Chemistry, Dr. Uday Kumar, 2013.
4. Chemistry – Higher Secondary – 1 st and 2nd year, Vol. I & II, Tamil Nadu Text Book Corporation, 2018.
5. Engineering Chemistry Fundamentals and Applications, Shikha Agarwal, Cambridge University Press, 2019.
6. Government of India, Geological Survey of India, Geology and Mineral Resources of The States of India Part VI – Tamil Nadu and Pondicherry
7. Indian Minerals Yearbook 2011, Government of India Ministry of Mines, Indian Bureau of Mines Indira Bhavan, Civil Lines, Nagpur – 440 004

Website references:
1. https://bookboon.com/en/fundamentals-of-chemistry-ebook

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Course Name	:	**All branches of Diploma in Engineering and Technology**
Subject Code	:	**GE015T**
Semester	:	**I**
Subject Title	:	**ENGINEERING GRAPHICS I**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours/ Semester	Marks			
			Internal Assessment	Board Examinations	Total	
ENGINEERING CHEMISTRY I	6	96	40	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and will be reduced to 60 marks.

Topics and Allocation of Hours:

Units	Topics	Time
I	Drawing Office Practice and Dimensioning	18
II	Geometric Constructions and Construction of Conics	18
III	Projection of Points & Straight Lines and Construction of Special Curves	18
IV	Orthographic Projections	36
Total		**96**

RATIONALE:

• Engineering Graphics is a basic subject for all branches of diploma in engineering and technology. Since engineering drawing is considered as the language of engineers, the proper understanding and practice is required with proper use of instruments.

• This subject is aimed at providing basic understanding of the fundamentals of Engineering Graphics; mainly visualization, graphics theory, standards of drawings, the tools of drawing and the use of drawings in engineering applications.

• The topics covered are based on the syllabus for diploma studies in engineering. The subject is planned to include sufficient practices which would help the student in visualization of two-dimensional objects and developing the drawing.

• The chapters are arranged in sequence and starts from the basic concepts of lettering, dimensioning, geometrical constructions, conic sections, projection of points and straight lines, construction of engineering curves, proceeds to the orthographic projection techniques. By learning this subject, it is expected that the students would be matured to visualize the engineering components by reading an engineering drawing.

OBJECTIVES:

At the end of the subject, the students will be able to,

• Understand the importance of drawing
• Identify and use the drawing instruments

- Practice the rules and methods of dimensioning
- Acquire knowledge about geometric constructions
- Construct conic curves
- Understand the concepts of projection of points and straight lines
- Acquire knowledge about the construction of special curves
- Draw orthographic views from the given pictorial drawing

Note: While practicing, usage of drawing instruments like drawing board, mini drafter, compass, divider, drawing clips / cello tape, H, 2H and HB grade drawing pencils, eraser etc., are mandatory for class work and examinations. Size of drawing sheet recommended: A2 size (420 x 594 mm). Use both sides of drawing sheets for practice.

GE015T - ENGINEERING GRAPHICS - I
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DRAWING OFFICE PRACTICE AND DIMENSIONING** **1.1 Drawing Office Practice** Importance of engineering drawing as a graphic communication–drawing practice as per BIS code–drawing instruments: drawing board, mini-drafter, compass, divider, protractor, drawing sheets, drawing pencils, set squares etc., – title block– layout and folding of drawing sheets. Lettering and numbering as per BIS –importance of legible lettering and numbering–single stroke letters–upper case and lower case letters–slanting/ inclined letters–general procedures for lettering and numbering–height of letters– guidelines–practices. Scales–full size scale, reducing scale and enlarging scales (Description only). Minimum criteria for Class assessment <table><tr><td>No. of Drawing Sheets</td><td>No. of Exercises</td></tr><tr><td>1</td><td>Upper case, lower case, slanting letters and numerals – each 5 sentences with different heights</td></tr></table> **1.2 Dimensioning** Dimensioning – need for dimensioning–dimensioning terms and notations as per BIS – dimension line, extension line and leader line – dimensioning systems – methods of placement of dimensions – uni-directional and aligned systems – important dimensioning rules –dimensioning of common features – diameters, radii, holes, chamfers – addition of letters and symbols – parallel, chain and progressive dimensioning – practice of dimensioning the given drawing as per BIS code (one view of the object). Minimum criteria for Class assessment <table><tr><td>No. of Drawing Sheets</td><td>No. of Exercises</td></tr><tr><td>1</td><td>8 - 2D drawings</td></tr></table>	18
II	**GEOMETRIC CONSTRUCTIONS AND CONSTRUCTION OF CONICS** **2.1 Geometric Constructions** Bisect a straight line – bisect an arc – bisect an angle – divide a straight line into any number of equal parts – divide the circle into number of equal divisions – construct an arc touching two lines at any angle – construct an arc touching two arcs. Minimum criteria for Class assessment <table><tr><td>No. of Drawing Sheets</td><td>No. of Exercises covering all methods</td></tr><tr><td>1</td><td>10</td></tr></table>	18

| | | **2.2 Construction of Conics**
Conic sections – definition of locus, focus, directrix, axis, vertex and eccentricity – practical applications of ellipse, parabola and hyperbola.
Ellipse: Construction of ellipse by concentric circle method, rectangular method when major and minor axis is given and eccentricity method when focus and directrix are given–exercises in practical applications.
Parabola: Construction of parabola by rectangular method, parallelogram method when major and minor axis is given and eccentricity method when focus and directrix are given – exercises in practical applications.
Hyperbola: Construction of hyperbola by eccentricity method when focus and directrix are given – exercises in practical applications. | |

Minimum criteria for Class assessment	
No. of Drawing Sheets	No. of Exercises covering all methods
2	07

		PROJECTION OF POINTS & STRAIGHT LINES AND CONSTRUCTION **OF SPECIAL CURVES**	
III		**3.1 Projection of Points and Straight Lines** Projection of points – position of a point on four quadrants and on the reference planes – system of notation–Place a point on four quadrants with different distances – exercises. Projection of straight lines–line in the first quadrant and on the reference planes – parallel to one plane and perpendicular to other plane – inclined to one plane and parallel to the other plane – parallel to both the planes –simple exercises.	18

Minimum criteria for Class assessment	
No. of Drawing Sheets	No. of Exercises
2	12

3.2 Construction of Special Curves
Definition and construction of cycloid – epicycloid – hypocycloid – involute of a circle – Archimedean spiral for one revolution – helix – practical applications – exercises.

Minimum criteria for Class assessment	
No. of Drawing Sheets	No. of Exercises covering all methods
2	06

		ORTHOGRAPHIC PROJECTIONS	
IV		**4.1 First Angle Projections: Simple components** Introduction – projection terms –orthographic projection – planes of projection – principal orthographic views – designation of views – four quadrants – first angle projection – third angle projection – symbols and arrangement of views for first angle and third angle projections –comparison –Simple exercises in first angle projection with minimum two views of simple components (Without curves and circles).	36

Minimum criteria for Class assessment	
No. of Drawing Sheets	No. of Exercises
1	6

4.2 First Angle Projections only: Engineering components
Draw the projections of the simple engineering components using first angle projection – exercises in drawing orthographic views – three views–front view, top view and right / left side views. (For Board Examinations any two views can be asked.)

Minimum criteria for Class assessment	
No. of Drawing Sheets	No. of Exercises
3	12

Reference Books:
1. Bhatt N.D, "Engineering Drawing", Charotar Publishing House Pvt. Ltd.
2. Gill P.S, "Engineering drawing", S.K.Kataria&Sons
3. Gopalakrishna.K.R., "Engineering Drawing", (Vol 1 & 2 combined), Subhas Publications.
4. Venugopal. K, Prabhu Raja V, "Engineering Graphics", New Age International
5. Natarajan K V "A Text Book of Engineering Drawing and Graphics" N Dhanalakshmi

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Board Examination-Question Paper Pattern for all theory subjects except Communicative English I & II &Engineering Graphics I & II.

Note: Clarkes Table and Programmable Calculators are not permitted.

Relevant data should be provided in the question paper for solving the problems if any required.

Time: 3 Hrs.   **Max.Marks:100**

PART-A   Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART-B   Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C   Five questions will be asked either or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have sub divisions. (7 + 8)

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. (Question Number 1 to 5)	5 X 1 = 5 Marks
PART B Short answer type questions. (Question Number 6 to 20)	5 X 2= 20 Marks
PART C Descriptive answer type questions. (Question number 21 to 25) (Either A or B)	5 X 15 = 75 Marks
TOTAL	100 Marks *

Note: Board Examinations will be conducted for 100 Marks and converted to 60 Marks.

ENGINEERING GRAPHICS I
PORTIONS FOR ASSESSMENT TEST
Assessment Test 1

Portion: Unit I and II

Question pattern

Duration: 2 Hrs.   Max. Marks: 50

Part A   **(2 x 5 = 10)**
- Three questions will be asked.
- Answer any two questions.
- Each question carries five marks.
- Minimum one question should be asked from each unit first chapter.

(Chapter 1.1 and 2.1)

Part B   **(2 x 20 = 40)**
- Three questions will be asked.
- Answer any two questions.
- Each question carries twenty marks.
- Minimum one question should be asked from each unit second chapter.

(Chapter 1.2 and 2.2)

Assessment Test 2

Portion: Unit III and IV

Question pattern

Duration: 2 Hrs.   Max. Marks: 50

Part A   **(2 X 5 = 10)**
- Three questions will be asked.
- Answer any two questions.
- Each question carries five marks.
- Minimum one question should be asked from each unit first chapter.

(Chapter 3.1 and4.1)

Part B   **(2 X 20 = 40)**
- Three questions will be asked.
- Answer any two questions.
- Each question carries twenty marks.
- Minimum one question should be asked from each unit second chapter.

(Chapter 3.2and 4.2)

Internal Assessment Marks:

Description	Marks
Class Assessment Sheets (Minimum 10 Sheets)	10
Average of Two Assessment Tests	10
Model Examination	10
Attendance	10
Total	**40**

BOARD EXAMINATION
QUESTION PAPER PATTERN

Time: 3 Hrs   **Max. Marks: 100**

Note: 1. Answer all the questions only in the drawing sheet.
        2. Assume missing dimensions suitably, if required.
        3. Proper drawing instruments and board should be used

Part – A   **(4x5 = 20)**
Note: Five questions will be asked (Sl. No: 1 to 5).
        Answer any four questions.
        Each question carries five marks.
        Minimum one question should be asked from each unit first chapter.
        (Chapters: 1.1, 2.1, 3.1, 4.1)

Part – B   **(4x20 = 80)**
Note: Six questions will be asked (Sl. No: 6 to11).
        Answer any four questions.
        Each question carries twenty marks.
        Minimum one question should be asked from each unit second chapter.
        (Chapters: 1.2, 2.2, 3.2, 4.2)

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Course Name : **All branches of Diploma in Engineering and Technology**
Subject Code : **GE016L**
Semester : **I**
Subject Title : **COMMUNICATION SKILL PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No. of weeks per semester: 16

Subject	Instructions		Examination			
COMMUNICATION SKILL PRACTICAL	**Hours / Week**	**Hours / Semester**	**Marks**			**Duration**
			Internal Assessment	**Board Examinations**	**Total**	
	2	32	60	100*	100	2 HRS

* Examinations will be conducted for 100 marks and will be reduced to 40 marks.

Topics and Allocation of Hours

Unit	Topics	Time (Hrs)
I	Listening Skill	10
II	Reading Skill	6
III	Speaking Skill	10
IV	Writing Skill	6
Total		**32**

RATIONALE:

1.3 "The quality of your life is in the quality of your communication" opined Antony Robins. Language is the means of self-expression and one of the prime most tools for communication. Communicative fluency augments one's personal, academic, social and professional life.

1.4 The present syllabus, focusing on four Communication Skills, viz. Listening, Reading, Speaking and Writing, enables the students at Diploma level gain confidence and fluency in communication which in turn would enhance themface their career commitments with globalized standards.

OBJECTIVES:

At the completion of the study, the students will be able to

➢ Improve their auditory skills to attentively listen, effectively comprehend and to identify important information and keywords.

➢ Fine tune their reading skills and make them articulate lucidly with proper stressand intonation

➢ Perfect their reading comprehending skills using the techniques like Skimmingto get the general idea and scanning to grasp specific information.

➢ Pronounce words with renewed confidence.

➢ Express their needs, obligations, suggestions, gratitude and apology with poiseand conviction.

➢ Introduce themselves and others in a self-assuring manner.

➢ Partake in face to face conversation with skilled agility.

➢ Emphatically write and complete the missing parts.

➢ Acquire a sound knowledge on the usage of non-verbal communication.

GE016L - COMMUNICATION SKILLS PRACTICAL
DETAILED SYLLABUS

Contents: Practical

Unit	Name of the Topics	Hours
I	**Listening Skill** Listening to Speeches by Great Speakers/ TV News (AssessmentThrough note taking) Listening to Short Stories (Assessment by Vocabulary Check) Listening to Indian / British / American English (Assessment by Cloze)	10
II	**Reading Skill** Stress & Intonation Tongue Twisters / Tongue Modulators FrequentlyMispronounced Words Reading Newspaper – (Skimming & Scanning)	06
III	**Speaking Skill** Polite Expressions (Greeting, Requesting, Thanking, Apologizing, Opinions, Suggestions) Introducing Yourself/ Friends/ Family Recite - quotes of Leaders / Scholars / ScientistsFace to Face Conversation	10
IV	**Writing Skill** Thought Fillers, Completing an Incomplete StoryHow to prepare PPT Non-Verbal Communication	06

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BOARD PRACTICAL EXAMINATIONS

Note:

- The students should be given proper practice in all the exercises. All the exercises should be completed before the examinations.
- The students should maintain a record notebook. The record note book should be submitted during the Board Practical Examinations.
- The external examiner should verify the availability facility for the batch strength before the commencement of Practical Examination.
- PART D should be conducted first for all the students. Part A, Part B and Part C can be conducted by both examiners by dividing the students into two groups.

Part -A - Listening (No. of Exercises: 3, Duration: 45 min.)

Question No.1: The examiner shall play either the audio of the speech of a great speaker or that of TV news running from 3 to 5 min. The audio can be played twice. The candidates may be given 10 minutes to take notes as directed in the question paper.

Question No.2: A short story selected by the external examiner shall be played only once without transcript. The objective of this exercise is to test the Listening ability of the candidate and therefore questions should be framed accordingly in the pattern of question and answer. The time to complete this exercise is 5 minutes.

Question No.3: Any one of the audios (British English, American English or Indian English) may be selected by the external examiner and the same shall be played only once. Maximum of 5 questions for filling in the blanks may be given and the candidates may be provided maximum of 10 minutes to answer the questions.

This part shall be completed within 45 minutes including the time used for playing listening audios.

Part – B – Reading (No. of Exercises 3, Duration: 45 min.)

Each batch may be divided into two. Both examiners may engage all the students.

Question No. 1: Readout the tongue twister.

Question No. 2: A passage from newspaper can be given for reading.

Question No. 3: Pronounce the words correctly. Part B shall be completed within 45 minutes.

Part – C – Speaking (No. of Exercises: 4, Duration: 45 min)

Divide the students to make it convenient for conversations in English by a pair. Both examiners can handle.

Question No. 1: Polite expressions for the context provided.

Question No. 2: Self-introduction for the interview.

Question No.3: Any five quotes can be recited from the given list of quotes of Leaders, Scholars and Scientists.

Question No. 4: The candidates have to speak as directed by the concerned examiner. All the questions are mandatory. Part C shall be completed within 45 minutes.

Part - D – Writing (No. of Exercises: 3, Duration: 45 min.)

All students should appear for this part.

Question No.1: Five questions with blanks shall be asked based on a list of 25 frequently used thought fillers already trained during lab classes.

Question No. 2: shall consist of an unknown incomplete story providing scope for further development and application of imagination. (minimum 3 lines for completion with suitable title and moral)

Question No. 3: Questions can be taken from a list of fifteen important questions covering the core areas of non-verbal communication. (Five out of eight questions to be answered)

Students shall be provided maximum of 30 minutes to complete Part-D.

DETAILED ALLOCATION OF MARKS

	Description	Marks
A	Listening	30
B	Reading	20
C	Speaking	30
D	Writing	20
Total		100

Guidelines for Conduct of Practical Classes and Writing Record Note:

There are 13 experiments in total equally distributed to each skill as follows:

Sl. No.	Name of the exercise	Minimum Exercises to be Practiced / written in Record Note
Listening Skill		
1	Listening to Speeches by Great Speakers/ TV News	Each One exercise
2.	Listening to Short Stories	Minimum of two exercises
3.	Listening to Indian / British / American English	Minimum of two exercises
Reading Skill		
4.	Reading Tongue Twisters	A list of 25 tongue twisters
5.	Reading English Newspapers	Minimum 2 passages from any English Newspaper
6.	Frequently mispronounced words	List of 25 words
Speaking Skill		
7.	Making Polite Expressions	Polite expressions- Greeting, Requesting, Thanking, Apologizing, Opinions, Suggestions
8.	Introducing oneself / friends/family	Minimum two exercises for introducing oneself and introducing others
9.	Reciting quotes	Quotes of Leaders/Scholars/Scientists (List of 25 quotes)
10	Face to face conversation	Minimum two exercises
Writing Skill		
11	Use of Thought Fillers	A list of 25 frequently used thought fillers
12	Completing an Incomplete Story	Minimum of two exercises. (conclusion – minimum 3 lines, title & moral)

13	Non-Verbal Communication	A list of 10 questions and answers relating to non- verbal communication.

Notes:

1. Each experiment shall be awarded 20 marks and the total marks secured in all experiments shall be averaged to 20 marks.
2. Attendance mark shall be calculated for 5 marks as per the given norms.
3. Total internal mark is 40 (Record 30 marks + Attendance 10 marks)
4. Observation note is not applicable for this practical.
5. Listening Skill Exercises:

- For each exercise under Listening Skill, minimum exercise should be provided for practice and should be recorded in the record note. (As per the tabular column)
- Open sources available online on the sites such as
- www.youtube.com,
- www.letstalk.co.in,
- http://www.bbc.co.uk/learningenglish/english/features/6-minute-english, and
- https://esl-lab.com/,
- Can be utilized for sessions on improving listening skill.

Note:
Since there is no observation note for English Communication Practical, the worksheets practiced by the students should be preserved along with the Record Note.

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Course Name	:	**All branches of Diploma in Engineering and Technology**
Subject Code	:	**GE017L**
Semester	:	**I**
Subject Title	:	**COMPUTER APPLICATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
COMPUTER APPLICATION PRACTICAL	2	32	60	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks will be reduced to 40 marks

Topics and Allocation of Hours:

Unit	Topics	Time (Hrs)
I	BASICS OF COMPUTER	5
II	WORD PROCESSING	9
III	SPREAD SHEET	9
IV	PRESENTATION	9
Total		**32**

GE017L - COMPUTER APPLICATIONS PRACTICAL

OBJECTIVES
- To learn fundamentals of the computer
- To understand documentation using word processor.
- To understand the spread sheet and its uses.
- To understand the presentation.

Contents: Practical

Units	Topics	Hours
I	**Basics of Computer:** Computer Basics – Hardware & Software - General understanding of various computer hardware components – CPU – Memory – Display – Keyboard- Mouse - HDD & Other Peripheral Devices – Types of Software – Application Software & System Software.	5
II	**Word Processing:** Creating new document – Opening an existing document – Edit & Save a document – Typing a text – Deleting a text – Inserting a text – Finding a text – Replacing a text – Copying & Moving a text – Selecting Font & Font Size – Justifying Texts – Bold – Italic – Underline – Strike – Double Strike – Coloring Text – Spell Check – Ruler – Formatting Page – Line Spacing – Margins – Page Size – Page Border – Page Color – Page Columns – Watermark – Page Break – Section Break – Portrait – Landscape – Inserting Symbols, Equations & Shapes – Text Box – Word Art – Hyperlink – Inserting Pictures – Picture Arrangement - Align	9

	Objects – Bullets & Numbering – Working with Tables – Header & Footer – Table of Contents – Inserting Page Number – Changing Character width & Line Spacing – Printing the document – Print Preview – Shortcuts for various activities in Word – Exercises.	
III	**Spread sheet:** Creating a new worksheet - Opening an existing worksheet - Editing and Saving a worksheet - Creating, Renaming and Deleting worksheets in a workbook - Types of data like Numeric, text etc. - Entering in a cell- Manipulation of a cell, row and column (deleting, inserting, finding, replacing, copying and moving) - Justifying in a cell, Merging cells and columns - Addition, Subtraction and using formula - Selecting Font and Font Sizes - Using and manipulating tables, inserting / deleting of rows and columns - Sorting Columns- Using Header and footer, Inserting Page number - Border and Shading of cells, rows and columns - Formatting page, margins, page size, portrait and landscape - Selecting area for printing, Printing of a worksheet and workbooks, Using print preview - Copy / moving text between two different worksheets and workbooks - Using Chart Wizard, Creation of different types of charts – Protect sheet using password - Shortcuts for various activities in spreadsheet – Exercises.	9
IV	**Presentations:** Creating New Presentations - Opening Presentations - Saving Presentation - Inserting new Slides - Slide Layout - Slide Design - Presentation View - Adding Text - Font formatting - Paragraph formatting – Inserting Clipart & Pictures - Inserting and Manipulating Smart Art - Running a slide show - - Insert Slide Number - Slide Header & Footer - Applying Slide Animation – Custom Animation - Inserting Shapes - Insert Video & Sound - Insert Action - Hyperlinks - Charts - Tables – Page Setup - Print Preview - Printing - Shortcuts of various activities in presentations – Exercises.	9

EXERCISES

EXERCISE 1 (WORD PROCESSING)

Prepare a report from the given printed document of minimum 250 words.

(Use text formatting tools, header & footer, page number, line spacing, font & images)

- **Page Setup:**

Set Margin: Left-1.5, Right-1.5, Top-1.5 & Bottom-1.5 / Orientation: Portrait / Paper Size: A4 / No. of Columns: 2

- **Page Background Settings:**

Watermark / Page Color / Page Borders

- **Text & Paragraph Settings:**

Title: Font size: 16 – Centered – Bold – Suitable font

Heading: Font size: 14 – Left Aligned – Underlined – Set the Suitable Font Face

Body Text: Fo nt size: 12 – Justified – 1.5 Line Spacing – Set the Suitable Font Face

- **Header & Footer:**

Header – Seminar Name, Name of the student, Reg. No. & Branch

- **Insert:**

Picture / Clipart / Shapes / Table.

- **Minimum No. of Words:** 250 words

EXERCISE 2 (WORD PROCESSING)

Create a resume for placement from the given printed template with your personal details. Publish a copy of the resume as PDF.

- **Page Setup:**

Margin: Left-0.5, Right-0.5, Top-0.5 & Bottom-0.5 / Orientation: Portrait /
Paper Size: A4 / No. of Columns: As per the given resume format.

- **Page Borders:**

Insert Page Border if required.

- **Font & Paragraph:**

Heading: Font size: 12 - Bold – Underlined – Set the Suitable Font Face Body

Text : Font size: 12 – Justified – 1 Line Spacing – Set the Suitable Font Face Insert Bullets &
Numberings were ever required.

- **Insert:**

Photo for your Resume / Tables for Academic Records.

- **Save as PDF:**

Publish a copy of the resume as PDF using any PDF Converting Tools.

EXERCISE 3 (WORD PROCESSING)

Create a standard covering letter and use mail merge to generate the customized letters for applying to a
job in various organizations. Also, create a database and generate labels for the applying organizations.

- **Page Setup:**

Margin: Left-1.5, Right-1.5, Top-1.5 & Bottom-1.5 / Orientation: Portrait / Paper Size: A4

- **Page Background:**

Add Page Border for the Letter

- **Font & Paragraph:**

Title: Font size: 16 – Centered – Bold – Suitable font

Heading: Font size: 14 – Left Aligned – Underlined – Set the Suitable Font Face

Body Text: Font size: 12 – Justified – 1.5 Line Spacing – Set the Suitable Font Face

- **Mailings:**

Select Recipients and add a New List of HR Database.

Start Mail Merge through Step by Step Mail merge wizard.

EXERCISE 4 (SPREAD SHEET)

Create a worksheet for the given relational data (minimum ten records) and show the data in the Line
Chart, Bar Chart and Pie Chart.

- **10 Records**

Add text to the spreadsheet to the various fields require to analyze the data in Chart

- **Font & Alignment**

Font Face – Font Size – Font Color

- **Formulae**

Use Formulae for the selected data for Calculation

- Insert Charts – Line Chart, Bar Chart & Pie Chart

EXERCISE 5 (SPREAD SHEET)

Create a worksheet for the given data with various functions like Sum, Average, Count, Min, Max &
Logical functions [IF, AND].

- **Data**

Create a Worksheet and Insert the various records to the cells.

- **Formatting**

Set the Font using Font Name, Font Size and with various Alignment tools.

- **Formulas and Functions**

Use some functions like Sum, Average, Count, Min, Max and Logical Functions. [IF, AND]

EXERCISE 6 (SPREAD SHEET)

Create a worksheet for the given data and analysis the data with various filters and conditional formatting.

- **Data**
- **Formatting**

  Text: Font Face – Font Size – Font Color – Alignment
- **Functions**
- **Conditional Formatting**
- **Filters**

EXERCISE 7 (PRESENTATION)

Create a presentation of minimum 10 slides from engineering related topic.

- **Design & Layout**

Add a suitable Theme and Layout according to the content of all 10 slides.

- **Header & Footer**

Header: Insert the Title & Author

Footer : Insert the Date & Slide Number

- **Font & Paragraph**

Font Face – Font Size Font Color - Alignment – Bullets & Numberings

- **Insert**

Images & Tables

EXERCISE 8 (PRESENTATION)

Create a presentation of 10 slides about your college with Slide & Custom Animation, Shapes Header & Footer, Slide number, Video, Audio, Picture, Tables and Hyperlink between slides.

- **Design & Layout**

Add a suitable Theme and Layout according to the content of all 10 slides.

- **Header & Footer**

Header: Insert the Title & Author

Footer : Insert the Date & Slide Number

- **Font & Paragraph**

Font Face – Font Size – Font Color - Alignment – Bullets & Numberings

- **Insert**

Video / Audio / Tables / Shapes

- **Hyperlink**

Use hyperlink to link between slides.

- **Animation**

Custom Animation for individual Objects / Slide Transition to all slides

Custom Animation for individual Objects / Slide Transition to all slides

GE016L - Computer Application Practical
BOARD PRACTICAL EXAMINATIONS

Note:

1. The student should be given proper training in all the exercises. All the exercises should be completed before the examinations.

2. The student should maintain observation note book / manual and record notebook. The record note book should be submitted during the Board Practical Examinations. Common printout for the record note book should not be allowed. Individual student output for every exercise should be kept in the record note book.

3. All exercises should be given in the question paper and student is allowed to select any one by lot. All exercises with the hard copy of the template related to the exercise should be provided by the external examiner for the examination. Template can be varied for every batch.

4. The external examiner should verify the availability of the infrastructure for the batch strength before the commencement of Practical Examination.

DETAILED MARK ALLOCATION

	Description	Marks
A	Aim & Procedure	20
B	Execution *	50
C	Output Printout / Handout ^	20
D	Viva voce	10
	TOTAL	**100**

* Should be evaluated during the execution by the examiners only.

^ Students output should be printed and submitted with the

Hardware and Software Requirements

Minimum Hardware Requirements:

Desktop Computers – 30Nos

Processor: 1 GHz, RAM: 1 GB, Hard Drive: 500 GB, Monitor: 15", Keyboard & Mouse, other accessories

Overhead Projector: 1 No.

Laser Printer: 1 No.

Minimum Software Requirements:

Operating System: Any GUI Operating System

Office Package (Open Office Packages)

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Course Name	:	All branches of Diploma in Engineering and Technology
Subject Code	:	GE026L
Semester	:	I and II
Subject Title	:	ENGINEERING PHYSICS PRACTICAL

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks		Total	Duration
			Internal Assessment	Board Examinations		
SEMESTER- I ENGINEERING PHYSICS I PRACTICAL	2	32	60	100*	100	3 Hrs
SEMESTER- II ENGINEERING PHYSICS II PRACTICAL	2	32				

* Examinations will be conducted for 100 marks will be reduced to 40 marks

RATIONALE:

In Diploma level engineering education skill development plays a vital role. The skill development can be achieved by on hand experience in handling various instruments, apparatus and equipment. This is accomplished by doing engineering related experiments in practical classes in various laboratories.

GUIDELINES:

• All the first eight experiments should be completed in the First Semester and the remaining eight experiments should be completed in the Second Semester. All the experiments should be given for the practical examination at the end of the Year. 87

• In order to develop best skills in handling Instruments / Equipment and taking readings in the practical classes, every two students should be provided with a separate experimental setup for doing experiments in the laboratory.

• The external examiners are requested to ensure that a single experimental question should not be given to more than two students while admitting a batch of 30 students during Board Examinations.

SEMESTER - I
ENGINEERING PHYSICS - I PRACTICAL

LIST OF EXPERIMENTS WITH OBJECTIVES:
1. MICROMETER (SCREW GAUGE).
To measure the thickness of the given irregular glass plate using micrometer.
To determine the area of the glass plate using a graph sheet and to calculate the volume of the glass plate.
2. VERNIER CALIPERS.
To measure the length and diameter of the given solid cylinder using Vernier calipers and to calculate the volume of the solid cylinder.
3. PARALLELOGRAM LAW.
To verify the parallelogram law using concurrent force.
4. LAMI'S THEOREM
To verify Lami's theorem using concurrent forces.
5. COMPARISON OF VISCOSITIES
To compare the co-efficient of viscosities of two low viscous Liquids by capillary flow method.
6. STOKES' METHOD.
To determine the coefficient of viscosity of a highly viscous liquid.
7. SONOMETER.
To determine the frequency of the given tuning fork.
8. DEFLECTION MAGNETOMETER
To compare the magnetic moments of the two bar magnets using Deflection Magnetometer in Tan a position, by equal distance method

SEMESTER - II
ENGINEERING PHYSICS - II PRACTICAL

LIST OF EXPERIMENTS WITH OBJECTIVES:
9. REFRACTIVE INDEX
To determine the refractive index of a transparent liquid (water) using travelling Microscope.
10. SPECTROMETER.
To measure the angle of the prism using Spectrometer.
11. SOLAR CELL.
To draw the V – I characteristics of the solar cell.
12. LAWS OF RESISTANCES.
To verify the laws of resistances by connecting the two given standard resistances in series and parallel, using Ohm's law.
13. JOULE'S CALORIMETER.
To determine the specific heat capacity of water.
14. COPPER VOLTAMETER.
To determine the electro chemical equivalent (e.c.e.) of copper.
15. **P-N JUNCTION DIODE**.
To draw the voltage – current characteristics in forward bias and to find the 'dynamic Forward resistance' & 'knee voltage' from the graph.
16. LOGIC GATES.

To find the output conditions for different combinations of the input for NOT gate and 2 inputs AND, OR, NAND & NOR logic gates, using IC chips. (IC 7404 – NOT Gate,IC 7408 – AND Gate, IC 7432 – OR gate, IC 7400 – NAND Gate,IC 7402 – NOR Gate).

BOARD PRACTICAL EXAMINATIONS

Note:

• The students should be given proper practice in all the experiments. All the experiments should be completed before the examinations.

• The students should maintain observation note book / manual and record notebook. In the observation, the student should draw diagram, mention the readings / observations, calculations and result manually. The same have to be evaluated for the observation mark.

• The record note book should be submitted during the Board Practical Examinations. The record work for the experiments should be completed and evaluated in the respective semesters.

• All experiments should be given and the students are allowed to select any one by   lot.

• The external examiner should verify the availability of the infrastructure for the batch strength before the commencement of Practical Examination.

• The examiners should ensure the proper safety measures before the commencement of practical examinations.

DETAILED MARK ALLOCATION

	Description	Marks
A	Formula & Diagram	20
B	Tabulation with proper units	10
C	Observation (including taking readings)	40
D	Calculation	15
E	Result	10
F	Viva voce	5
	Total	**100**

LIST OF EQUIPMENTS:

(Minimum Two set of equipment / components are required For the Batch of 30 Students.)

1. MICROMETER (SCREW GAUGE).

Screw gauge, graph sheet and irregular glass plate.

2. VERNIER CALIPERS.

Vernier Calipers and Solid Cylinder

3. PARALLELOGRAM LAW.

Vertical drawing board, two Z pulleys, three sets of slotted weights (5 x 50g) and twine thread.

4. LAMI'S THEOREM

Vertical drawing board, two Z pulleys, three sets of slotted weights (5 x 50g) and twine thread.

5. COMPARISON OF VISCOSITIES

Burette stand, graduated burette without stopper, rubber tube, capillary Tube, beaker, digital stop watch, two liquids and funnel.

6. STOKES' METHOD.

Stokes' Apparatus, highly viscous liquid (Castrol oil), glass beads of different radii, digital stop watch and screw gauge.

7. SONOMETER.

Sonometer, screw gauge, tuning fork, rubber hammer, slotted weight hanger set (5 x 0.5kg) and paper rider.

8. DEFLECTION MAGNETOMETER

Deflection Magnetometer, meter scale and two bar magnets

9. REFRACTIVE INDEX

Travelling Microscope, Beaker with transparent liquid and Saw dust.

10.   SPECTROMETER.

Spectrometer, Sodium vapour lamp, Reading lens and Glass prism

11.   SOLAR CELL.

Solar cell Kit for drawing the V - I characteristics

12.   LAWS OF RESISTANCES.

Battery Eliminator, key, rheostat, ammeter, voltmeter, Connecting wires and two known standard resistances.

13.   JOULE'S CALORIMETER.

Joule's Calorimeter, Battery eliminator, Rheostat, Key, Ammeter, voltmeter, stop clock, thermometer, digital Balance and connecting wires.

14.   COPPER VOLTAMETER.

Copper Voltameter, Battery eliminator, Rheostat, Key, Ammeter, stop clock, digital balance, emery sheet and Connecting wires.

15.   P-N JUNCTION DIODE.

P-N Junction Diode forward characteristics kit.

16.   LOGIC GATES.

Logic gates testing apparatus kit with bread board for Mounting ICs and Integrated circuit chips (IC 7404 –NOT Gate, IC 7408 – AND Gate, IC 7432 – OR gate, IC 7400 –NAND Gate, IC 7402 – NOR Gate)

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Course Name	:	**All branches of Diploma in Engineering and Technology**
Subject Code	:	**GE027L**
Semester	:	**I and II**
Subject Title	:	**ENGINEERING CHEMISTRY PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours/ Semester	Marks			
			Internal Assessment	Board Examinations	Total	
SEMESTER I ENGINEERING CHEMISTRY I PRACTICAL	2	32	60	100*	100	3 Hrs.
SEMESTER II ENGINEERING CHEMISTRY II PRACTICAL	2	32				

*Examinations will be conducted for 100 marks and will be reduced to 40 marks.

OBJECTIVES:
1. At the end of the program the student will have knowledge about volumetric analysis in acidimetric, alkalimetric and permanganometric titration and their applications.
2. To get knowledge of estimation of total hardness, temporary and permanent hardness in the hard water sample.
3. To get knowledge about measurement of TDS, pH and to calculate Hydrogen ion concentration in a solution.
4. To get knowledge of estimation of dissolved chlorine in a water sample.

GE027L - ENGINEERING CHEMISTRY – I PRACTICAL

Intellectual Skills
1. Carrying out Volumetric titrations and calculation of masses
2. Knowing units for Concentrations of solutions

Motor Skills
1. Measure quantities accurately
2. Observe chemical reactions
3. Handle the apparatus carefully

EXPERIMENTS

i) Acidimetry and Alkalimetry
1. Estimate the amount of sulphuric acid present in ………. ml of a given solution using Standard solution of HCl of strength…………….N and an approximately decinormal solution of NaOH.
2. Estimate the amount of NaOH present in ……….ml the given solution using a standard solution of KOH of strength ………….N and approximately decinormal solution of H2SO4

3. Compare of strength of two given hydrochloric acids and estimate the stronger/weaker solution present in ………….ml using a standard solution of sodium hydroxide of strength …………N

ii) Permanganometry

4. Estimation of the amount of Mohr salt present in……….ml of the given solution using a standard solution of ferrous sulphate of strength …………N and an approximately decinormal solution of $KMnO_4$.

5. Estimation of the amount of Fe 2+ present in……….ml of the given solution using a standard solution of ferrous ammonium sulphate of strength …………N and an approximately decinormal solution of $KMnO_4$.

6. Compare of strength of two given $KMnO_4$ solution and estimate the stronger/weaker solution present in ………….ml using a standard solution of ferrous ammonium sulphate of strength …………N

iii) Water Analysis

7. Water analysis for residual chlorine
8. Estimation of total hardness of a sample using EDTA
9. Water quality testing, pH (3 samples)
10. Water quality testing TDS (3 sample) Determination of pH and TDS using a pH meter and TDS meter respectively and calculation of hydrogen ion Concentrations (For three given samples, one of the samples brought from home by each student) **(This question must be given to any two students per batch in the Board Examination).**

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GE027L - ENGINEERING CHEMISTRY–II PRACTICAL

INTELLECTUAL SKILLS
1. Studying the effect of heating on substances and reagents
2. Study of the reactions of the following radicals leading to qualitative analysis of the given Inorganic simple salt soluble in water or dilute acids
3. Studying the harmful effects of effluents

Acid Radicals   :   Carbonate, Chloride, Nitrate and Sulphate
Basic Radicals   :   Lead, Copper, Aluminium, ferrous iron, Zinc, Barium, Calcium, Magnesium and Ammonium

MOTOR SKILLS
1. Handling the apparatus carefully
2. Awareness on Industrial safety

EXPERIMENTS
I. Analysis of Inorganic simple salt (QUALITATIVE ANALYSIS)
- Analysis of nine inorganic simple salts containing any one acid radical and basic radical without omitting any of the above – mentioned radicals.

II. Analysis of Effluent containing Lead, Copper and Zinc metal ions (EFFLUENT ANALYSIS)
- Analysis of three effluents, each containing the above – mentioned metal ions.
- Report on the metallic pollutant with procedure (Basic Radical Analysis Procedure) and their harmful effects.

BOARD PRACTICAL EXAMINATIONS
Note:
- The students should be given proper practice in all the experiments. All the experiments should be completed before the examinations.
- The students should maintain observation note book / manual and record notebook. In the observation, the student should draw diagram, mention the readings / observations, calculations and result manually. The same have to be evaluated for the observation mark.
- The record note book should be submitted during the Board Practical Examinations. The record work for the experiments in the concerned semester should be completed and evaluated in the respective semesters. Both Volumetric and Salt analysis shall be recorded in the in the same record note book. During the completion of First semester, Volumetric analysis needs to be completed and record needs to be submitted. The second semester, Salt analysis also be recorded in the same record note book.
- All experiments should be given as per the model question paper and the students are allowed to select any one by lot.
- The external examiner should verify the availability of the infrastructure for the batch strength before the commencement of Practical Examination.
- The examiners should ensure the proper safety measures as per the guidelines before the commencement of practical examinations.

DETAILED MARK ALLOCATION

	DESCRIPTION	MARKS
A	**PART A** **Engineering Chemistry I Practical**	**53**
B	**PART B** **Engineering Chemistry II Practical**	**42**
C	**VIVA VOCE**	**05**
	Total	**100**

Guidelines for Evaluation
Part - A: ENGINEERING CHEMISTRY I PRACTICAL

Volumetric Analysis - Distribution of Marks

FOR	MARKS
Short procedure	5
Titration I	18
Titration II	18
Calculations (3 X 4)	12
Total	53
Volumetric Analysis	
Titration value accuracy for Titration I and II	
Accuracy	**Marks**
±0.2ml	18
above ±0.2 ml to ±0.4 ml	15
above ±0.4 ml to ±0.6 ml	**12**
above ±0.6 ml 5	**5**

Determination of pH: Distribution of marks

FOR	MARKS
Answer for short questions on pH and TDS	5
Determination of pH of three samples (3 x 7)	21
Calculation of H+ (3X2) 6	6
Determination of TDS - three samples (3X7)	21
TOTAL	**53**
Accuracy per pH value	
Accuracy	**MARKS**
±0.2ml	7
above ±0.2 ml to ±0.4 ml	5
above ±0.4 ml	2
TDS Value Accuracy	
Accuracy	**Marks**
±0.2ml	7
above ±0.2 ml to ±0.4 ml	5
above ±0.4 ml	**2**

Note: All the students should be given same question and each batch of student is given different inorganic simple salt and effluent. (Nine salt and three effluents)

Part - B: ENGINEERING CHEMISTRY II PRACTICAL

Qualitative Analysis

FOR	MARKS
Identification Procedure of Acid Radical with Systematic Procedure	21
Identification Procedure of Basic Radical with Systematic Procedure	21
Total	**42**
Without Systematic Procedure	
Identification of Acid Radical with confirmatory test only	13
Identification of Basic Radical with confirmatory test only	13
Mere Spotting of Acid Radical and Basic Radical (3+3)	6

EFFLUENT ANALYSIS (two samples to be given)

FOR	MARKS
Identification of metallic pollutant procedure with systematic procedure Effluent sample	16
Harmful effects of metallic pollutant	5
Identification of metallic pollutant procedure with systematic procedure Effluent sample II	16
Harmful effects of metallic pollutant	5
Total	42
Without systematic procedure	
Group Identification Tests of metallic pollutant	13
Confirmatory Test of metallic pollutant	13
Mere Spotting of the pollutant (3+3)	6

SAFETY MEASURES (DO'S & DON'TS)

Experiment should be carried out with the supervision of Lab instructor / staff i/c.
- Do not enter into the Laboratory without proper supervision.
- Do wear protective equipment for eye protection and make sure to wear a laboratory coat.
- Do not smell, inhale taste of chemicals.
- Do label all containers with chemicals.
- Do avoid direct contact with chemicals, far from your hands face, clothes and shoes.
- Do not use Hazardous chemical without proper directions.
- Do Use separate cabinets for acid solutions with concentration more than 6M.
- Whenever, accidentally when concentrated acids fallen on hands / cloth wash thoroughly with running water, and after taking first aid, and the student may be taken to hospital.
- Do attach chemical labels with all necessary information to all containers.
- Do read the warning labels when opening newly received reagent chemicals. This will help to be aware of any special storage precautions such as refrigeration or inert atmosphere storage.
- Do periodic check on chemical containers for rust, corrosion and leakage.

- Do Store bottles in chemicals afe bags especially those hazardous and moisture absorbing chemicals.
- Do not use of mouth suction to fill a pipette. Use a pipette bulb or other filling devices.
- Do not Smoke, drink, eat and the application of cosmetics is forbidden in areas where hazardous chemicals are used or stored.
- Do use chemicals with adequate ventilation.
- Do wash thoroughly with soap and water whenever you leave the lab after handling any chemicals.
- Do Keep your hands and face clean free from any trace of chemicals.
- Do not play with chemicals.

List of Apparatus to be provided for each student in Chemistry Laboratory during the Engineering Chemistry – I & II Practical Classes / Board Examination in addition to the required reagents:

LIST OF EQUIPMENTS
List of Equipment Required for a Batch of 30 Students

NON-CONSUMABLE ITEMS

Sl. No.	Name of the item	Quantity
1.	LPG Connection	Sufficient Nos.
2.	Exhaust Fan (High Capacity)	Sufficient Nos.
3.	Fire Extinguisher	1
4.	First Aid Box (Full Set)	2
5.	Safety Chart	1
6.	Chemical Balance	1
7.	Fractional Weight Box	1
8.	pH Meter	2
9.	TDS meter	2
10.	Working Table with all accessories	8

GLASSWARE AND OTHER ITEMS

Sl. No.	Name of the item	Quantity
1	Burette(50 ml)	35
2	Burette stand	35
3	Pipette(20 ml) (With safety bulb)	35
4	Pipette(10 ml)	35
5	Conical Flask(250 ml)	35
6	Funnel (3")	50
7	Porcelain Tile	35
8	Measuring Cylinder (10 ml)	5
9	Measuring Cylinder (1000 ml)	2
10	Reagent Bottle (White) (250 ml)	60
11	Reagent Bottle (White) (125 ml)	100
12	Reagent Bottle (Amber) (250 ml)	80
13	Test Tube(15 mm x 1.5 mm)	1000
14	Test Tube(15 mm x 2.5 mm)	500
15	Test Tube Stand	35

16	Test Tube Holder	35
17	Test Tube Cleaning Brush	35
18	Glass Trough	5
19	Beaker(100 ml)	35
20	Glass Rod(15 cm)	35
21	Watch Glass (3")	35
22	Wash Bottle (Polythene)	35
23	Nickel Spatula	35
24	Bunsen Burner for Gas connection	35
25	Plastic Bucket(15L)	10
26	Filter Papers (Round)	Sufficient No.
27	Pipette bulb / filling devices	35

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Course Name : **All branches of Diploma in Engineering and Technology.**
Subject Code : **GE021T**
Semester : **II**
Subject Title : **COMMUNICATIVE ENGLISH – II**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
COMMUNICATIVE ENGLISH – II	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks.

Topics and Allocation of Hours

Unit	Topics	Time (Hrs)
I	Functional Grammar and Usage	13
II	English for Enrichment	11
III	Situational English	11
IV	Creative English	11
V	English for Scholarly Presentation/ Fluency	11
	Test & Model Exam	7
	Total	**64**

GE021T - COMMUNICATIVE ENGLISH – II
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Functional Grammar and Usage** Application of Modal Verbs Negative Formation (No, Never, Nothing, Hardly, Seldom, No longer, None, Nowhere, Neither … nor) Use of Subordinating Conjunctions Use of Conditionals Reported Speech (Dialogue to Indirect Speech) Punctuation	13
II	**English for Enrichment** The Language Game: Unscramble Phrases (Noun Phrase, Verb Phrase, Prepositional Phrase, etc.) Cause and Effect Writing Suitable Responses to the Given Questions Giving Instructions	11
III	**Situational English** Email for Official Communication Social Media Language Reacting to Situations Correction of Sentences Proverbs for Everyday Situations	11
IV	**Creative English** The Language Game: Word Puzzle Grid Notice Writing for the Given Situations Slogan Writing Technical Words Infographics Comprehension	11
V	**English for Scholarly Presentation/ Fluency** "The Lost Child" by Mulk Raj Anand "My Vision for India" by Abdul Kalam "From Lover's Gift" by Rabindranath Tagore "The Flower" by Tennyson	11

REFERENCE BOOKS:
Glossaries
- https://www.engineering-dictionary.com/
- https://techterms.com/definition/
- http://dictionary.tamilcube.com/
- https://www.lexilogos.com/english/tamil_dictionary.htm

Grammar
- Just Enough English Grammar Illustrated, Gabriele Stobbe, McGraw-Hill Osborne Media, 2008
- Visual Guide to Grammar and Punctuation, DK Publishing, 2017
- English Grammar in Use, Raymond Murphy, Cambridge University Press, 2019
- Intermediate English Grammar, Raymond Murphy, Cambridge University Press Second Edition.
- Essential English Grammar, Raymond Murphy, Cambridge University Press, New edition.

Motivation
- Autobiography, The Story of My Experiments with Truth, Mahatma Gandhi, Penguin Books, 2001
- You Can Win, Shiv Khera, New Dawn Press, 2004
- Chicken Soup for the Soul, Jack Canfield, Mark Victor Hansen, 2001

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Course Name : **All branches of Diploma in Engineering and Technology**
Subject Code : **GE022T**
Semester : **II**
Subject Title : **ENGINEERING MATHEMATICS II**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENGINEERING MATHEMATICS II	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks will be reduced to 75 marks.

TOPICS AND ALLOCATION OF HOURS:

Unit	Topics	Time (Hrs)
I	Analytical Geometry	16
II	Vector Algebra	16
III	Integral Calculus - I	16
IV	Integral Calculus - II	16
V	Application of Integration	16
Total		**80**

GE022T - ENGINEERING MATHEMATICS – II
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**ANALYTICAL GEOMETRY** **1.1 ANALYTICAL GEOMETRY II:** Circles – General equation of a circle Family of circles-Concentric circles – Orthogonal circles (condition only) – contact of circles - simple problems. **1.2 CONICS** Definition of a conic, Focus, Directrix and Eccentricity. General equation of a conic. $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$ (statement only). Condition for conic for circle: a = b and h = 0 for pair of straight line: $\begin{vmatrix} a & h & g \\ h & b & f \\ g & f & c \end{vmatrix} = 0$ for parabola: $h^2 - ab = 0$ for ellipse: $h^2 - ab < 0$ and for hyperbola: $h^2 - ab > 0$ Simple problems.	16
II	**VECTOR ALGEBRA – I** **2.1 VECTOR – INTRODUCTION** Definition of vector – types, addition, subtraction and scalar multiplication of vector, properties of addition and subtraction. Position vector. Resolution of vector in three dimensions, distance between two points, Direction cosines and direction ratios. Simple problems. **2.2 PRODUCT OF TWO VECTORS** Scalar product – Vector product – condition for parallel and perpendicular vectors, properties, angle between two vectors, unit vector perpendicular to two vectors – simple problems. Application of Scalar and Vector product.	16
III	**INTEGRAL CALCULUS – I** **3.1 INTEGRATION - DECOMPOSITON METHOD** Historical approach for integration - Anti derivative - Definition of the integral as an anti-derivative - Fundamental rules for integration - Integration using decomposition method - simple problems based on Engineering Applications. **3.2 METHODS OF INTEGRATION - INTEGRATION BY SUBSTITUION** Integrals of the form $\int [F(x)]^n f'(x)dx$ where $n \neq -1$, $\int \frac{f'(x)}{f(x)}dx$ and $\int F[f(x)]f'(x)dx$ simple problems. **3.3 STANDARD INTEGRALS** Integrals of the form $\int \frac{dx}{a^2 \pm x^2}$, $\int \frac{dx}{x^2-a^2}$, $\int \frac{dx}{\sqrt{a^2-x^2}}$, $\int \sqrt{a^2 - x^2}\,dx$, $\int \sqrt{x^2 \pm a^2}dx$ - Simple problems.	16
IV	**INTEGRAL CALCULUS – II**	16

	4.1 METHODS OF INTEGRATION - INTEGRATION BY PARTS Integrals of the form $\int x \sin nx\,dx$, $\int x \cos nx\,dx$, $\int xe^{nx}dx$, $\int x^n \log x\,dx$, and $\int \log x\,dx$,- Simple problems. **4.2 BERNOULLI'S FORMULA** Evaluation for the integrals $\int x^m \sin nx\,dx$, $\int x^m \cos nx\,dx$ and $\int x^m e^{nx} dx$ Where $m \leq 3$ using Bernoulli's formula - Simple problems. **4.3 DEFINITE INTEGRALS** Definition of definite integral – Properties of definite integrals - Simple problems**.**	
V	**APPLICATION OF INTEGRATION** **5.1 AREA AND VOLUME** Area and volume – Area of Circle – volume of Sphere and Cone - Simple problems **5.2 FIRST ORDER DIFFERENTIAL EQUATION** Solution of first order variable type differential euquation – Simple problems. **5.3 LINEAR TYPE DIFFERENTIAL EQUATION** Solution of Linear differential equation –simple problems.	**16**

Reference Books:
1 Engineering Mathematics V. Sundaram, R. Balasubramanian
2 Engineering Mathematics – I C.B.Gupta, A.K.Malik, New age international Publishers, 1st edition – 2008.
3 Differential Calculus S. Balachandra Rao, CK Shantha New age Publishers Probability Theory and Stochastic Process B.Prabhakara Rao, TSR Murthy, BS Publishers.
4 Vectors and Geometry GS.Pondey, RR.Sharma, New age international publishers.
5 Engineering Mathematics – I Guruprasad Samanta, New age international publishers, 2nd edition 2015. Engineering Mathematics Reena Garg, Khanna publishing House, New Delhi, Revised edn. – 2018.
6 Engineering Mathematics Volume I P. Kandasamyand K. Thilagavathy, S. Chand & Company Ltd.

Board Examination-Question Paper Pattern for all theory subjects except

Communicative English I & II & Engineering Graphics I & II.

Note: Clarkes Table and Programmable Calculators are not permitted.

Relevant data should be provided in the question paper for solving the problems if any required.

Time: 3 Hrs.   **Max.Marks:100**

PART – A   Five questions will be asked covering all units. All questions are to be answered. Each question carries 1 mark.

PART- B   Fifteen questions will be asked covering all the units. Three questions from each unit. Answer any ten questions. Each question carries 2 marks.

PART-C   Five questions will be asked Either / Or type. One question from every unit. Answer either A or B. Each question carries 15 marks. A and B have subdivisions. (7 + 8)

The questions are to be numbered from 1 to 25. All the units are to be covered with equal weightage.

PART A Definitions and Statements. Question Number 1 to 5	5 X 1 = 5 Marks
PART B Short answer type questions Question Number 6 to 20	5 X 2= 20 Marks
PART C Descriptive answer type questions (Either A or B) Question number 21 to 25	5 X 15 = 75 Marks
TOTAL	**100 Marks ***

Note: Board Examinations will be conducted for 100 Marks and converted to 60 Marks.

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Course Name : **All branches of Diploma in Engineering and Technology**
Subject Code : **GE023T**
Semester : **II**
Subject Title : **ENGINEERING PHYSICS II**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
ENGINEERING PHYSICS II	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks will be reduced to 60 marks

Topics and Allocation of Hours:

Unit	Topics	Time (Hrs)
I	HEAT	14
II	THERMODYNAMICS, LIQUEFACTION OF GASES& NON-CONVENTIONAL ENERGY	14
III	LIGHT AND REMOTE SENSING	12
IV	ELECTRICITY	12
V	ELECTRONICS	12
Total		**64**

GE023T - ENGINEERING PHYSICS – II
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**HEAT** **TRANSFER OF HEAT** Concept of Heat and Temperature – Centigrade, Fahrenheit and Kelvin scales of temperature measurement- Conduction, convection and radiation – Definitions and explanations-Good and Poor conductors-Examples. Coefficient of thermal conductivity-Definition and SI Unit-Properties of thermal radiation – Heat conversions. **KINETIC THEORY OF GASES** Postulates –Mean square velocity and Root Mean Square (RMS) velocity of molecules – Definitions and expressions – Expression for the pressure of a gas on the basis of postulates of kinetic theory of gases – Relation between pressure and kinetic energy of the gas-Relation between kinetic energy and absolute temperature–Simple problems based on the expression for the pressure of a gas. **SPECIFIC HEAT CAPACITY** Specific heat capacity of a substance (solids and liquids) –Definition – Specific heat capacity of a gas at constant volume – Specific heat capacity of a gas at constant pressure– Ratio of specific heat capacities – Explanation for Cp is greater than Cv– Derivation of Mayer's relation – calculation of Universal gas constant R from the gas equation PV= RT. Simple problems based on Mayer's relation – Solved problems.	14
II	**THERMODYNAMICS, LIQUEFACTION OF GASES and NON-CONVENTIONAL ENERGY** **THERMODYNAMICS** First law of thermodynamics – Statement – Isothermal and Adiabatic changes – Explanation – Equations for isothermal and adiabatic changes (No derivation) Simple problems based on equations $P1V1 = P2V2$ and $P1V1 \gamma = P2V2 \gamma$. Second law of thermodynamics – Clausius statement and Kelvin's statement – Working of Carnot's reversible engine with indicator diagram and its efficiency – Applications of heat and thermodynamics. **LIQUEFACTION OF GASES** Critical temperature, critical pressure and critical volume – Definitions – Principle used in cascade process –Cascade process of liquefaction of oxygen –Disadvantages of cascade process – Joule Thomson effect – Temperature of inversion – Liquefaction of air by Linde's process. **NON – CONVENTIONAL ENERGY** Introduction – Non-renewable and Renewable (Alternate) energy sources – Examples – Solar energy, wind energy, – Advantages and disadvantages of renewable energy – Tidal Energy.	14

III	**LIGHT AND REMOTE SENSING** **OPTICS** Refraction – Laws of refraction – Refractive index of a medium – Derivation of refractive index of glass prism using minimum deviation – Definition –Spectrometer – Experimental determination of refractive index using spectrometer- Phenomenon of total internal reflection – Fiber optics – Introduction –Optical Fiber Cable as a wave guide – advantages of OFC – problems using the refractive index – Applications of total internal reflection. **LASER** LASER – Characteristics of LASER – principle of LASER –Spontaneous emission – Stimulated emission – population inversion – Ruby LaserConstruction and working- Uses of LASER. **REMOTE SENSING** Remote sensing – Introduction – Active and passive remote sensing – Explanation and examples – Components of remote sensing – Data acquisition and data analysis – Reference data – RADAR – principle and working with block diagram.	**12**
IV	**ELECRICITY** **ELECTRICAL CIRCUITS** Ohm's law – Laws of resistances – Resistivity, Conductivity, Superconductivity and Meissner effect- Definitions – Kirchhoff's current and voltage laws. Condition for balancing the Wheat Stone's bridge – Simple problems based on expression for resistivity. Capacitance of a capacitor – Definition – 'farad'– Definition– expressions for effective capacitance when capacitors are connected in series and in parallel. Simple problems based on effective capacitance for series and parallel connections of capacitors – Applications of capacitors. **EFFECTS OF CURRENT** Joule's law of heating – Experimental determination of specific heat capacity of a liquid using Joule's calorimeter – Faraday's laws on electrolysis – Electro chemical equivalent (e.c.e) of an element – Definition – Experimental determination of e.c.e. of copper – Simple problems based on expressions for e.c.e – Applications of heating effect of electric current. **MEASURING INSTRUMENTS** Expression for the force acting on a current carrying straight conductor placed in a uniform magnetic field – Fleming's Left Hand rule – Expression for the torque experienced by a rectangular current carrying coil placed inside a uniform magnetic field – Working of a moving coil galvanometer and its merits – Conversion of galvanometer into an Ammeter and Voltmeter. Simple problems based on conversion of Galvanometer into Ammeter and Voltmeter – Solved problems.	**12**

V	**ELECTRONICS** **SEMI CONDUCTORS** Semiconductors – Intrinsic semiconductors -Concept of holes – Doping – Extrinsic semiconductors – Energy bands in solids – Energy band diagram of good conductors, insulators and semiconductors – Concepts of Fermi level – P type and N type semiconductors. **DIODES AND TRANSISTORS** P-N junction diode – Forward bias and reverse bias –Rectification action of diode – Working of full wave bridge rectifier using P N junction diodes – PNP and NPN transistors – Three different configurations – Working of NPN and PNP transistor in common base configuration. **DIGITAL ELECTRONICS** Digital electronics – Introduction – Logic levels – Basic logic gates: OR, AND, NOT gates – Universal logic gates: NAND and NOR gates – Symbolic representation, Boolean expression and Truth table for all above logic gates – Integrated circuits– Levels of integration – SSI, MSI, LSI and VLSI-Advantages of Ics – Applications of transistors, gates and Ics – Solved problems.	**12**

Reference Books:
1. Fundamentals of physics – Brijlal and Subramaniam.
2. Fundamentals of Electricity – D.N. Vasudeva – S. Chand & co
3. Non- Conventional energy sources – G.D. Rai.- Khanna publishers
4. Text book of remote sensing and Geographical information systems – M. Anji Reddy BS publications.

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Course Name	:	All branches of Diploma in Engineering and Technology
Subject Code	:	GE024T
Semester	:	II
Subject Title	:	ENGINEERING CHEMISTRY II

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	
ENGINEERING CHEMISTRY II	4	64	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and will be reduced to 60 marks.

Topics and Allocation of Hours:

Units	Topics	Time
I	**Electrochemistry** – Electro Chemistry-I, Electro Chemistry - II – Energy Sources.	14
II	**Chemistry of corrosion and prevention** - corrosion – theory of Corrosion – Methods of Prevention of Corrosion, Organic Coatings	14
III	**Energy Chemistry** - Fuels, Combustion, Rocket Propellants.	12
IV	**Applied Chemistry** – Technology of Water – I,– Technology of Water – II	12
V	**Environmental Chemistry** – Air Pollution, Water Pollution, Solid Waste Management and Green Chemistry	12
	Total	64

RATIONALE:

• The subject Engineering Chemistry – II develop basic understanding about electrochemistry, energy resources, corrosion, methods of prevention of corrosion and its organic coatings.

• Energy chemistry explains various aspects with regard to fuels, combustion and rocket propellants.

• Prime importance is given to technology of water, its analysis of few parameters like pH, TDS, Hardness, dissolved chlorine, e-coli etc.

• Environmental chemistry explains environmental pollution, solid waste management and green chemistry.

OBJECTIVES:

The objective of this Course is to make the student:
1. To acquire knowledge about electro chemistry, electro chemical cell.
2. To know about corrosion and prevention.
3. To acquire knowledge about fuels, combustion of fuels and rocket propellants.
4. To know about water and its analysis.
5. To acquire knowledge about Environmental Chemistry.

GE024T - ENGINEERING CHEMISTRY I
DETAILED SYLLABUS

Contents: Theory

Units	Name of the Topics	Hours
I	**ELECRO CHEMISTRY** **1.1 Electrochemistry-I** Electronic concept of oxidation and reduction – Faradays' laws of electrolysis – simple problems – electrolytes - nonelectrolytes – electrolysis – definition – Mechanism – Industrial applications of Electrolysis – electroplating – chromeplating. **1.2 Electrochemical cell** Electrochemical cell – Definition Galvanic cell – Formation of Daniel cell – Electrochemical series – Definition – significance. **1.3 Energy Sources** Primary Battery – Secondary Battery – Definition and example – cell – Construction, working principle and Uses of Lead acid – Storage battery – Lithium ion – battery - Solar Cell – Definition – working principle.	14
II	**CHEMISTRY OF CORROSION AND PREVENTION** **2.1 Corrosion** Definition – types of corrosion – theories of corrosion – galvanic cell formation theory – differential aeration theory – factors influencing rate of corrosion. **2.2 Methods of Prevention of corrosion** Galvanization – tinning – anodisation – cathodic protection – sacrificial anode method and impressed voltage method. **2.3 Organic Coatings** Paint – definition – Components of paints – Varnish – definition – Preparation of oil varnish – differences between paint and varnish – Special Paints – Luminescent paint, fire retardant paint, Aluminum paint and distemper.	14
III	**ENERGY CHEMISTRY** **3.1 Fuels** Fuel – Definition – Calorific value – calorie – Liquid fuels – liquid hydrogen – power alcohol – uses – Refining of Petroleum – Fractional distillation – Cracking (Concept only) – Gaseous fuels – Preparation, composition and specific uses of Producer gas and Water gas – Composition and uses of CNG and LPG – advantages of gaseous fuels. **3.2 Combustion** Definition – Combustion calculation by mass (for solid and liquid fuels) – Stoichiometric calculations – Volume of air required – Definition of Flue gas – Flue gas Analysis – Orsat Apparatus – Simple numerical problems. **3.3 Rocket Propellants** Definition – characteristics – Classification of propellants –brief idea of solid and liquid propellants.	12
IV	**APPLIED CHEMISTRY** **4.1 Technology of Water–I** Sources of water – depletion of underground water – Reasons – Rain water harvesting (Basic ideas) – advantages – Hard water and soft water – Hardness of water – Carbonate	12

	and Non–carbonate hardness – Methods of expressing hardness – mg/lit and ppm – Simple problems – Disadvantages of hard water – Estimation of total hardness by EDTA method – Problems involving Total, Carbonate and Non–carbonate hardness in ppm – Disadvantages of using hard water in boilers –Scale formation, Corrosion of boiler metal, Caustic Embrittlement – Priming and Foaming. **4.2 Technology of Water–II** Softening of hard water – Ion-Exchange method and Reverse Osmosis method – Municipal supply – purification of drinking water – Quality of potable water (WHO standard) – parameters of potable water – pH – TDS – residual Chlorine permissible limits – determination of ecoli (preliminary idea)	
V	**ENVIRONMENTAL CHEMISTRY** **5.1 Air Pollution** Pollution and Air pollution – Definition – Air pollutants (SO2, H2S, HF, CO and Dust) – Sources and Harmful effects – smog and types of smog – Formation of Acid Rain – Harmful effects – Green House Effect – Causes – Global warming – Harmful effects – Ozone Layer – Importance – Causes for Depletion of Ozone Layer (No equations) – Harmful effects of Ozone Layer Depletion – Control of Air Pollution. **5.2 Water Pollution** Causes of Water Pollution – Sewage, Effluents, Algae and Microorganisms – Harmful effects – Definition – Sewage – Sewerage – Disposal – Industrial Effluents – Harmful effects of Effluents Treatment of Effluents – Eutrophication – definition – harmful effects. **5.3 Solid Waste Management** Solid Waste – Definition – Problems – Types of Solid Waste – Methods of Disposal – Land fill and Incineration – Recycling – Definition – Examples – Advantages of Recycling (Basic ideas) Green Chemistry Definition – Goals of Green Chemistry (Basic ideas)	12

Reference Book:
1. Introduction to Engineering Chemistry, Shradha Sinha , S S Dara & Sudha Jain, S. Chand Publishers, 2004.
2. S.Chand's Engineering Chemistry, S S Dara, Sudha Jain & Shradha Sinha, 2005.
3. A Textbook of Engineering Chemistry, Dr. Uday Kumar, 2013.
4. Chemistry – Higher Secondary – 1 st and 2nd year, Vol. I & II, Tamil Nadu Text Book Corporation, 2018.
5. Engineering Chemistry Fundamentals and Applications, Shikha Agarwal, Cambridge University Press, 2019.
6. Handbook of rain water harvesting, Chennai Metrowater, 2018
7. Engineering Chemistry, Jain&Jain Dhanpat Raj Publishing Comapany,2016
8. Pradeeps new course chemistry, Vol I, Class 11,Dr.S.C. Khetarpal, Dr.S.N.Dhawan, Pradeep Publication,2018
9. Electrochemistry and Corrosion Science,,Nestor Perez,
10. https://link.springer.com/book/10.1007%2F978-3-319-24847-9#toc

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Course Name	:	All branches of Diploma in Engineering and Technology
Subject Code	:	GE025T
Semester	:	II
Subject Title	:	ENGINEERING GRAPHICS II

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			Duration
	Hours/ Week	Hours/ Semester	Marks			
			Internal Assessment	Board Examinations	Total	
ENGINEERING CHEMISTRY I	5	80	25	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and will be reduced to 75marks.

Topics and Allocation of Hours:

Units	Topics	Time
I	Construction of Polygons and Projection of Planes	20
II	Projection of Solids and Section of Solids	20
III	Development of Surfaces	20
IV	Missing Views and Isometric Projections	20
Total		**80**

RATIONALE:

• Engineering graphics is a basic subject for all branches of diploma in engineering and technology. Since engineering drawing is considered as the language of engineers, the proper understanding and practice is required with the use of proper drawing instruments.

• This subject is aimed at providing basic understanding of the fundamentals of engineering drawings mainly visualization of three dimensional drawings for practical applications and the use of drawings in real life engineering applications.

• The topics covered are based on the syllabus for diploma studies in engineering. The subject is planned to include sufficient practice which would help the students in visualization of three dimensional objects and developing the drawing.

• The chapters are arranged in sequence and starts from the construction of polygons, concepts of projection of planes, solids and section of solids. It proceeds to the construction of development of surfaces and isometric projections.

• By the end of the subject, it is expected that the students would be matured to visualize engineering components by reading an engineering drawing.

OBJECTIVES:

At the end of the practice, the students will be able to

➢ Understand the importance of drawing
➢ Identify and use of the drawing instruments
➢ Acquire knowledge about the construction of polygons in various positions

- ➢ Understand the concepts of projection of planes
- ➢ Draw the projection of solids and section of solids
- ➢ Draw the development of solids and sheet metal components
- ➢ Draw the missing views from the given drawing
- ➢ Convert orthographic views into isometric drawings

Note: While practicing, usage of drawing instruments like drawing board, mini drafter, compass, divider, drawing clips / cello tape, H, 2H and HB grade drawing pencils, eraser etc., are mandatory for class work and examinations. Size of drawing sheet recommended: A2 size (420 x 594 mm).Use both sides of drawing sheets for practice.

GE025T - ENGINEERING GRAPHICS - II
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**CONSTRUCTION OF POLYGONS AND PROJECTION OF PLANES** **1.1 Construction of Polygons** Construction of regular polygon: triangle, square, pentagon and hexagon – various positions – side of the polygon is parallel, perpendicular and inclined to principal planes. Minimum criteria for Class assessment: <table><tr><td>No. of Drawing Sheets</td><td>No. of Exercises covering all methods</td></tr><tr><td>1</td><td>12</td></tr></table> **1.2 Projection of Planes** Projection of planes – rectangle, square, hexagon and circle–plane parallel to HP and perpendicular to VP – plane parallel to VP and perpendicular to HP – plane perpendicular to both HP and VP – plane parallel to both the planes – simple exercises. Minimum criteria for Class assessment: <table><tr><td>No. of Drawing Sheets</td><td>No. of Exercises covering all methods</td></tr><tr><td>2</td><td>16</td></tr></table>	20
II	**PROJECTION OF SOLIDS AND SECTION OF SOLIDS** **2.1 Projection of Solids – I** Introduction – important terms – classification of solids – triangular and hexagonal prisms and pyramids – solids of revolution –cylinder and cone– projection of solids in simple positions – axis parallel to one plane and perpendicular to other plane. Minimum criteria for Class assessment: <table><tr><td>No. of Drawing Sheets</td><td>No. of Exercises covering all methods</td></tr><tr><td>1</td><td>8</td></tr></table> **2.2 PROJECTION AND SECTION OF SOLIDS** **2.2.1 Projection of Solids - II** Position of solid–axis inclined to one plane and parallel to other plane –axis parallel to both planes – simple exercises. Minimum criteria for Class assessment: <table><tr><td>No. of Drawing Sheets</td><td>No. of Exercises covering all methods</td></tr><tr><td>1</td><td>6</td></tr></table> **2.2.2 Section of Solids** Need for section view – cutting plane – cutting plane line–representation as per BIS code–Hatching line – true section–section of simple solids –triangular and hexagonal prisms and pyramids, cylinder, cone – position of solids – axis perpendicular to one plane and parallel to other plane – position of cutting planes – cutting plane perpendicular to one plane and parallel to another plane – cutting plane perpendicular to one plane and inclined to another plane – true shape– exercises.	20

		Minimum criteria for Class assessment		
		No. of Drawing Sheets	No. of Exercises covering all methods	
		2	8	
III		**DEVELOPMENT OF SURFACES** **3.1 Development of Regular Solids** Need for preparing development drawing with reference to sheet metal work – procedure for preparing development drawing of prism, pyramid, cylinder and cone –exercises in rectangular, square and hexagonal prisms and pyramids – exercises in regular cylinder and cone.		20

Minimum criteria for Class assessment	
No. of Drawing Sheets	No. of Exercises covering all methods
1	8

3.2 Development of Components

Cutting plane – cutting plane line – development of truncated prism and cylinder – frustum of pyramid and cone – development of simple engineering components such as elbow, ducts, lamp shade and funnel.

Minimum criteria for Class assessment	
No. of Drawing Sheets	No. of Exercises covering all methods
3	10

MISSING VIEWS AND ISOMETRIC PROJECTIONS

4.1 Missing Views

Reading a drawing – missing views – visualization – possible view problems – Drawing a missing view or third view (Draw missing view only) – simple exercises.

Minimum criteria for Class assessment	
No. of Drawing Sheets	No. of Exercises covering all methods
1	6

IV · 20

4.2 Isometric Projections

Introduction–isometric view – isometric projection – methods of drawing an isometric view – box method – construction of arcs and circles – four centre method for drawing ellipse – construction of isometric drawing of components from the given orthographic views – simple exercises.

Minimum criteria for Class assessment	
No. of Drawing Sheets	No. of Exercises covering all methods
1	8

Reference Books:

1. Bhatt N.D, "Engineering Drawing", Charotar Publishing House Pvt. Ltd.
2. Gill P.S, "Engineering drawing", S.K.Kataria & Sons.
3. Gopalakrishna.K.R., "Engineering Drawing", (Vol 1 & 2 combined), Subhas Publications.
4. Venugopal.K, Prabhu Raja V, "Engineering Graphics", New Age International Publishers.
5. Natarajan K V "A Text Book of Engineering Drawing and Graphics" Publisher: N Dhanalakshmi.
6. Shah M B, Rana B C, "Engineering Drawing", Pearson.
7. Basant Agrawal, Agrawal C M "Engineering Drawing", McGraw hill HED.
8. Parkinson A C, "First Year Engineering Drawing", Sir Isaac Pitman & Sons Ltd.

ENGINEERING GRAPHICS II
PORTIONS FOR ASSESSMENT TEST

Assessment Test 1

Portion: Unit I and II

Question pattern

Duration: 2 Hrs.   **Max. Marks: 50**

Part - A   **(2 X 5 = 10)**

- Three questions will be asked.
- Answer any two questions.
- Each question carries five marks.
- Minimum one question should be asked from each unit first chapter.
(Chapter 1.1and 2.1).

Part - B   **(2 X 20 = 40)**

- Three questions will be asked.
- Answer any two questions.
- Each question carries twenty marks.
- Minimum one question should be asked from each unit second chapter.
(Chapter 1.2 and 2.2).

Assessment Test 2

Portion: Unit III and IV

Question pattern

Duration: 2 Hrs.   **Max. Marks: 50**

Part – A   **(2 X 5 = 10)**

- Three questions will be asked.
- Answer any two questions.
- Each question carries five marks.
- Minimum one question should be asked from each unit first chapter.
(Chapter 3.1 and 4.1).

Part - B   **(2 X 20 = 40)**

- Three questions will be asked.
- Answer any two questions.
- Each question carries twenty marks.
- Minimum one question should be asked from each unit second chapter.
(Chapter 3.2 and 4.2).

Internal Assessment Marks:

Description	Marks
Class Assessment Sheets (Minimum 10 Sheets)	10
Average of Two Assessment Tests	05
Model Examination	05
Attendance	05
Total	**25**

BOARD EXAMINATION
QUESTION PAPER PATTERN

Time: 3 Hrs   **Max. Marks: 100**

Note: 1.   Answer all the questions only in the drawing sheet.
       2.   Assume missing dimensions suitably, if required.
       3.   Proper drawing instruments and board should be used

Part – A   (4x5 = 20)

Note: Five questions will be asked (Sl. No: 1 to 5).
       Answer any four questions.
       Each question carries five marks.
       Minimum one question should be asked from each unit first chapter.
       (Chapters: 1.1, 2.1, 3.1, 4.1)

Part – B   (4x20 = 80)

Note: Six questions will be asked (Sl. No: 6 to11).
       Answer any four questions.
       Each question carries twenty marks.
       Minimum one question should be asked from each unit second chapter.
       (Chapters: 1.2, 2.2, 3.2, 4.2)

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Course Name   : **All branches of Diploma in Engineering and Technology**
Subject Code   : **GE028L**
Semester   : **II Semester**
Subject Title   : **BASICS OF INDUSTRIES & WORKSHOP PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
BASICS OF INDUSTRIES & WORKSHOP PRACTICAL	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks will be reduced to 75 marks

Topics and Allocation of Hours:

Unit	Topics	Time (Hrs)
	A: THEORY PORTION	
I	BASICS OF INDUSTRIES	6
II	INDUSTRIAL SAFETY AND MAINTENACE	6
III	QUALITY AND STANDARDS	6
IV	BASICS OF ENGINEERING	8
V	INDUSTRY 4.0	6
	B: PRACTICAL PORTION	
	BASIC ENGINEERING MANUFACTURING PRACTICES	24
	BASIC SERVICE AND MAINTENANCE PRACTICES	24
	Total	**80**

COURSE OBJECTIVE:
- To learn the basics of industries.
- To understand the MSME.
- To understand the importance of safety and plant maintenance.
- To learn the importance of the quality and its standards.
- To study the basics of engineering.
- To understand the industry 4.0.
- To understand the importance of global readiness in industries.
- To understand basic tools and measuring instruments in general workshop.
- To understand and familiar with the shop floor practices and safety procedures.
- To understand the basic engineering manufacturing practices on the metal and wood works.
- To understand the basic service and maintenance practices in the wiring and basic plumbing practices.
- To learn the importance and various methods of rainwater harvesting to improve the ground water level.
- To understand the principles of basic industrial and domestic applications.

GE028L - BASICS OF INDUSTRIES & WORKSHOP PRACTICAL
DETAILED SYLLABUS

Contents: Theory Portion

Unit	Name of the Topics	Hours
I	**BASICS OF INDUSTRIES:** What is Industry? - Classification– Factors influences the location of the industries. Types of industries: Small Scale Industries: Definitions – procedure to start. Medium scale industries: Definition. Large scale industries: Definition. Manufacturing Industry - purpose of manufacture – global manufacture. Engineering Industry: Introduction – Products of various engineering sectors.	6
II	**INDUSTRIAL SAFETY AND MAINTENACE:** Introduction – Safety equipment – Health and safety procedure – Personnel Protective Equipment – Safe working practices - Safety Signs. Plant Maintenance: Introduction – objectives – importance. Types of Maintenance: Break down maintenance – Preventive maintenance – Predictive Maintenance. TPM: introduction – objectives - Steps of TPM process.	6
III	**QUALITY AND STANDARDS:** Definition of Quality – Total Quality Management - introduction – basic concepts – Quality Council – objectives. 5S Principle – Sort, Set in Order, Shine, Standardise and Sustain. – Necessity of 5S – Six Sigma – Essential elements – Methodologies – Six Sigma belt. ISO standards – Intellectual Property Rights - Engineering Ethics. Brief description only.	6
IV	**BASICS OF ENGINEERING:** Tolerance - limits – Deviation – Allowance – Definitions only. Types of tolerances: Unilateral, Bilateral – Fits – Types of fits. List of important materials used for building construction – Requirements of water for construction. Mortar: Types and its properties. Concrete: constituents – requirements. Types of roofing – Types of foundation – requirements of good foundation – Standard sizes of doors and windows. Weathering course: purpose – materials required. Earth quake: types of earth quake and its remedial measures. Rain water harvesting – types - importance. Electrical flux – electrical flux density – electrical field intensity – current – EMF – potential difference – resistivity – ohms law – work – power – energy – Kirchhoff's law – definitions only.	8
V	**INDUSTRY 4.0** Industrial revolution – Definition - Industry 4.0 - Definition – Key trends. Components: Big data – Cloud computing – Internet of Things – Simulation – Autonomous Robots – Augmented reality – Cyber security – System integration – Additive manufacturing. Evolution of Industry 4.0 – Global readiness – Global trend – Initiative by industries and Government – Importance of Industry 4.0	6

Reference Books:

1. Basic Manufacturing "Roger Timings" Third Edition – Newnes, An imprint of Elsevier.
2. Industrial Organisation and Engineering Economics – "T.R. Banga, S.C.Sharma"- Khanna Publishers
3. Industrial Engineering and Management "O.P.Khana" – Dhanbat Rai Publications.
4. Machine Drawing -K.L.Narayana, P.kannaiah, K.Venkatareddy – New Age International Publishers.
5. Elements of Civil Engineering - M.S.Palanisamy – Tata Mc Grawhill Publication.
6. A Text Book of Electrical Technology B.L.Theraja, A.K.Theraja – S.Chand& Company Ltd.
7. IJTSRD Conference Issue | March 2019 - The Fourth Industrial Revolution (I4.0) in India Challenges &Opportunities by Viraj Vijay Jadhav, Ravindra Mahadeokar.
8. Industry4.0 – All India Management Association report.
9. CII Reports.

CONTENTS: PRACTICAL PORTION
GE028L - BASICS OF INDUSTRIES & WORKSHOP PRACTICAL

Note:

1. The observation note book or observation manual may be used. In the observation, the student should draw diagram, mention the readings / observations, calculations and result manually. The same have to be evaluated for the observation mark.

2. The proper safety procedure and norms should be followed with proper uniform (Khaki pant & shirt) with shoe during the practices.

BASIC ENGINEERING MANUFACTURING PRACTICE   24Hrs.
(Tutorial – 6 Hrs. Practice – 18 Hrs.)

Objective:

- At the end of this course, the students will able to
- Know the basic workshop production processes and general safety precautions inside the shop.
- Read and interpret job drawings.
- Identify suitable marking and measuring tools for metal and wood materials.
- Select and use various cutting and filing tools for metal works.
- Select and use various chiseling and planning tools for woodworks.
- Learn different metal working operations like marking, cutting, filing, drilling, tapping etc.
- Understand different wood working operations like marking, planning, chiseling, sawing etc.
- Study and handle drilling machine and work holding devices.
- Produce jobs as per specified dimensions and inspect the job for the quality.
- Study the basic measuring instruments and measurements.

Skills:

- Ability to read job drawing
- Ability to identify and select proper material, tools, equipment and machine.
- Ability to set tools, work piece, and machines for desired operations.
- Ability to use safety equipment and follow safety procedures during operations.
- Ability to complete job as per job drawing in allotted time.
- Ability to measure and inspect the job for confirming desired dimensions and shape.
- Ability to acquire hands-on experience.
- Ability to use of workshop practices in day today industrial and domestic life helps to dissolve the problems.

SYLLABUS

Introduction of Manufacturing: Definition – Type of manufacturing: Casting Process – Forming Process – Joining Process – Material removal process – Material addition Process.

Bench work: Metal work (Fitting) and Wood work (Carpentry) – Selection of material – Types of materials - Holding Devices - Striking Tools - Cutting Tools - Measuring and Marking tools- Power tools. Steps/procedures to prepare a part. Safety precautions in workshop.

Exercises

Note: Practices should be given to cover all the operations. All the students should be given sufficient practice to do the below exercises for the board practical examinations. Importance should be given for the measurement and dimensions.
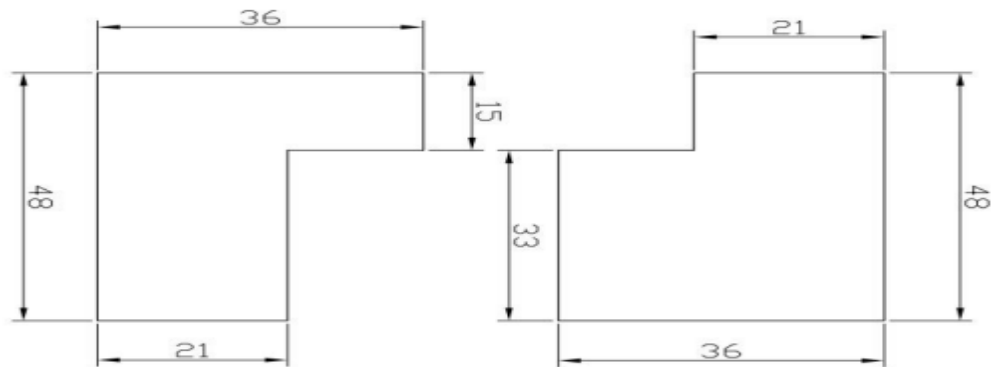
Exercise 1
Raw material: 75mm X 50mm X 3 mm thick M.S. flat – 1 No.
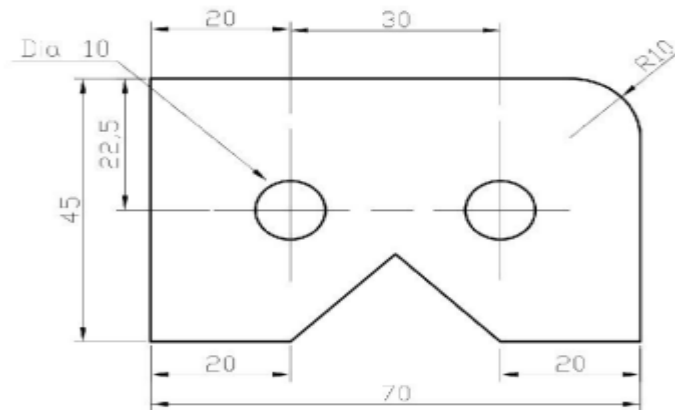
All dimensions are in mm

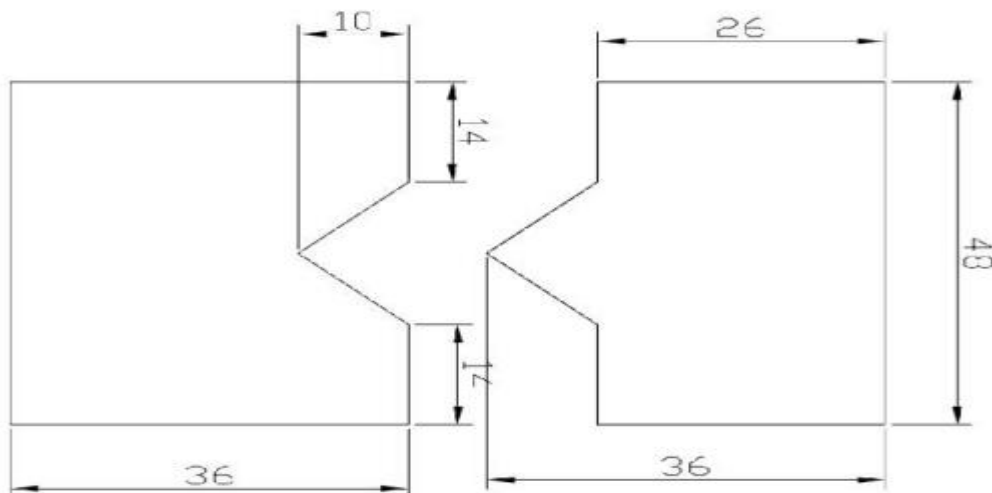**Exercise 2**
Raw material: 50mm X 40mm X 3 mm thick M.S. flat – 2Nos.
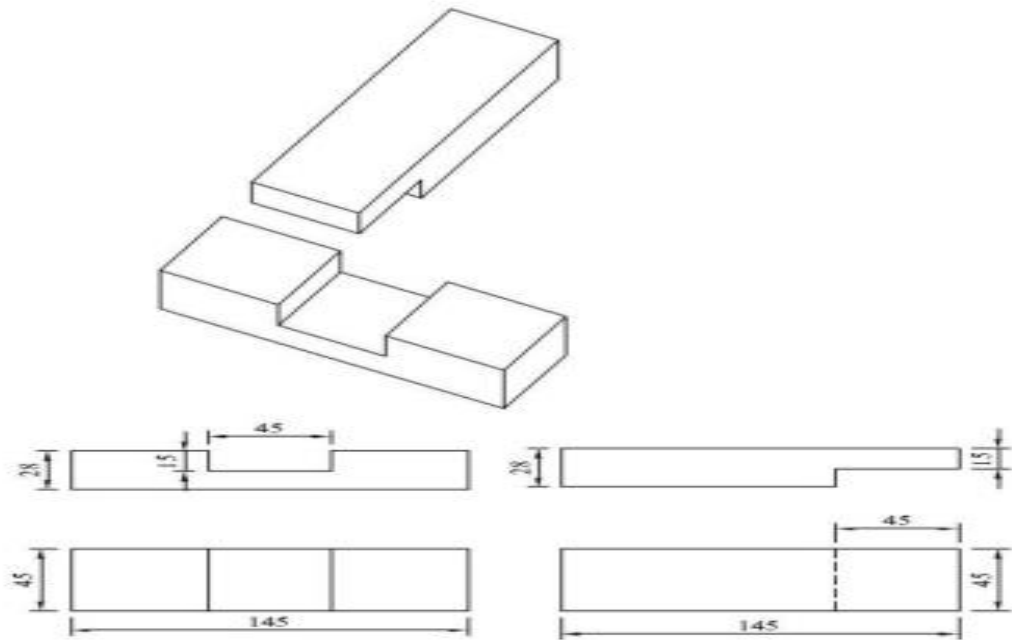

All dimensions are in mm

Exercise 3
Raw material: 50mm X 40mm X 3 mm thick M.S. flat – 2Nos
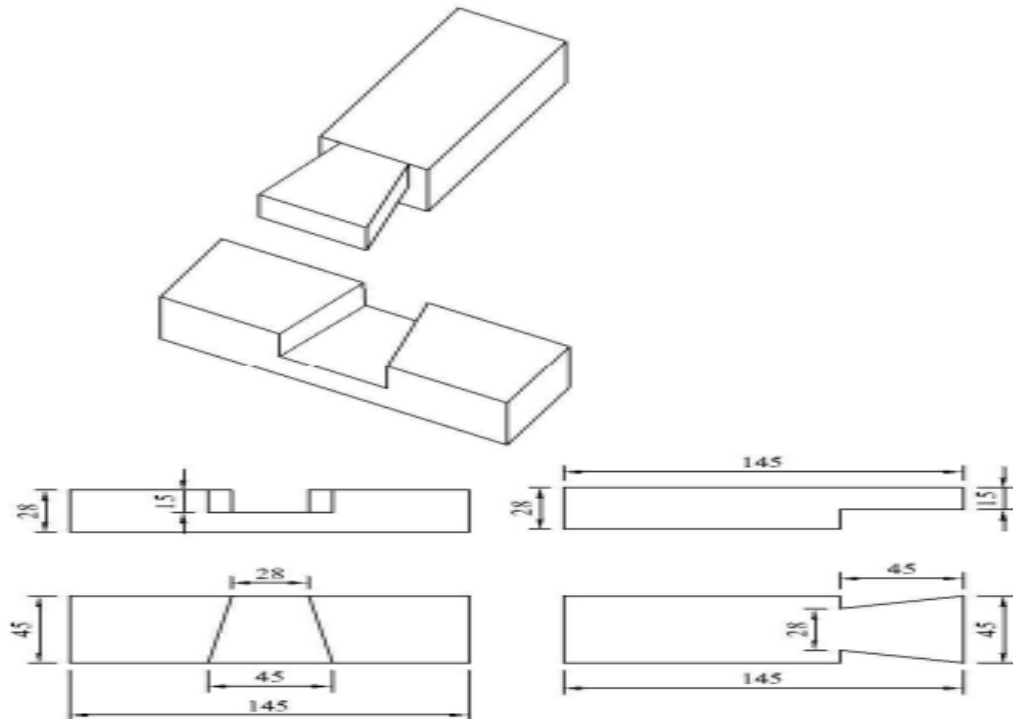

All dimensions are in mm

Exercise 4

Raw material: 150 mm X 50mm X 30mm thick Wood – 2Nos.

All dimensions are in mm

Exercise 5

Raw material: 150 mm X 50mm X 30mm thick Wood –2 Nos.

All dimensions are in mm

GE028L - BASICS OF INDUSTRIES & WORKSHOP PRACTICAL - 24Hrs.

(Tutorial – 6 Hrs. Practice – 18 Hrs.)

Objective:
- At the end of this course, the students will able to
- Identify, select and use various wires and colour codes practiced in the industry.
- Adopt safety practices while working with electric power supply.
- Able to know about the basic tools and measuring equipment.
- Understand the importance of earthing.
- Identify and make use of different electrical fittings and accessories.
- Read and understand circuit diagram and symbols.
- Practice simple wiring based on the circuit.
- Ability to use multimeter for measurements.
- Identify, select and use various plumbing tools and components
- To install pipes and accessories.
- To repair or replace components In case of water leakages.
- To make use of PVC pipes, pipe fittings and accessories.
- To know about different plumbing layouts and pipe joints.
- Pipe threading using standard die sets.

Skills:
- Ability to read circuit diagram.
- Ability to identify and select proper wires and tools.
- Ability to follow safety procedures during work.
- Ability to complete connections as per circuit in allotted time.
- Ability to check the connections and measure the voltage.
- Ability to read layout diagram.
- Ability to identify and select proper pipes, accessories and tools.
- Ability to follow safety procedures during work.
- Ability to complete connections as per layout in allotted time.
- Ability to check the leakages in connections.
- Ability to acquire hands-on experience

SYLLABUS:

Electricity - Ohm's Law - current – voltage - resistor – capacitor – inductor - Wiring materials – Conducting materials - Insulating materials - Semiconductor materials - Types of switches – Types of holders – wiring accessories and tools – types of casings – MCB – types of wiring - Wiring colour codes. Distribution Board – Types of wiring circuit - Electrical hazard - First Aid for Electrical Emergencies, Rescue techniques. Lux: Definition – Use. Earthing: different methods – Importance – how to Improve of earth resistance - Earth Leakage circuit breaker (ELCB) - BIS provision.

Plumbing: Introduction- important equipment, tools and accessories for installation and service in piping systems- plumbing fixtures. Pipes: types ofmaterials - Pipe fittings - Power tools. Marking and measuring tools

Note: Students should draw the circuit diagram / block diagram and collect the components according to their requirement. The connections should be done by the student in a board and should be verified. Suitable safety precautions should be made accordingly.

Exercise 6:

Draw the circuit and connect the LED bulb, Tube light and one plug point socket with individual switch control in a board. Measure the current and voltage for various loads.

Exercise 7:

Draw the circuit and connect two lamps in series and parallel with switch control in a board. Measure the current and voltage.

Exercise 8:

Draw the circuit and connect stair case wiring for a LED bulb using two-way switches In a board.

Exercise 9:

Draw a block diagram and install a sink / wash basin with tap using PVC pipe and accessories such as gate valve, bend / elbow, tee, coupling, water meteretc.with draining system.

Exercise 10:

Draw a block diagram and provide the tap connection with water meter and gate valve from overhead tank and rectify the leakages in tap and pipeline. Also measure the flow through the water meter.

Internal Mark Allocation

Assignment (Theory portion) *	- 20
Practical (Observation (5) and Record work (5))	- 20
Attendance	- 20
Total	**- 60**

Note: * Three assignments should be submitted. The same must be evaluated and converted to 10 marks.

Guidelines for assignment:
    First assignment – Unit I & II
    Second assignment – Unit III & IV
    Third assignment – All Units
Each assignment should have five two marks questions and two five marks questions.

BOARD EXAMINATION

Note :

1. The students should be taught theory portion and proper training in all the exercises. All the portions should be completed before examinations.

2. The students should maintain theory assignment, observation note book / manual and record notebook. The assignment and record note book should be submitted during the Board Practical Examinations.

3. The question paper consists of theory and practical portions. All students should write the answers for theory questions (45 Marks) and any ONE exercise (50 Marks) should be completed for board examinations.

4. All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do the examination for 3Hrs.

5. For theory question and answer: 45 Marks Ten questions will be asked for 2 marks each. Two questions from each unit. (10 X 2 = 20). Five questions will be asked for 5 marks each. One question from each unit. (5 X 5 = 25)

6. Required instruments / equipments / tools should be available for the batch strength as prescribed for practice and examination.

7. The external examiner should verify the availability of the equipments / instruments for the batch strength before the commencement of Practical Examination

<u>DETAILED ALLOCATION OF MARKS</u>

	Description				Marks
A	Theory Question and Answer (5 X 9 = 45 Marks)				45
B	BASICS OF INDUSTRIES & WORKSHOP PRACTICAL				50
	Marking, Cutting / Planning. Tools list	15	Circuit diagram / Block Diagram. Tools list	15	
	Filing / Chiselling, Dimensions	25	Connection, Checking	25	
	Finish	10	Finish	10	
C	Viva voce				5
	TOTAL				**100**

TOOLS REQUIRED

- Bench Vice - Fitted in the work bench   15 Nos.
- Carpentry Vice - Fitted in the work bench   10 Nos.
- Drilling machine (Separate in the First Year)   2 Nos.
- Wiring board with stand   10 Nos.
- Plumbing board with stand   10 Nos.
- File flat 150 mm rough   10 Nos.
- Fie flat 150 mm smooth   10 nos.
- File flat 300mm rough / smooth   5 Nos. each
- File round 150mm rough / smooth   5 Nos. each
- File triangular 150mm rough / smooth   10 Nos. each
- File half round 150 mm rough / smooth   10 Nos.
- Steel rule 300 mm   30 Nos.
- Vernier caliper   10 Nos.
- Vernier height gauge   3 Nos.
- Try square 200 mm   20 Nos.
- Scriber   10 Nos.
- Marking Gauges   10 Nos.
- Mortise gauge   5 Nos.
- Divider   10 Nos.
- Caliper Inside and Outside   10 Nos. each
- Spring Caliper   10 Nos. each

- Carpenters folding rule — 10 Nos.
- Saws — 5 Nos.
- Tenon saw — 5 Nos.
- Bow saw — 5 Nos. K
- eyhole saw — 5 Nos.
- Firmer chisel — 10 Nos.
- Beveled chisel — 10 Nos.
- Mortise chisel — 10 Nos.
- Jack plane — 10 nos.
- Screw Driver 100 mm — 10 Nos.
- Cutting Pliers insulated — 10 Nos.
- Knife Electrician D.B. — 10 Nos.
- Hammer Ball peen. 0.25 Kg — 10 Nos.
- Plumb bob 115 grams — 5 Nos.
- Neon tester pencil bit type 500 volt — 10 Nos.
- Spanner set DE Set of 6 from 6x7 to 16x7 — 5 Nos.
- Spanner set Ring Set of 6 from 6x7 to 16x7 — 5 Nos.
- Pliers flat nose insulated 150mm — 5 Nos.
- Pliers round nose insulated 200mm — 3 Nos.
- Pliers long nose insulated 200mm — 3 Nos.
- Screw driver heavy duty 200mm — 3 Nos.
- Screw driver heavy duty 300 mm — 3 Nos.
- Screw driver set 100-300 mm — 5 Nos.
- Soldering iron 60 w/230 v — 5 Nos.
- Centre punch 100mm — 10 Nos.
- Wooden mallet 1 kg — 10 Nos.
- Firmer chisel 1" — 10 Nos.
- Firmer chisel ½" — 10 Nos.
- Hammer Ball Peen 0.50 kg. — 10 Nos.
- Hammer cross Peen 0.50 kg. — 5 Nos.
- Adjustable spanner 300mm — 3 Nos.
- Allen keys Set 5 to 11 2 set Spirit level 300mm — 3 No.
- Rubber gloves 5000volts — 10 pairs
- Multi meter AC/DC — 5 Nos.
- Water meter — 2 Nos.
- Electrical hand power drilling machine 12mm — 1 No.
- Megger (Insulation tester) 500 volts — 1 Nos.
- Pipe cutting machine — 2 Nos.
- Pipe bending machine — 2 Nos.
- Rubber matting 2meter x 1meter x 9mm — 2 nos.
- Fire extinguishers Dry chemical 5 Kg — 4 Nos.
- Consumables — Required quantity
- Additional tools and instruments — Required quantity
(To complete the exercises)

PONDICHERRY UNIVERSITY
DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

<u>CURRICULUM OUTLINE</u>
<u>DIPLOMAIN MECHANICAL ENGINEERING</u>

(To be implemented for the students admitted from the year 2024 – 2025 onwards)

Course Name	:	**Diploma in Mechanical Engineering**
Subject Code	:	**ME301T**
Semester	:	**III**
Subject Title	:	**Strength of Materials**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Strength of Materials	**Hours / Week**	**Hours / Semester**	**Marks**				**Duration**
			Internal Assessment	**Board Examinations**	**Total**		
	5	**80**	**40**	**100***	**100**		**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Engineering Materials	15
II	Deformation of Metals	15
III	Geometrical Properties of Sections and Thin Shells	15
IV	Theory of Torsion and Springs	14
V	SF and BM Diagrams of Beams and Theory of Bending	14
Test and Model Exam		07
Total		80

RATIONALE:

Day by day, engineering and technology experience tremendous growth. Design plays a major role in developing engineering and technology. Strength of material is backbone for design. The strength of material deals generally with the behavior of objects, when they are subject to actions of forces. Evaluations derived from these basic fields provide the tools for investigation of mechanical structure.

OBJECTIVES

- Acquire knowledge about materials properties.
- Calculate the deformation of materials, which are subjected to axial load and shear.
- Determine the moment of Inertia of various sections used in industries.
- Estimate the stresses induced in thin shells.
- Draw the shear force and bending moment diagram of the beam for different load

ME301T - STRENGTH OF MATERIALS
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Time
I	**ENGINEERING MATERIALS** **Chapter: 1.1: Engineering materials:** Classification - definition of Mechanical properties - ferrous metals - cast iron - uses - advantages - types of cast iron - properties and applications - effect of impurities on cast iron. steel - classification - alloying elements - purpose of alloying - effect of alloying elements on steel - uses of steels - properties of mild steel - defects in steel - applications - properties of hard steel – market forms of steels – nonferrous metals - properties and uses. **Chapter: 1.2: Mechanical testing of materials:** Compression test - bend test - hardness test - Brinell hardness test, Vickers hardness test, Rockwell hardness test - impact test - fatigue test - creep test. Tensile test of mild steel in UTM - stress strain diagram -limit of proportionality - elastic limit - yield stress - breaking stress - ultimate stress - percentage of an elongation and percentage reduction in area - problems. **Chapter: 1.3: Friction** Introduction - definition - force of friction - limiting friction - static friction - dynamic friction - angle of friction - coefficient of friction - laws of static and dynamic friction. Description only.	15
II	**DEFORMATION OF METALS** **Chapter: 2.1: Simple stresses and strains** Definition - load, stress and strain - classification of force systems: tensile, compressive and shear force systems. Hooke's law – definition Young's modulus - working stress, factor of safety, load factor, shear stress and shear strain - modulus of rigidity. Linear strain – deformation due to tension and compressive forces - simple problems in tension, compression and shear forces. **Chapter: 2.2: Elastic constants** Definition - lateral strain – poison's ratio - volumetric strain - bulk modulus - volumetric strain of rectangular and circular bars – problems connecting linear, lateral and volumetric deformations - elastic constants and their relationship - problems on elastic constants. Composite bar - definition - problems in composite bars subjected to tension and compression. Temperature stresses and strains - simple problems. **Chapter: 2.3 Strain Energy** Definition – proof resilience – modulus of resilience – the expression for strain energy stored in a bar due to axial load – instantaneous stresses due to gradual, sudden, impact and shock loads – problems computing instantaneous stress and deformation in gradual, sudden, impact and shock loadings.	15
III	**GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS** **Chapter: 3.1: Properties of sections** Definition – center of gravity and centroid - position of centroids of plane geometrical figures such as rectangle, triangle, circle and trapezium problems to	15

	determine the centroid of angle, channel, T and I sections only – Definition - centroidal axis - Axis of symmetry. Moment of Inertia - parallel axis theorem and perpendicular axis theorem (statement only) Moment of Inertia of lamina of rectangle, circle, triangle, I and channel sections – Definition Polar moment of Inertia - radius of gyration - Problems computing moment of inertia and radius of gyration for angle, T, Channel and I sections. **Chapter: 3.2: Thin Shells** Definition – Thin and thick cylindrical shell shell subjected to internal pressure stress causes in a thin cylindrical shell subjected to internal pressure simple problems – subjected to internal pressure induced in a thin spherical shell subjected to internal pressure problems – change in diameter and volume of a thin spherical shell due to internal pressure – problems.	
IV	**THEORY OF TORSION AND SPRINGS** **Chapter: 4.1: Theory of Torsion** Assumptions – torsion equation $\dfrac{T}{J} = \dfrac{f_s}{R} = \dfrac{C\theta}{l}$ strength of solids and hollow shafts – power transmitted Definition – Polar modulus - Torsional rigidity – strength and stiffness of shafts – comparison of hollow and solid shafts in weight and strength considerations - Advantages of hollow shafts over solid shafts – Problems. **Chapter: 4.2: Springs** Types of springs – Difference between open and closely coiled helical springs coiled helical spring subjected to an axial load shear stress, deflection, stiffness and resilience of closed coiled helical springs	14
V	**SF AND BM DIAGRAMS OF BEAMS AND THEORY OF BENDING** **Chapter: 5.1: SF and BM diagrams** Classification of beams – Definition – shear force and bending movement – sign conventions for shear force and bending moment – types of loadings - Relationship between load, force and bending moment at a section – shear force diagram and bending moment diagram of cantilever and simply supported beam subjected to point load and uniformly distributed load (UDL) – Determination of Maximum bending moment in cantilever beam and simply supported beam when they are subjected to point load and uniformly distributed load. **Chapter: 5.2: Theory of bending** Theory of simple bending – Assumptions – Neutral axis – bending stress distribution – moment of resistance – bending equation – M/I=f/y=E/R – Definition – section modulus - rectangular and circular sections – strength of beam – simple problems involving flexural formula for cantilever and simply supported beam.	14

Reference Books:
1. Strength of Materials, R. S. Khurmi, S.Chand & Co., Ram Nagar, New Delhi.
2. Strength of Materials, S. Ramamrutham, 15th Edition 2004, DhanpatRai Pub. Co., New Delhi.
3. Strength of Materials, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 3 rd Edition, 2010.
4. Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2008, ISBN 9780070668959,
5. Strength of Materials, B K Sarkar, I Edition, 2003Tata Mcgraw hill, New Delhi.
6. Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 2 nd Edition, 2007.

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Course Name	:	Diploma in Mechanical Engineering
Subject Code	:	ME302T
Semester	:	III
Subject Title	:	Manufacturing Technology - I

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Manufacturing Technology - I	**Hours / Week**	**Hours / Semester**	**Marks**				**Duration**
			Internal Assessment	**Board Examinations**	**Total**		
	5	**80**	**40**	**100***	**100**		**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Casting Processes	15
II	Joining Processes	15
III	Bulk Deformation Processes and Heat Treatment	15
IV	Manufacturing of Plastic Components and Powder Metallurgy	15
V	Centre Lathe and Special Purpose Lathe	13
	Test and Model Exam	07
	Total	80

RATIONALE:

Manufacturing, the major and the most important aspect in industries needs utmost care and attention. Knowledge about various processes and allied areas will be of great use to the personnel involved in production. This will provide the students an opportunity to skill themselves for the industrial scenario.

OBJECTIVES:

- Acquire Knowledge about types of pattern, casting, and moulding.
- Describe the various casting processes.
- Knowledge about various welding process and its working principle.
- Appreciate the safety practices used in welding.
- Acquire knowledge about various forming technologies.
- Knowledge about the lathe and its working parts.
- Describe the functioning of semi-automatic lathes.

ME302T - MANUFACTURING TECHNOLOGY - I
DETAILED SYLLABUS

Unit	Name of the Topics	Time
I	**CASTING PROCESSES** **Chapter: 1.1: Patterns** Definition – pattern materials – factors for selecting pattern materials – Types of Pattern - solid piece, split patterns, loose piece, match plate, sweep, skeleton, segmental, shell – pattern allowances – core prints. **Chapter: 1.2: Moulding** Definition – moulding boxes, moulding and – ingredients – silica – clay – moisture and miscellaneous materials – properties of moulding sand – sand additives – moulding sand preparation - moulding tools – mixing – tempering and conditioning – types of moulding – green sand – dry sand – machine moulding –Top and bottom squeezer machines – Jolting machines – sand slinger- core – CO_2 core making – types of core – core boxes. **Chapter: 1.3: Casting** Definition – sand casting using green sand and dry sand – gravity die casting – pressure die casting – hot and cold chamber processes – centrifugal casting – continuous casting – chilled casting – malleable casting – melting of cast iron – cupola furnace – melting of nonferrous metals – crucible furnace melting of steel - arc furnaces – induction furnaces – instrument for measuring temperature – optical pyrometer – thermo electric pyrometer – cleaning of casting – tumbling, trimming, sand and shot blasting – defects in casting – causes and remedies – safety practices in foundry.	15
II	**JOINING PROCESSES** **Chapter: 2.1: Arc Welding** Definition – arc welding equipment – arc welding methods – carbon arc, metal arc, Metal Inert gas (MIG), Tungsten inert gas (TIG), Atomic hydrogen, Plasma arc, Submerged arc and Electro slag welding. **Chapter: 2.2: Gas welding** Definition Gas Welding Equipment– Oxy and acetylene welding - Three types of flame– resistance welding – classification of resistance welding – butt – spot – seam – projection welding – welding related processes – oxy and acetylene cutting – arc cutting – hard facing bronze welding – soldering and brazing special welding processes – cast iron welding – thermit welding – solid slate welding, ultrasonic, diffusion and explosive welding – explosive cladding – modern welding, electron beam and laser beam welding – types of welded joints – merits and demerits of welded joints – inspection and testing of welded joints – destructive and nondestructive types of tests – magnetic particle test – radiographic and ultrasonic test defects in welding – causes and remedies – safety practices in welding .	15

III	**BULK DEFORMATION PROCESSES AND HEAT TREATMENT** **Chapter: 3.1: Forming** Hot working, cold working – advantages of hot working and cold working– hot working operations – rolling, forging, smith forging, drop forging, upset forging, press forging – roll forging Press working : Types of presses – Mechanical and Hydraulic presses – press tool and accessories – press working operations – bending operations – angle bending – curling – drawing – shearing operations – blanking, piercing, trimming – notching – lancing. **Chapter: 3.2: Heat treatment** Heat treatment processes – purpose – procedures – applications of various heat treatment processes – Iron – carbon equilibrium diagram – full annealing – process annealing stress relief annealing - spherodising annealing – isothermal annealing – normalizing – hardening – tempering – quenching medium – different types and their relative merits – case hardening – pack carburizing – cyaniding – nitriding – induction hardening and flame hardening.	15
IV	**MANUFACTURING OF PLASTIC COMPONENTS AND POWDER METALLURGY** **Chapter: 4.1: Plastic Components** Types of plastics-Engineering plastics – thermosets – composite - structural foam, elastomers - polymer alloys and liquid crystal polymers. **Chapter: 4.2: Processing of Plastics** Extrusion-general features of single screw extrusion - twin screw extruders and types- Injection moulding types : Plunger type.- Reciprocating screw injection - details of injection mould - structural foam injection mould - sandwich moulding - gas injection moulding – injection moulding of thermosetting materials calendaring and rotational moulding. Design consideration for plastic components. **Chapter: 4.3: Powder Metallurgy** Methods of manufacturing metal powders – atomization, reduction and electrolysis deposition – compacting – sintering – sizing – infiltration – mechanical properties of parts made by powder metallurgy – design rules for the power metallurgy process.	15
V	**CENTRE LATHE AND SPECIAL PURPOSE LATHES** **Chapter: 5.1: Centre Lathe** Centre lathe: specifications – simple sketch with principal parts. Head stock: back geared type – all geared type - description only. Working principle of tumbler gear mechanism, quick change gear box, apron mechanism, carriage cross slide. Feed mechanism: automatic feed, longitudinal feed and cross feed. Construction and working of tail stock. work holding device: face plate – three jaw chuck – four jaw chuck – catch plate and carrier – center. Operations: straight turning – step turning - taper turning – knurling-Thread cutting - Facing – Boring – chamfering. Cutting speed – feed - depth of cut. **Chapter: 5.2: Semi-Automatic Lathes** Types of semi-automatic lathes – capstan and turret lathes – difference between turret and capstan. **Chapter: 5.3: Automatic Lathes** Automatic lathe – Construction and working principle of single spindle automatic lathe – automatic screw cutting machines – multi spindle automatic lathes.	13

Reference Books:

1. Elements of workshop Technology Volume I & II – Hajra Chowdry & Bhattacharaya - IIth Edition - Media Promoters & Publishers Pvt. Ltd., Seewai Building `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2. Introduction of basic manufacturing processes and workshop technology – Rajendersingh – New age International (P) Ltd. Publishers, 4835/24, Ansari Road, Daryaganj, New Delhi – 110002.
3. Manufacturing process – Begeman - 5th Edition -McGraw Hill, New Delhi 1981.
4. Workshop Technology- WAJ Chapman - Volume I, II, & III – Vima Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
5. Workshop Technology – Raghuwanshi - Khanna Publishers. Jain & Gupta,
6. Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi 110 006 – 2006.
7. Production Technology - P. C. SHARMA - Edn. X - S.Chand & Co. Ltd., Ram Nagar, New Delhi 110 055 – 2006.
8. Production Technology – HMT - Edn. 18 - published by Tata McGraw Hill publishing Co. Ltd., 7 West Patel nagar, New Delhi 110 008. – 2001.

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Course Name	:	Diploma in Mechanical Engineering
Subject Code	:	ME303T
Semester	:	III
Subject Title	:	Measurements and Metrology

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Manufacturing Technology - I	Hours / Week	Hours / Semester	Marks		Total	Duration
			Internal Assessment	Board Examinations		
	5	80	40	100*	100	3Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Basic Concepts of Measurements	15
II	Linear and Angular Measurements	15
III	Form Measurement	15
IV	Advances in Metrology	15
V	Measurement of Mechanical Parameters	13
	Test and Model Exam	07
	Total	80

RATIONALE:

Measurements and metrology are the basic and prominent tools in all the industries in the present scenario. The students should be trained not only in manufacturing also they should have knowledge about the various measuring instruments which is used in industries. This will provide the students an opportunity to skill themselves for how to handle the various metrological equipment available to measure the dimensions of the components.

OBJECTIVES

- Study about the basic concepts of measurements.
- Acquire knowledge about precision and accuracy.
- Describe about the various linear and angular measurements.
- Acquire knowledge about the measurement of screw threads and gears.
- Study about the laser metrology and computer in metrology.
- Describe the measurement of mechanical parameters force, power and flow.

ME303T - MEASUREMENTS AND METROLOGY
DETAILED SYLLABUS

Contents Theory:

Unit	Name of the Topics	Time
I	**BASIC CONCEPTS OF MEASUREMENTS** **Chapter: 1.1: Introduction** Basic units - system concepts used in measuring technology - measuring instruments - length, angles and surface - scope of Metrology - standardization - international standardization, the bureau of Indian standards - legal Metrology - definition - applications - important elements of measurements - methods of measurements - needs for inspection - need for measurement - important terminology. **Chapter: 1.2: Precision and accuracy** Precision - definition - accuracy - definition - difference between precision and accuracy - factors affecting the accuracy of the measuring system - general rules for accurate measurements - precautions for use of instruments so as to avoid in accuracy in measurements - reliability - definition - error - definition - sources of errors - classification of error - compare systematic error and random error - selection of measuring instruments - symbols for metallurgical terms (ASME and ISO).	15
II	**LINEAR AND ANGULAR MEASUREMENTS** **Chapter: 2.1: Linear measurements** Classification of linear measurement instrument - construction and the principles only - Steel rule - callipers - outside calliper, inside calliper, Jenny caliper - combination set - feeler gauge - pitch screw gauge - Vernier caliper - digital caliper - Vernier height gauge micrometer - inside micrometer - thread micrometer - optical micrometer - light wave micrometer - possible sources of errors in micrometers - slip gauges - requirements - Indian standard - care and use. **Chapter: 2.2: Angular measurements** Introduction - vernier bevel protractor - universal bevel protractor - optical bevel protractor. Sine bar - types - uses and limitations - working principle of clinometer, autocollimator, angle dekkor. Comparators - uses - application - classification of comparator - mechanical comparator, optical comparator, electrical comparator, pneumatic comparator - principles - advantages and disadvantages - compare comparator with measuring instruments - compare electrical and mechanical comparators.	15
III	**FORM MEASUREMENT** **Chapter: 3.1: Measurement of screw threads** Screw thread terminology - error in thread - measurement of various elements of thread (description only) - thread gauges - classification - plug screw gauges, ring screw gauges, caliper gauges - adjustable thread gauge - gauging of taps - function of various types of gauges - floating carriage micrometer. **Chapter: 3.2: Measurement of gears** Introduction - types of gear - gear terminology - gear errors – spur gear measurement - run out, tooth measurement, profile measurement, lead checking , backlash checking,	15

	tooth thickness measurement - vernier gear tooth caliper - David brown tangent comparator - constant chord method - measurement of concentricity, alignment checking - Parkinson gear tester - Rolling gear testing machine - radius measurement - radius of circle - surface finish measurement - classification of geometrical irregularities - elements of surface texture - methods of measuring surface finish - measuring surface roughness - tracer type profilogram - double microscope.	
IV	**ADVANCES IN METROLOGY** **Chapter: 4.1: Laser Metrology** Basic concepts of lasers - types of lasers - uses, advantages and applications - laser telemetric system - laser and LED based distance measuring instruments - scanning laser gauge - photodiode array imaging - diffraction pattern technique - laser triangulation sensors - two frequency laser interferometer - gauging wire diameter from the diffraction pattern formed in laser - interferometry - use of laser in interferometry - interferometer - standard interferometer, single beam interferometer, AC interferometer, Michelson interferometer, dual frequency laser interferometer - Twyman green interferometer - applications. **Chapter: 4.2: Computer in Metrology** Coordinating measuring machine - introduction - types of measuring machines - types of CMM - futures of CMM - causes of errors in CMM - 3 co-ordinate measuring machine - performance of CMM - applications - advantages disadvantages - computer controlled coordinating measuring machine - mechanical system of computer controlled CMMs - trigger type probe system, measuring type prop system, features of CNC and CMM - features of CMM software - factors affecting CMM - digital devices - Computer based inspection - Computer aided inspection using robots.	15
V	**MEASUREMENT OF MECHANICAL PARAMETERS** **Chapter: 5.1: Force** Measurement of force - Direct methods - equal arm balance, unequal arm balance, multiple lever system, pendulum scale - indirect methods - electromagnetic balance - load cells - hydraulic load cell, pneumatic load cell, strain gauge load cell, shear type load cell, electronic weighing system. Torque measurement - torque measurement using strain gauge - laser optical torque measurement - stroboscope for torque measurement. **Chapter: 5.2: Measurement of power** Mechanical dynamometer - DC dynamometer - inductor dynamometer - hydraulic dynamometer - diaphragm pressure sensor - deform cage with LVDT - diaphragm gauge with strain gauges - piezoelectric sensors. **Chapter: 5.3: Measurement of flow** Types of flow metres - rotameter, electromagnetic flow metre, hot wire anemometer, ultrasonic flow metre, laser Doppler anemometer (LDA) - reference beam mode, interference French mode.	13

Reference Books:
1. Mechanical Measurements and Instrumentation, Rajput R K, S.K.Kataria and Sons.
2. Mechanical Measurement and Control, Jalgaonkar R.V, Everest Publishing House.
3. Mechanical and Industrial Measurements, Jain R K, Khanna Publications.
4. Instrumentation Devices and Systems, Narang C S, Tata McGraw Hill Publications.
5. Instrumentation, Measurement and Analysis, Nakra B.C, Chaudhary K.K, Tata McGraw Hill Publications.

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Course Name	:	**Diploma in Mechanical Engineering**
Subject Code	:	**ME304T**
Semester	:	**III**
Subject Title	:	**Thermal Engineering – I**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			Duration
Thermal Engineering – I			**Internal Assessment**	**Board Examinations**	**Total**	
	5	**80**	**40**	**100***	**100**	**3 Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Basics of Thermodynamics and Thermodynamic processes of Perfect Gases	15
II	Thermodynamic Air Cycles and Heat Transfer	15
III	Internal Combustion Engines	15
IV	Fuels & Combustion of Fuels and Performance of IC Engines	15
V	Refrigeration and Air Conditioning	13
Test and Model Exam		07
Total		80

RATIONALE:

The growth of industries in the areas of Automobile and thermal power generation is the contemporary need of the present day. For these industries Knowledge on the concept of Thermodynamics, Thermodynamic Processes, Steady flow energy equation and study of fuels, IC Engines and performance of IC Engines are vital.

OBJECTIVES:

- Explain the basics of systems and laws of thermodynamic and
- Thermodynamic processes.
- Explain different type of fuels and their combustion phenomenon.
- Explain the types, functions and the performance tests of IC engines.
- Explain vapour compression refrigeration system.
- Explain vapour absorption refrigeration system.
- Compare the properties and applications of various refrigerants.
- Describe the equipment used for air conditioning.

ME304T - THERMAL ENGINEERING - I
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**BASICS OF THERMODYNAMICS AND THERMODYNAMIC PROCESSES OF PERFECT GASES** Introduction – definitions and units of mass, weight, volume, density, work – power- energy – types- specific weight, specific gravity and specific volume – pressure – units of pressure –temperature -absolute temperature – S.T.P and N.T.P conditions – heat –specific heat capacity at constant volume and at constant pressure – law of conservation of energy – thermodynamic system– types –thermodynamic equilibrium - properties of systems – intensive and extensive properties –State of System- process – cycle – point and path functions – zeroth, first and second laws of thermodynamics. Description of basic concepts only. Perfect gases – laws of perfect gases – Boyle's, Charles', Joule's, Regnault's and Avogadro's laws –General Gas Equation-characteristic gas equation – relation between specific heats and gas constant – universal gas constant – Thermodynamic Processes-Change in Internal Energy- enthalpy –change in enthalpy – entropy –change in entropy – general equations for change in entropy. Description only. Constant volume, constant pressure, isothermal, isentropic (reversible adiabatic) – Description and problems. Polytrophic (derivation only),hyperbolic (derivation only) – P-V and T-S diagrams, work done, change in internal energy, heat transfer, change in enthalpy, change in entropy for various processes - Free expansion and throttling processes.	15
II	**THERMODYNAMIC AIR CYCLES AND HEAT TRANSFER** Air cycles – air standard efficiency – reversible and irreversible processes – assumptions in deriving air standard efficiency – Carnot cycle – Otto cycle – Joule cycle – Diesel cycle – comparison of Otto cycle and Diesel cycle Comparison of ideal and actual p-V diagrams of Otto and Diesel cycles – problems . Modes of heat transfer – heat transfer by conduction – Fourier's Law-– heat transfer by convection –heat exchanger – Parallel flow and Counter flow– heat transfer by radiation – Description only. Steady flow system – control volume – steady flow energy equation – assumptions –Engineering applications of steady flow energy equation – non flow energy equation. Description only.	15
III	**INTERNAL COMBUSTION ENGINES** Internal combustion engines. Classifications of I.C Engines –components of I.C Engines and functions material and method of manufacturing - four stroke cycle petrol and diesel engines – two stroke cycle petrol and diesel engines - comparison of four stroke and two stroke engines – Comparison of petrol and diesel engines – valve timing diagram for four stroke petrol and diesel engines – port timing diagram for two stroke petrol and diesel engines. Layout of fuel supply system in petrol engines - A.C. mechanical fuel pump – simple	15

	carburetor – layout of fuel supply system in diesel engine- single acting fuel feed pump – CAV fuel injection pump – fuel injectors –types of nozzles -fuel filters. Ignition systems – battery coil ignition systems – magneto ignition system - MPFI and CRDI System. Governing of I.C. engines - quantity and quality governing – cooling systems – air cooling – water cooling. Lubrication system – properties of lubricants –types of lubrication systems – high pressure Lubrication system - oil pump (Gear & Rotor Pumps) and oil filters.	
IV	**FUELS &COMBUSTION OF FUELS AND PERFORMANCE OF I.C ENGINES** Classifications of fuels - merits and demerits – requirements of a good fuel – combustion equations – stoichiometric air required for complete combustion of fuels – excess air – products of combustion – analysis of exhaust gases - Exhaust gas analyzer - calorific value of fuels –higher and lower calorific values – Dulong's formula – determination of calorific value – Bomb and Junker's calorimeter. Description only. Testing - thermodynamic and commercial tests – indicated power –brake power – friction power – efficiencies of I.C. engines – indicated thermal ,brake thermal, mechanical and relative efficiencies – Specific fuel consumption – problems - Morse test – heat balance sheet –procedure and problems.	15
V	**REFRIGERATION AND AIR CONDITIONING** Refrigeration – refrigerators and heat pumps – types and applications of refrigeration Systems – refrigerating effect – unit of Refrigeration –C.O.P. – actual C.O.P. Air Refrigeration System – reversed Carnot cycle – C.O.P of refrigerator, heat pump & Heat Engines. Bell - coleman cycle – Vapour compression refrigeration system – vapour absorption system – Comparison- refrigerants – properties. Description only. Psychrometry - psychometric properties – dry air – moist air – water vapour – saturated air – dry bulb temperature – wet bulb temperature– wet bulb depression – dew point temperature – dew point63depression – humidity – specific and relative humidity – psychrometric chart – psychrometric processes – sensible heating and cooling - By-pass Factor - humidification – dehumidification –Mixing of Air Stream. Air conditioning – classification and applications of air conditioning system – room air conditioning – central air conditioning – comparison – comfort and industrial air conditioning – factors to be considered in air conditioning – loads encountered in air conditioning systems. Description only.	15

Reference Books:
1. Thermal Engg, R.K.Rajput, 8th Edition, Laxmi publications Pvt Ltd , New Delhi.
2. Applied Thermodynamics, P.K. Nag, 2nd Edition, TATA Mcgraw – Hill Publishing Company, New Delhi .
3. Thermal Engineering, R.S. Khurmi and J.K. Gupta, 18th Edition, S. Chand & Co,   New Delhi.
4. Thermal Engineering, P.L Ballaney , 24th Edition Khanna Publishers, New Delhi.
5. Thermal Engineering, B.K. Sarkar , 3rd Edition , Dhanpat Rai & Sons New Delhi .
6. Applied Thermodynamics, Domkundwar and C.P Kothandaraman, 2ndEdition Khanna publishers, New Delhi.

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Course Name	:	Diploma in Mechanical Engineering
Subject Code	:	ME305L
Semester	:	III
Subject Title	:	Machine Drawing and CAD Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Machine Drawing and CAD Practical	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	4	65	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

RATIONALE:

Mechanical Engineering Diploma Engineer is expected to possess a thorough understanding of drawing, which includes clear visualization and proficiency in reading and interpreting a wide variety of production drawing. Manufacturing of various parts start from the basic drawing of components. The assembly of components is also carried out from the drawing. So drawing is an important subject to be studied by the students to carry and complete the production and assembly process successfully.

OBJECTIVES:

- To learn the parts and assembly of the machine components.
- To appreciate the need for sectional view and types of sections.
- To draw sectional views.
- To practice manual drawing
- To use Computer Aided Drafting.
- To prepare geometrical model of various machine elements.
- To draw the different views of machine elements.
- To interpret the drawing in engineering field and illustrate three dimensional objects.

ME305L - MACHINE DRAWING AND CAD PRACTICAL
DETAILED SYLLABUS

Contents: Practical

PART–A: MANUAL DRAWING PRACTICE

Sectioning - sectional views – representation of sectional plane – hatching – inclination – spacing – hatching large areas – hatching adjacent parts - full section – half section – types of half sections – conventional representation of materials in section – Dimensioning. Detailed drawings of the machine parts are given to students to assemble and draw any two views of the machine elements in the Drawing Sheet with dimensions. Front View /Full Section / Half SectionFront Viewand Top View / Left Side View / Right Side View.

PART–B: COMPUTER AIDED DRAFTING (CAD)

CAD applications – Hardware requirement – Software requirement – CAD screen interface – menus – Toolbars – types of co-ordinate system – Creating 2D objects – Using draw commands – Creating text – Drawing with precision – Osnap options – drafting settings – drawing aids – Fill, Snap, Grid, Ortho lines – Function keys – Editing and modify commands – Object selection methods – Erasing object – Oops – Cancelling and undoing a command – Copy – Move – Array – Offset – Scale – Rotate – Mirror – Break – Trim – Extend – Explode. Divide – Measure – stretch – Lengthen – Changing properties – Color – line types – LT scale – Matching properties – Editing with grips – P edit – D dedit – M ledit - Basic dimensioning – Editing dimensions – Dimension styles – Dimension system variables. Machine drawing with CAD. Creation of blocks – W block – inserting a block – Block attributes – Hatching – Pattern types – Boundary hatch – working with layers – Controlling the drawing display – Blip mode – View group commands – Zoom, redraw, regen, 67 regenauto, pan, viewers – Real time zoom. Inquiry groups – calculating area – Distance – Time – Status of drawing – Using calculator. Plot Detailed drawings of the machine parts are given to students to assemble and create two views of the machine elements in the CAD package with dimensions. Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View.

EXERCISE:

Draw the Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View for the following given part drawing of the components after assemble in the drawing sheet and CAD package.
1.   Sleeve & Cotter joint
2.   Screw jack
3.   Plummer Block
4.   Simple Eccentric
5.   Machine Vice
6.   Protected type flanged coupling

Reference Books:
1.   A Textbook of Machine Drawing, Pritam Singh Gill, S.K.Kataria & Sons.
2.   Machine Drawing, N.D.Bhatt, V.M.Panchal, Charoter Publishing House.
3.   Introducing Autocad 2010 and Autocad LT 2010, George Omura, Wiley India Pvt. Ltd.
4.   A Textbook of Engineering Drawing, R.B.Gupta, Satya Prakasan, Technical India Publications.
5.   Engineering Drawing, D.N. Ghose, Dhanpat Rai &Sons, Delhi

Internal Mark Allocation

Note:

All the students should maintain the observation cum record note book / manual as per the regulation. The printout of the actual CAD output created by the student during practice should be pasted for every exercise in the observation cum record note work.

For every exercise, manual drawing sheet (Two views) should be submitted and evaluated for 50 Marks. (Front view – 30 Marks and Top view/Side view – 20 Marks). The average of the six exercises should be converted to 10 Marks.

Drawing Sheet (Six Exercise Average)	-	20 Mark
Observation and Record work	-	20 Marks
Attendance	-	20 Marks
Total	**-**	**60 Marks**

BOARD EXAMINATION

Note: All the exercises should be completed by Manual and CAD. All the exercise should be given for examination, the students are permitted to select by lot or the question paper from PONDICHERRY UNIVERSITY should be followed. Observation cum Record note book should be submitted during examination along with the drawing file. Part A and Part B should be completed for the examination.

PART A: Manual Drawing in the Drawing sheet

Draw the assemble Front View / Sectional Front View (Full Section / Half Section) for the given part drawing of the components in the drawing sheet.

PART B: Computer Aided Drafting in the CAD package

Create the assemble Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View for the given part drawing of the components in any one of the CAD package.

DETAILLED ALLOCATION OF MARKS

Manual Drawing in Drawing sheet	**: 30 marks**
Assemble Front view	: 30
Computer Aided Drafting	**: 60 marks**
Drafting	: 20
Assembly	: 20
Dimensioning	: 20
Viva-voce	**: 10 marks**
Total	**: 100 marks**

LIST OF EQUIPMENT

(To accommodate a batch of 30 students in Practice / Board Examinations)

1. Personal computer – 30 Nos.
2. Printer – 1 No.
3. Required Software's: CAD Package– Sufficient to the strength.

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Course Name : **Diploma in Mechanical Engineering**
Subject Code : **ME306L**
Semester : **III**
Subject Title : **Manufacturing Technology - I Practical**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Manufacturing Technology - I Practical	**Hours / Week**	**Hours / Semester**	**Marks**			**Duration**
			Internal Assessment	**Board Examinations**	**Total**	
	4	**65**	**60**	**100***	**100**	**3 Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

OBJECTIVES:
- Identify the parts of a center lathe
- Identify the work holding devices
- Set the tools for various operations
- Operate the lathe and Machine a component using lathe
- Identify the tools used in foundry.
- Identify the tools and equipment's used in welding
- Prepare sand moulds for different patterns.
- Perform welding operation to make different types of joints.
- Identify the different welding defects.
- Appropriate the safety practices used in welding

ME306L - MANUFACTURING TECHNOLOGY - I PRACTICAL
DETAILED SYLLABUS

Contents: Practical
Lathe: Study of Lathe parts and its fuctions – Operations - Plain Turning , Step Turning, Taper turning, Knurling, Thread cutting, Bushing, Ecentric Turning Foundry: Study of foundry - green sand – properties – patterns – Types - Solid Pattern - Stepped pulley, Bearing top, Gear wheel. Split Pattern - T Pipe, Bent Pipes, Dumbles - Loose Piece pattern – Dovetail – Core – Cores sand -cylindrical core making.

Welding Exercises
Arc welding principles and components - Arc Welding - Lap Joint - Butt Joint, T Joint, Corner joint. Gas welding equipment's – components - Gas welding - Lap Joint, Butt Joint, T Joint, Corner Joint. Gas cutting - Spot Welding.

Exercises
PART A – Lathe Exercises
Note: All Dimensions are in mm. All linear dimensions in ± 0.5mm tolerance. All cylindrical dimensions in ± 0.2mm tolerance. Estimate the cost of the job for following exercises for M.S. round rod with suitable raw material for the final size. Final job of the raw material should be retained for verification. (student wise or batch wise).
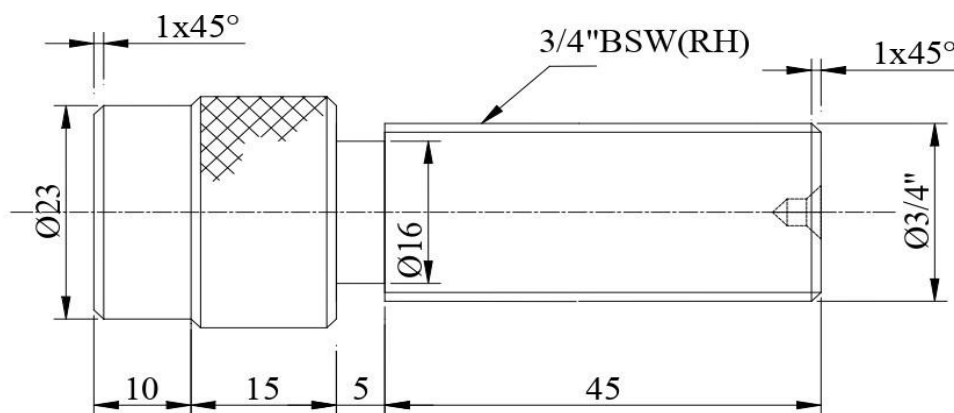
1. Prepare the specimen and make the Step turning & Taper turning as shown in figure using the Lathe.
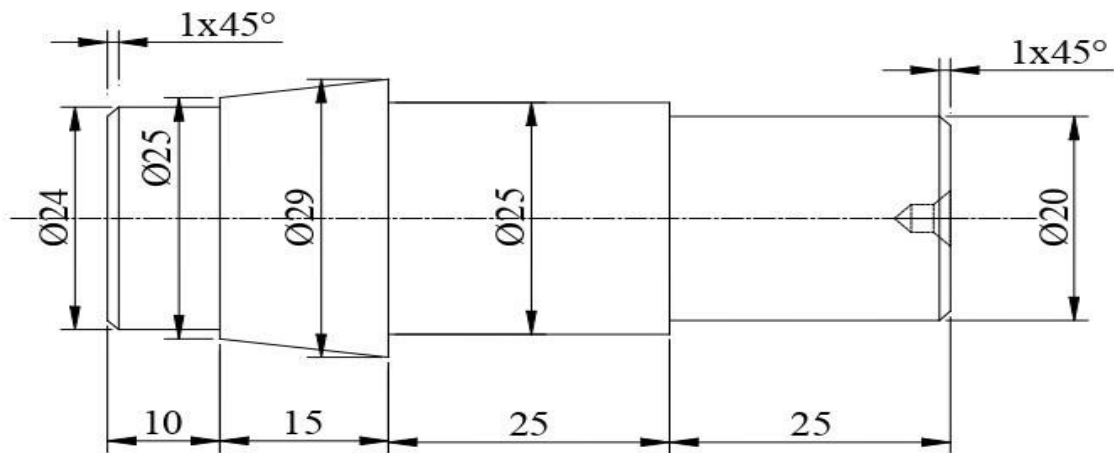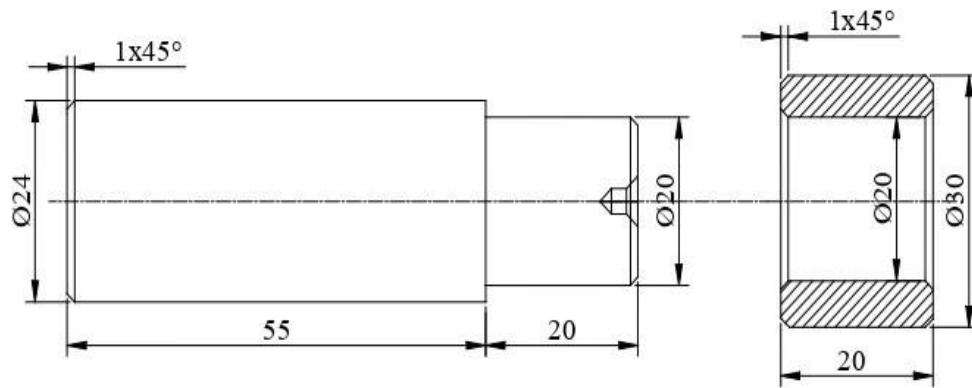

2. Prepare the specimen and make the Step turning & Knurling as shown in figure using the Lathe
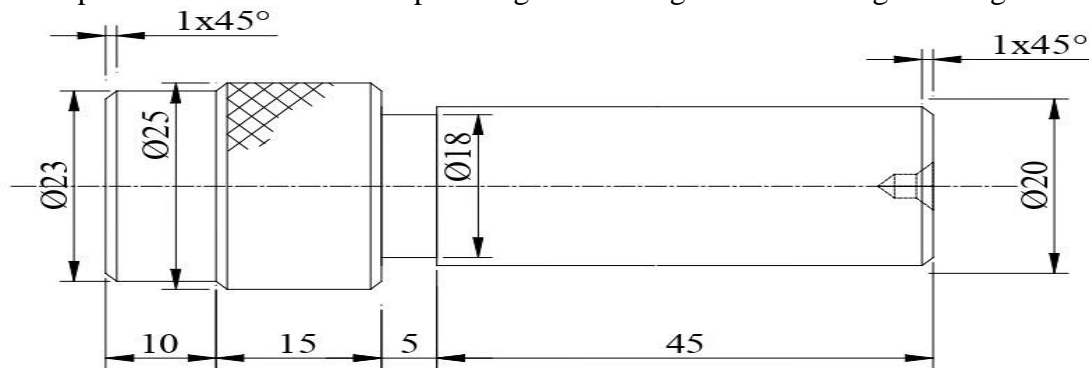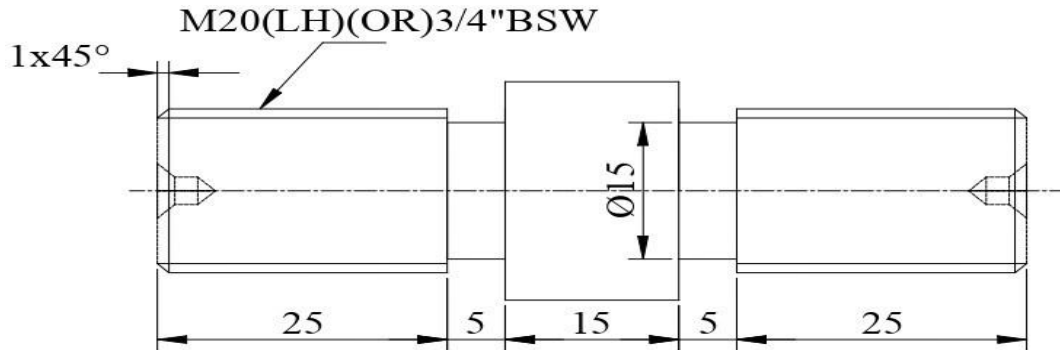

3. Prepare the specimen and make the Step turning & BSW Thread cutting as shown in figure using the Lathe.

4. Prepare the specimen and make the Shaft and Bush as shown in figure using the lathe.

5. Prepare the specimen and make the Step turning & BSW and Metric Thread cutting as shown in figure using the Lathe.

6. Prepare the specimen and make the Eccentric turning as shown in figure using the Lathe.
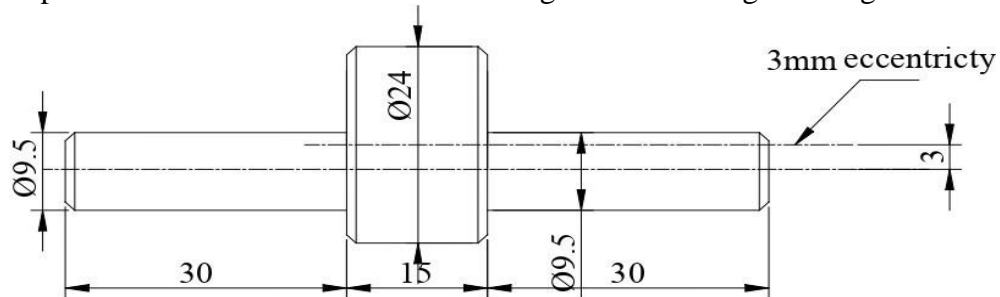
PART B – Exercises
1. Prepare the green sand moulding using any one Solid Pattern in the foundry.
2. Prepare the green sand moulding using any one Split Pattern in the foundry.
3. Prepare the green sand moulding using any one Loose Piece pattern in the foundry.
4. Prepare the specimen and make the Lap joint by the Arc Welding (Both side welded). (Raw material 25mm X 6mm MS flat)
5. Prepare the specimen and make the corner joint by the Gas Welding. (Raw material 25mm X 3mm MS sheet)
6. Prepare the specimen and make the joint by the Spot welding.

BOARD EXAMINATION

Note:

• All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART A and one exercise from PART B.

• All the exercises should be given in the question paper and students are allowed to select by a lot or Question paper issued from the PONDICHERRY UNIVERSITY should be followed.

• All regular students appearing for first attempt should submit record notebook for the examination.

• The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.

• The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Part-A	55marks
Procedure/Preparation	10
Machining/Dimensions	35
Finishing	10
Part-B	**40marks**
Procedure/Preparation	10
Machining/Dimensions	25
Finishing	5
Vivavoce	**05marks**
Total	**100Marks**

LIST OF EQUIPMENT
(To accommodate a batch of 30 students in Practice / Board Examinations)

1. Center Lathe 4 ½ 'Bed length – 10 No's
2. 4 Jaw / 3 Jaw Chucks – required numbers
3. Chuck key (10 mm x 10 mm size) – 10 No's
4. Box spanner – 1 No's
5. Cutting Tool H.S.S ¼ '' X ¼ '' X 4 '' long – 10 No's
6. Pitch gauge – 5 Nos
7. Vernier Caliper (0-25 and 25-50) – 5 Nos each
8. Micrometer, Inside and Outside(0-25 and 25-50) – 5 each
9. Vernier Height Gauge(300mm) – 1 no
10. Snap gauge – 1 set
11. Gear tooth Vernier – 1 No
12. Parallel Block – 2 Nos
13. Steel Rule (0-150) – 10 Nos.
14. Outside and Inside Calipers – 10 Nos. each
15. Thread gauge – 5 Nos.
16. Bevel Protractor – 1 No
17. Jenny Caliper – 5 Nos.
18. Dial Gauge with Magnetic Stand – 5 Nos.
19. Marking Gauge – 10 Nos.

20. Safety Glass	– 10 Nos.
21. Arc welding	– 2 No's with oil /air cooled
22. Gas welding unit (Oxygen and acetylene cylinder)	– 1 Set
23. Flux	– 500 g
24. Electrode 10 SWG	– 200 No's
25. Face shield	– 3 No's
26. Gas welding goggles	– 2 No's
27. Leather Glows 18''	– 4 Set
28. Flux chipping hammer	– 4 No's
29. Spot welding machine	– 1 No
30. Shovel	– 10 Nos
31. Rammer set	– 10 Nos
32. Slick	– 10 Nos
33. Strike-off bar	–10 Nos
34. Riddle	–10 Nos
35. Trowl	– 10 Nos
36. Lifter	– 10 Nos
37. Sprue pin	– 20 Nos
38. Brush	– 10 Nos
39. Vent rod	– 10 Nos
40. Draw spike	– 10 Nos
41. Gate cutter	– 10 Nos
42. Cope box	– 10 Nos
43. Drag box	– 10 Nos
44. Core box	– 10 Nos
45. Runner & riser	– 20 Nos
46. Moulding board	– 10 Nos
47. Patterns	– 5 Nos each

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Course Name   :   **Diploma in Mechanical Engineering**
Subject Code   :   **ME307L**
Semester   :   **III**
Subject Title   :   **Measurements and Metrology Practical**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Measurements and Metrology Practical	**Hours / Week**	**Hours / Semester**	**Marks**				**Duration**
			Internal Assessment	**Board Examinations**	**Total**		
	4	**65**	**60**	**100***	**100**		**3 Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

OBJECTIVES:
- Familiarize about measuring techniques of Metrology instruments.
- Select the range of measuring tools. Study of accuracy of instruments and calibration of instruments.
- Obtain accurate measurements.
- Determine the least count of measuring instruments.
- Acquire knowledge about linear measurement.
- Acquire knowledge about angular measurement.
- Acquire knowledge about geometric measurements.
- Study of Linear Measuring Instruments: Vernier Caliper, Micrometer, Inside Micrometer, Vernier Height gauge and Slip Gauge.
- Study of Angular Measuring Instruments – Universal Bevel Protractor, Sine Bar.
- Study of Geometric measurement - Gear tooth Vernier, Thread Vernier.

EXERCISES:
PART A:
1. Measure the dimensions of ground MS flat / cylindrical bush using VernierCaliper compare with Digital / Dial Vernier Caliper.
2. Measure the diameter of a wire using micrometer and compare the result with digital micrometer 3. Measure the thickness of ground MS plates using slip gauges
3. Measure the inside diameter of the bore of a bush cylindrical component using inside micrometer compare the result with digital micro meter.
4. Measure the height of gauge blocks or parallel bars using vernier height gauge.
5. Detect of cracks of the given two specimens using liquid penetrant test and magnetic particle test.
PART B:
1. Measure the angle of a V-block / Taper Shank of Drill / Dovetail using universal bevel protractor.
2. Measure the angle of the machined surface using sine bar with slip gauges.
3. Measure the geometrical dimensions of V-Thread using thread micrometer.
4. Measure the geometrical dimensions of spur gear.
5. Find out the measurement of given component and compare with a standard component using mechanical comparator and slip gauge.
6. Prepare a specimen to examine and find the grain structure using the Metallurgical Microscope.

BOARD EXAMINATION

Note:

• All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise from PART A and one exercise from PART B.

• All the exercises should be given in the question paper and students are allowed to select by a lot or Question paper issued from the Pondicherry University should be followed.

• All regular students appearing for first attempt should submit record notebook for the examination.

• The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination

• The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Part-A	45 marks
Procedure/Preparation	10
Observation/Dimensions	25
Finishing	10
Part-B	**45 marks**
Procedure/Preparation	10
Observation/Dimensions	25
Finishing	10
Viva-voce	**10marks**
Total	**100Marks**

LIST OF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

1. Vernier Caliper — 2 Nos.
2. Digital / Dial Vernier Caliper. — 2 Nos.
3. Outside micrometer — 2 Nos.
4. Inside Micrometer — 2 Nos.
5. Digital Micrometer — 2 Nos.
6. Slip gauges — 2 Nos.
7. Universal bevel protractor. — 2 Nos.
8. Sine bar — 2 Nos.
9. Digital inside micrometer — 2 Nos.
10. Surface plate — 2 Nos.
11. Vernier height gauge — 1No.
12. Thread Vernier — 1 No.
13. Thread micrometer — 1 No.
14. Gear tooth Vernier — 2 Nos.
15. Mechanical comparator — 2 Nos.
16. Dial indicator (0-10) — 2 Nos.
17. Abrasive grinder — 1 No.
18. Polishing Machine — 1 No.
19. Mounting machine — 1 No.
20. Metallurgical microscope — 2 Nos.
21. Magnetic yoke — 1 No.
22. Liquid penetrant test kit — 1 set.
23. Consumable — Sufficient quantity

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Course Name   : Diploma in Mechanical Engineering
Subject Code   : ME401T
Semester   : IV
Subject Title   : Fluid Mechanics and Fluid Power

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Fluid Mechanics and Fluid Power	**Hours / Week**	**Hours / Semester**	**Marks**			**Duration**
			Internal Assessment	**Board Examinations**	**Total**	
	5	80	40	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Properties of Fluids & Fluid Pressure	12
II	Fluid Flow, Flow Through Pipes & Impact of Jet	17
III	Hydraulic Turbines, Centrifugal Pumps & Reciprocating Pumps	16
IV	Hydraulic Systems	16
V	Pneumatic Systems	12
Test and Model Exam		7
Total		**80**

RATIONALE:

The purpose of this subject is to teach the students the fundamentals of engineering fluid mechanics in a very general manner so that they can understand the way that forces are produced and transmitted by fluids that are, first, essentially at rest and, second, in motion. This will allow them to apply the physical principles behind some of the most common applications of fluid mechanics in engineering.

OBJECTIVES:

• To study the basic fluid properties and types of flow;
• To understand the transmission of pressure in liquids and its application to hydraulics;
• To calculate hydrostatic forces on plane and curved submerged surfaces;
• To employ the concept of continuity of flow and use Bernoulli's equation to measure flow rate and velocity;
• To apply the momentum principle to liquids in jets and pipes.
• To understand the working of hydraulic machines like, turbines, pumps.
• To identify the various components of a Hydraulic & Pneumatic systems and select them for design of hydraulic and pneumatic circuits for Engineering applications.

ME401T - FLUID MECHANICS AND FLUID POWER
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**PROPERTIES OF FLUIDS & FLUID PRESSURE** **Chapter: 1.1: Properties of Fluids** Fluid – definition-classification. Properties – density, specific gravity, specific weight, specific volume, dynamic viscosity, kinematic viscosity, surface tension, capillarity, vapour pressure and compressibility –Problems **Chapter: 1.2: Fluid Pressure & Its Measurement** Fluid Pressure – Hydrostatic law - Pressure head, Pascal's Law – proof -applications - Hydraulic press- Hydraulic jack. Concepts of absolute, vacuum, gauge and atmospheric pressures. Pressure measurements – Simple U tube manometers and differential manometers and their types – Problems - Bourdon tube pressure gauge.Pressure sensor technologies - classification only. Total Pressure, Centre of pressure on immersed bodies (flat vertical., flat vertical) – Problems.	12
II	**FLUID FLOW, FLOW THROUGH PIPES & IMPACT OF JET** **Chapter: 2.1: Fluid Flow** Types of Fluid flow - Laminar, turbulent, steady, unsteady, uniform, non-uniform, rotational, irrotational. Continuity equation, Bernoulli's theorem - assumptions-derivation - applications and limitations -Problems. Venturimeter – Construction - working principle, coefficient of discharge -derivation for discharge. Orificemeter - Construction working principle, coefficient of discharge- derivation for discharge. Problems. Pitots Tube– Construction and working principle only. **Chapter: 2.2: Flow through Pipes** Laws of fluid friction for Laminar and turbulent flow- Darcy's equation andChezy's equation for frictional losses – Problems. Minor Losses -description. Hydraulic gradient line and Total energy line. Hydraulic Power transmission through pipes – problems. Chapter: 2.3: Impact of Jet Impact of jet on fixed vertical plate - Impact of jet on moving vertical flat plates in the direction of jet - Impact of jet on a series of moving plates or vanes - Problems on work done and efficiency.	17
III	**HYDRAULIC TURBINES, CENTRIFUGAL PUMPS &** **RECIPROCATING PUMPS** **Chapter: 3.1: Hydraulic Turbines** Classification of hydraulic turbines and their applications. Construction and working principle of Pelton wheel, Francis and Kaplan turbine. Draft tubes – types and construction, Concept of cavitation in turbines, Surge tank and its need. **Chapter: 3.2: Centrifugal Pumps** Construction - Principle of working. Types of casings and impellers. Concepts of multistage. Priming and its methods. Manometric head, work done, manometric, mechanical and overall efficiencies - problems	16

	Chapter: 3.3: Reciprocating Pumps Construction, working principle and applications of single and double acting reciprocating pumps. Discharge - Theoretical power required coefficient of discharge – Problems Concepts of slip – negative slip. Cavitation and separation. Use of air vessel. Indicator diagram with effect of acceleration head and friction head.	
IV	**HYDRAULIC SYSTEMS** **Chapter: 4.1: Introduction to Fluid power systems** Fluid power systems - general layout - components of hydraulic &Pneumatic systems. Practical applications of Fluid power systems. Comparison - Advantages and limitations. **Chapter: 4.2: Components of Hydraulic systems** Types, construction, working Principle and symbol of the following components. Pump – vane, gear and piston pumps. Valves: Pressure Control valves – pressure relief .valve, pressure reducing valve, pressure unloading valve. Direction control valve – poppet valve, spool valve, 3/2, 4/2 & 4/3 DC valves, sequencing valve. Flow control valve –pressure compensated – non pressure compensated. Actuators – Linear actuactors – single acting & double acting – rotary actuators – hydraulic motors. Accessories – Intensifiers and Accumulators. **Chapter: 4.3: Hydraulic Circuits** Double acting cylinder with Meter in, Meter out circuits, Pump unloading cut, Bleed off circuit, sequencing circuit. Hydraulic circuits for milling machine, shaping machine. Motion synchronization circuit.	16
V	**PNEUMATIC SYSTEMS** **Chapter: 5.1: Components of pneumatic systems** Types, construction, working Principle and symbol of the following components. Compressor – Reciprocating & Rotary Compressors. Valves. Pressure Control valves – pressure relief valve, pressure regulating valves. Direction control valves – 3/2, 5/2 & 5/3 DC valves, sequencing valve. Flow control valve – throttle valves – shuttle valves-quick exhaust valves. Actuators – Linear actuators – single acting &double acting – rotary actuators – air motors. Accessories.- FRL unit. **Chapter: 5.2: Pneumatic Circuits** Double acting cylinder with Meter in, Meter out circuits, speed control circuit and sequencing circuit	12

Reference Books:

1. A Textbook of Fluid Mechanics and Hydraulic Machines, R. K. Bansal, Laxmi Publications (P).,Ltd, New Delhi, 2010
2. Hydraulics and Fluid Mechanics, Modi P.N. and Seth, S.M. Standard Book House, New Delhi, 2013.
3. Fluid Power with Applications, Anthony Esposito,, Pearson Education 2005.
4. A Textbook of Fluid Mechanics, R. K Rajput, S.Chand & Co, New Delhi, 2019
5. Engineering Fluid Mechanics, Kumar K. L., Eurasia Publishing House (P) Ltd., New Delhi, 2016.
6. Oil Hydraulics Systems- Principles and Maintenance", Majumdar S.R., Tata McGraw- Hill, 2001.
7. Hydraulic and Pneumatic Controls, Shanmugasundaram.K, Chand & Co, 2006

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Course Name   : Diploma in Mechanical Engineering
Subject Code   : ME402T
Semester   : IV
Subject Title   : Manufacturing Technology - II

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Manufacturing Technology - II	**Hours / Week**	**Hours / Semester**	**Marks**				**Duration**
			Internal Assessment	**Board Examinations**	**Total**		
	5	**80**	**40**	**100***	**100**		**3 Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Theory of Metal Cutting, Drilling Machine & Abrasive Process	15
II	Reciprocating Machines and Broaching	15
III	Milling Machines and Gear Generating	14
IV	Unconventional Machining Processes	14
V	CNC Machine and CNC Programming	15
	Test and Model Exam	7
	Total	**80**

RATIONALE:

In the process of manufacturing we should possess adequate and through knowledge about the working of conventional as well as non-conventional machines. The topics included aim to inculcate in the students the skills of metal cutting, milling, grinding, CNC machines and other machining processes which are very much essential.

OBJECTIVES:

- Study the working of various machine tools: Planer, Shaper, Drilling and Slotter
- Study the various work holding devices
- Study various types of milling cutter.
- Study the different types of grinders and grinding wheels.
- Study the broaching operation and their applications.
- Study the milling procedure for spur, helical and bevel gears.
- Study the various types of gear generating processes
- Study the use of non-conventional machining processes.
- Study the CNC machines working principle and its components.

ME402T - MANUFACTURING TECHNOLOGY – II
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**THEORY OF METAL CUTTING, DRILLING MACHINE & ABRASIVE PROCESS** **Chapter: 1.1: Theory of metal cutting** Introduction – orthogonal cutting – oblique cutting – single point cutting tool – nomenclature – types of chips – chip breakers – cutting tool materials – properties – tool wears – factors affecting tool life – cutting fluids – functions – properties of cutting fluid. **Chapter: 1.2: Drilling machines** Drills – flat drills – twist drills – nomenclature of twist drill – types of drilling machines – bench type – floor type – radial type – gang drill –multi spindle type – principle of operation in drilling – methods of holding drill bit – drill chucks – socket and sleeve – drilling operation – reaming, counter sinking, counter boring, spot facing, tapping and deep hole drilling. **Chapter: 1.3: Abrasive process** Types and classification – specifications – rough grinding – pedestal grinders - portable grinders – belt grinders. Precision grinding – cylindrical grinder – center less grinders - surface grinder – tool and cutter grinder – planetary grinders – principles of operations – grinding wheels – abrasives – natural and artificial diamond wheels – types of bonds – grit, grade and structure of wheels – wheel shapes and sizes –standard marking systems of grinding wheels – selection of grinding wheel – mounting of grinding wheels -dressing and truing of wheels – balancing of grinding wheels.	15
II	**RECIPROCATING MACHINES** **Chapter: 2.1: Planer** Introduction – description of double housing planner – specifications –principles of operation – drives – quick return mechanism – feed mechanism - operations. **Chapter: 2.2: Shaper** Introduction – specifications – principles of operations – standard shaper– quick return mechanism – crank and slotted link – hydraulic shaper –feed mechanism – operations. **Chapter: 2.3: Slotter** Introduction - specifications – method of operation – whit worth quick return mechanism - feed mechanism – types of tools. **Chapter: 2.4: Broaching** Types of broaching machine – horizontal, vertical and continuous broaching – principles of operation – types of broaches – classification –broach tool nomenclature – broaching operations.	15
III	**MILLING MACHINES AND GEAR GENERATING PROCESSES** **Chapter: 3.1: Milling machines** Types – column and knee type, plain, vertical and universal milling machines – principles of operation – specification of milling machines –work holding devices	14

	– tool holding devices – arbor – stub arbor – spring collet – adaptor. Milling cutters – cylindrical milling cutter - slitting cutter– side milling cutter – angle milling cutter – T slot milling cutter – woodruff milling cutter – fly cutter – nomenclature of cylindrical milling cutter. Milling operations – straddle milling - gang milling – vertical milling attachment. Indexing plate – differential indexing – simple indexing and compound indexing – simple problems. **Chapter: 3.2: Generating processes** Gear shaper – gear hobbing – principle of operations only. Gear finishing processes – burnishing – shaving – grinding and lapping – gear materials.	
IV	**UNCONVENTIONAL MACHINING PROCESSES** **Chapter: 4.1: Mechanical energy based process** Introduction – classification – process selection – advantages –limitations – demerits of conventional processes. Mechanical energy based process: Introduction – abrasive jet machining – metal removal rate process parameters – water jet machining – hydrodynamic jet machining – ultrasonic machining process – advantages – disadvantages– applications – compares ultrasonic machining with traditional abrasive machining. **Chapter: 4.2: Electrical energy based processes** Introduction – electrical discharge machine (EDM) – flushing system in EDM – tool (electrode) materials - tool wear – metal removal rate and surface finish - factors affecting the metal removal rate – advantages –disadvantages – applications – wire cut EDM , features of wire cut EDM– difference between EDM and wire cut EDM. **Chapter: 4.3: Thermal energy based processes** Introduction – electron beam machining – laser beam machining – lasing materials – machining applications of laser – plasma arc machining –gases used in plasma arc machining – types of plasma arc torches –advantages – disadvantages – applications	14
V	**CNC MACHINE AND ITS COMPONENTS** **Chapter: 5.1: CNC machines** Numerical control – definition – working principle of a CNC system –features of CNC machines – advantages of CNC machines – difference between NC and CNC – construction and working principle of turning center – construction and working principle of machining center - machine axes conventions turning center and machining center – co-ordinate measuring machine – construction and working principle. **Chapter: 5.2: Components of CNC machine** Slide ways – requirement – types – friction slide ways and anti-friction slide ways – linear motion bearing – recirculation ball screw – ATC – tool magazine – feedback devices – linear and rotary transducers – encoders– in process probing – tool material – tool inserts. **Chapter: 5.3: CNC Programming** Introduction – Cartesian coordinate system – Polar coordinate system –Absolute and incremental positioning – Purpose of G and M codes. Basic codes – basic CNC program. CNC turning program using linear interpolation and	15

circular interpolation. Machine control panel – Homing position – Offset setting – Auto. CNC milling program using linear interpolation and circular interpolation. Compensation – Machine control panel – Home position – Work offset setting procedure – Tool offset .

Reference Book:

1. Elements of Workshop Technology- Vol. I & II, Hajra Choudry & Battacharya, Edn. 11, published by Media Promoters and Publishers Pvt. Ltd., Seervai Buildings `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2. Production Technology, Jain & Gupta, Khanna Publishers, 2-B, North Market, Naisarak, New Delhi – 110 006 – 2006.
3. Production Technology, HMT, Edn. 18, published by Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008. 94
4. Manufacturing process, Myro N Begman, , Edn. 5, Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
5. Workshop Tech Vol I,II, III, WAJ. Chapman, published by Viva Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
6. Production processes, NITTTR, published by 5, Tata McGraw Hill Publishing Co. Ltd., West Patel Nagar, New Delhi 110 008.
7. Principles of the manufacturing of Composite materials – Suong V Hoa, DES tech publication. Inc, 439, North Duke Street, Lancaster, Pennsylvania – 17602 U.S.A.

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Course Name	:	Diploma in Mechanical Engineering
Subject Code	:	EE403T
Semester	:	IV
Subject Title	:	Electrical Drives and Control

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Electrical Drives and Control	Hours / Week	Hours / Semester	Marks				Duration
			Internal Assessment	Board Examinations	Total		
	5	80	40	100*	100		3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Dc Circuits and Dc Machines	15
II	Ac Circuits and Ac Machines	15
III	Special Machines & Drives	15
IV	Power Supplies, Control Elements and Electrical Safety	14
V	Display Devices, Logic Gates and PLC	14
	Test and Model Exam	7
	Total	**80**

RATIONALE:

The automation is being the order of the day to improve the production with high quality consciousness. Such automation involves electrically operated switches, sensors controlled through electrically driven motors and actuators. The subject aims in introducing the basic electrical DC and AC circuits and motors and also focuses on the various special control devices like stepper, servo drives and its controlling elements.

OBJECTIVES:

- Explore fundamental electric circuit laws.
- Explain the working principle of DC and AC Electrical machines.
- Identify the effective uses of drives of Electrical machines.
- Analyze the various power supply circuits.
- Select the field controlled elements.
- Explain the construction and working of Transformer.
- Compare the different types of Logic gates.
- Appreciate the safety practices followed in Electrical system.
- Compare the use of servo motors and stepper motors in electrical driving system
- Identify PLC Input outputs.
- Identify the use of Control elements.

EE403T -ELECTRICAL DRIVES AND CONTROL
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**DC CIRCUITS AND DC MACHINES** **Chapter: 1.1:** Definition- Electric Current, Voltage and Resistance -Ohm's law and Kirchoff's law. Resistance in series, parallel and series parallel – simple problems - Electromagnetism (definitions only) – Magnetic flux, Fluxdensity, Magnetic field intensity, MMF, Permeability, Reluctance, Faraday's law of Electromagnetic induction, Electrical and Mechanical units. **Chapter: 1.2:** DC Generators – Construction, Principle of operation and Applications. DC Motors: - Construction, Principle of operation and Applications. Necessity of starters: Three point, four point starters.	15
II	**AC CIRCUITS AND AC MACHINES** **Chapter: 2.1**: Fundamentals of AC voltage, and current – Peak, Average, RMS value of sine wave, frequency, time period, amplitude, power and power factor (definition only).Transformer: Principle of operation and construction – EMF equation- Losses in Transformer – Efficiency – Applications. Alternator construction – Principle of operation and Applications. **Chapter: 2.2:** AC machine: AC Motors- Principle of operation of Single Phase, Capacitor Start induction motor - universal motor - Applications-Three Phase Induction Motors – Squirrel Cage and Slip ring Induction motors (Construction and Working Principle only) -Applications – Speed control of 3Φ Induction Motor - DOL andstar/delta starter	15
III	**SPECIAL MACHINES & DRIVES** **Chapter: 3.1:** PMDC Motor, Stepper motor- Construction and Working Principle and Applications - Servo motor – types. Permanent Magnet Servo motor Construction and Applications. Brushless Servo motor - Construction and Applications. **Chapter: 3.2:** Industrial drives- types, Group drive, Individual drive, Multi motor drive. Block diagram of Variable Frequency Drive (VFD).Stepper motor Drive: Single stepping and Half stepping Servo drives. DC Servo drive, AC Servo drive and BLDC Servo drive.	15
IV	**POWER SUPPLIES, CONTROL ELEMENTS AND ELECTRICAL SAFETY** **Chapter: 4.1:** Rectifiers – Half wave, Full wave and Bridge rectifiers – Necessity of Filters-Regulated Power Supplies: IC Voltage Regulators. Batteries -Working, Constructions, Maintenances and Trouble shooting. **Chapter: 4.2:** Fuses – Selection of Fuse – Necessity of Fuse- Fuse switch units. Sensors: Photo electric sensor, Inductive Proximity sensors, Temperature sensors. Contactors - usage –	14

	Necessity of Contactor-Solenoid type Contactor. **Chapter: 4.3:** Circuit breakers – Miniature Circuit Breaker (MCB), Earth Leakage Circuit Breaker (ELCB). Electrical Safety: - Importance of Earthing - Electric shock: First aid, Precautions - Causes of Accident and their Preventive measures.	
V	**DISPLAY DEVICES, LOGIC GATES AND PLC** **Chapter: 5.1:** Display devices – LED, 7 segments LED, LCD, applications. **Chapter: 5.2:** Logic gates: Positive and Negative Logic, Definition, Symbol and truth table. Boolean expression for OR, AND, NOT, NOR, NAND, EXOR AND EXNOR gates. Universal Logic Gates: NAND, and NOR. **Chapter: 5.3:** Features of PLC - PLC Block diagram - PLC scan. Fixed and Modular PLC. Ladder logic - NO, NC contacts - Coils - AND logic, OR logic	14

Reference Books

1. Fundamentals of physics, Brijlal and Subramaniam.
2. Fundamentals of Electricity, D.N. Vasudeva, S. Chand & co.
3. Electric motors and drives, Austin Hughes
4. A text book of Electrical Technology, Volume II, B.L. Theraja, S. Chand & co.
5. Programmable Logic Controllers – John R Hackworth Frederick D. Hackworth Jr., Pearson Education.

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Course Name　　　　: Diploma in Mechanical Engineering
Subject Code　　　　: GE404T
Semester　　　　　　: IV
Subject Title　　　　: Production and Quality Management

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Production and Quality Management	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	5	80	40	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Process Planning and Selection	15
II	Basic concepts of Total Quality Management	14
III	TQM Tools	14
IV	Statistical Fundamentals & Charts	15
V	Lean Manufacturing Concepts	15
	Test and Model Exam	7
	Total	**80**

RATIONALE:

In the product manufacturing the process selection and planning are important. Quality and customer satisfaction in every product and every activity is the order of the day. As there is a shift from quality control to quality management in all activities, the concept Total Quality Management and the pillars of TQM are to be given to Engineers, who are designing products and production systems.

OBJECTIVES:

- Understand the process planning.
- Study the process selection.
- Define quality and appreciate its signature.
- Explain the concept of TQM.
- Appreciate the use of principles of TQM to meet customer satisfaction.
- Solve problem using the Quality control tools.
- Apply Brainstorming and quality circle to solve problems.
- Use PDCA cycle for continuous improvement.
- Appreciate the benefits of implementing 5S concepts.
- Collect, classify and present the data
- Determine the process capability of a manufacturing process.
- Practice on management planning tools.
- Use Bench Mark and JIT concepts.

GE404T -PRODUCTIONS AND QUALITY MANAGEMENT
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Process Planning And Selection** **Chapter: 1.1:** Production: Types of Production – Mass production, batch production and job order production **Chapter: 1.2:** Process Planning: Introduction – concept – Information required to do process planning – factors affecting process planning – process planning procedure – Make (or) Buy decision using Break Even Analysis –simple problems. Manual process planning – Introduction of Automated process planning and generator process planning –Advantage of computer aided process planning – Principle of line balancing – need for line balancing – Value Engineering –Definition – cost control Vs costreduction – value analysis when to do – steps information needed –selection of product. **Chapter: 1.3:** Process Selection: Process selection – technological choice – specific component choice – Process flow choice – Factors affecting process election– machine capacity – analysis of machine capacity – process and equipment selection procedure – Determination of man, machine and material requirements – simple problems – selection of material – jigs – fixtures etc. – Factors influencing choice of machinery – selection of machinery – simple problems – Preparation of operation planning sheet for simple components.	15
II	**Chapter: 2.1:** Basic Concepts Of Total Quality Management Quality Definitions – Dimensions of quality – Brainstorming and its objectives – Introduction to TQM - Characteristics – Basic concepts –Elements - Pillars – Principles – Obstacles to TQM implementation -Potential benefits of TQM - Quality council – duties – Responsibilities - Quality statements – Vision – Mission – Quality policy statements –Strategic planning – Seven steps to strategic planning – Deming philosophy – Customer – Input / Output process model – Juran Trilogy -PDCA (Deming Wheel) cycle.	14
III	**TQM Tools** **Chapter: 3.1:** Seven tools of quality control (Q 7 tools): Check sheet – Types of check sheet – Histogram – Cause and effect diagram – Pareto diagram Stratification Analysis – Scatter diagram-Graph/run charts – Control charts – Construction of above diagrams. Quality circle – concept of quality circle – Organization of Quality circle and objectives of Quality circle. Zero Defect Concepts. **Chapter: 3.2:** Management Planning Tools (M 7 Tools)Affinity diagram – Radar Diagram – Inter Relationship diagram (Inter Relationship diagram) – Tree diagram – Prioritization matrix – Matrix diagram – Decision tree – Arrow diagram – Matrix data analysis diagram– Construction of above diagrams.	14
IV	**Statistical Fundamentals And Control Charts** **Chapter: 4.1:**	15

	Types of Data – Collection of Data – Classification of Data – Tabular presentation of Data - Graphical representation of a frequency distribution –Comparison of Frequency distribution – Mean - Median – Mode –Comparison of measures of central tendency - Introduction to measures of dispersion – Sample – sampling – Normal curve – Sigma –Concept of six sigma – Principles – Process - Problems. **Chapter: 4.2: Control Charts** Control chart – Types of control charts – Control chart for variables –Construction of X bar and R charts – control limits Vs specification limits –Process capability – Method of doing process capability Analysis –Measures of process capability – Problems. Attributes – Control charts - P chart – np chart – c chart – u chart –Construction of above diagrams – Problems – Comparison between variable chart and Attribute chart.	
V	**Chapter 5.1: Lean Manufacturing Concepts** 5S Concepts (SEIRI, SEITON, SEISO, SEIKETSU and SHITSUKE) –needs and objectives – effective implementation of 5S concepts in an organization – Housekeeping – Kaizen – Kanban System. Bench marking- Objectives of bench marking – Types – Benchmarking process –Benefits of Bench marking – Pit falls of Benchmarking-Just In Time(JIT)concepts and its objectives – Total Productive Maintenance(TPM) –Introduction, Objectives of TPM –steps in implementing TPM. – Overall Equipment Effectiveness(OEE)–Lean Six Sigma – Value Stream Mapping – DMAIC(Define, Measure, Analyse, Improve, Control) –DMADV (Define , Measure, Analyse, Design, Verify)	15

Reference Books:

1. Industrial Engineering & Management – O.P Khanna
2. Industrial Engineering & Production Management – Martand Telsang
3. Total Quality Management, Date H.Besterfiled, Pearson Education Asia.
4. Total Quality Management, V.Jayakumar, Lakshmi Publications.(reprint 2005)
5. Training manual on ISO 9001 : 2000 & TQM, Girdhar J.Gyani, Raj Publishing House, Second Edition 2001
6. Quality Management, Howard Cuitlow, Tata Mc Graw Hill, 1998
7. Production Engineering – P.C.Sharma.
8. Production and Costing – GBS Narang and V.Kumar
9. Mechanical Estimating and Costing – Banga & Sharma.
10. Total Quality Management, Oakiand.J.S. Butterworth Heinemann Ltd. Oxford1989.
11. Quality Management – Concepts and Tasks- Narayana.V and
12. Sreenivasan.N.S., New Age International 1996.
13. Total Quality Management for engineers, Zeiri. Wood Head Publishers. 1991.
14. Quality Planning and Analysis, Juran J.M and Frank M.Gryna Jr., TMH. India.1982
15. ISO 9001, Brain Rethry, Productivity and Quality Publications.
16. ISO 9001, Brain Rethry, Productivity and Quality Publishing Pvt. Ltd. 1993.
17. Quality Auditing D.Mills, Chapman and Hall, 1993.

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Course Name   : Diploma in Mechanical Engineering
Subject Code   : ME405L
Semester   : IV
Subject Title   : Strength of Materials and Fluid Mechanics Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
	Hours / Week	**Hours / Semester**	**Marks**				**Duration**
Manufacturing Technology - I			**Internal Assessment**	**Board Examinations**	**Total**		
	4	**64**	**60**	**100***	**100**		**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Basic Concepts of Measurements	15
II	Linear and Angular Measurements	15
III	Form Measurement	15
IV	Advances in Metrology	15
V	Measurement of Mechanical Parameters	13
Test and Model Exam		07
Total		80

OBJECTIVES:

- Acquire skills on different types of testing methods of metals.
- Conduct material testing on elasticity, hardness, shear strength
- Determine modulus of rigidity of open coil spring and closed coil springs.
- Determine the co-efficient of discharge of venture meter and mouth piece
- Determine the co-efficient of friction in pipes.
- Conduct performance test on reciprocating pump.
- Conduct performance test on impulse turbine.

ME405L - STRENGTH OF MATERIALS AND FLUID MECHANICS PRACTICAL
DETAILED SYLLABUS

Experiments:
PART A : Strength of Materials Laboratory
1. **Test on Ductile Materials:**
Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.
2. **Hardness Test:**
Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminum.
3. **Torsion test:**
Torsion test on mild steel – relation between torque and angle of twist determination of shear modulus and shear stress.
4. **Impact test:**
Finding the resistance of materials to impact loads by Izod test and Charpy test.
5. **Tests on springs of circular section:**
Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open or Closed coil spring)
6. **Shear test:**
Single or double shear test on M.S. bar to finding the resistance of material to shear load.

PART B: Fluid Mechanics Laboratory
1. Verify the Bernoulli's Theorem.
2. Determination of co-efficient of discharge of a mouth piece by variable head method.
3. Determination of co-efficient of discharge of a venturimeter.
4. Determination of the friction factor in a pipe.
5. Performance test on reciprocating pump and to draw the characteristics curves.
6. Performance test on impulse turbine and to find out the Efficiency.

BOARD EXAMINATION

Note:
- All the experiments in both sections have to be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the PONDICHERRY UNIVERSITY should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's/ equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Part-A   : 45 marks
    Procedure / Observation   :10
    Tabulation / Calculations   :25
    Result / Graph   :10

Part-B   : 45 marks
    Procedure / Observation   :10
    Tabulation / Calculations   :25
    Result / Graph   :10

Viva-voce   **: 10 marks**

Total   **: 100 Marks**

LIST OF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

Si. No	EQUIPMENTS	Quantity
1	UTM	01
2	Rockwell's Hardness Testing Machine	01
3	Torsion testing machine	01
4	Impact testing machine	01
5	Spring testing arrangements	01
6	Shear testing machine	01
7	Vernier calliper	02
8	The Bernoulli's Apparatus	01
9	An open tank fitted with an external mouth piece and a collecting tank with Piezometer	01
10	An arrangement to find friction factor of pipe	01
11	A reciprocating pump with an arrangement for collecting data to find out the efficiency and plot the characteristics curves	01
12	A impulse turbine with an arrangement for calculating data to find out the efficiency	01
13	An arrangement of Venturimeter fitted in horizontal water pipe line to find coefficient of discharge	01

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   ME406L
Semester   :   IV
Subject Title   :   Manufacturing Technology - II Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
			Marks				
Manufacturing Technology - II Practical	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	Duration	
	4	64	60	100*	100	3Hrs.	

*Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

OBJECTIVES:

- Identify a milling machine and its parts
- Identify a cylindrical grinder, surface grinder and tool and cutter grinder
- Identify shaper, Slotter and its parts
- Identify the tools and instruments used in milling.
- Study the components of the CNC machine and setting.
- Handle the different types of work holding devices
- Machine a component using different machine tools.
- Calculate the indexing for a work
- Machine a gear using milling machine.
- Machine a cutting tool using Tool and Cutter grinder.
- Machine a plug gauge using Cylindrical grinding machine.
- Machine components by shaping machine
- Machine components by slotting machine.
- Machine components by the CNC machines.

ME406L - MANUFACTURING TECHNOLOGY - II PRACTICAL
DETAILED SYLLABUS

EXERCISES: **Raw Material: M.S. / C.I**

1. Make 'V' Block using shaping machine

Dimensions			
Sl.No	Part Name	Actual	Obtained
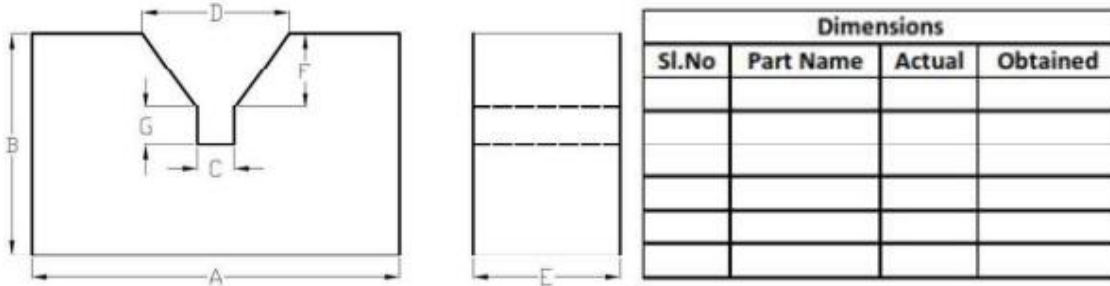
2. Make dovetail using shaping machine

Dimensions			
Sl.No	Part Name	Actual	Obtained
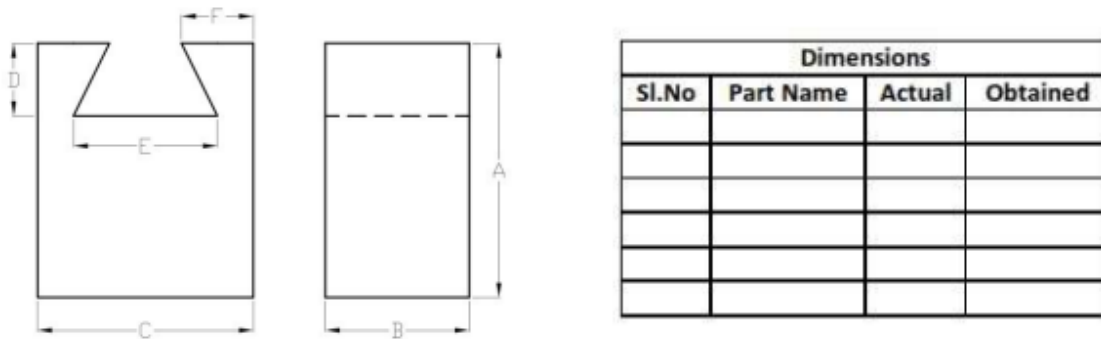
3. Make groove cut using slotting machine

Dimensions			
Sl.No	Part Name	Actual	Obtained
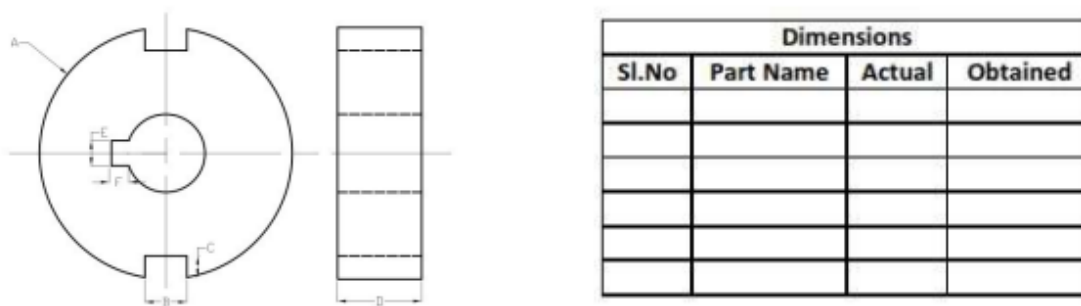
4. Make round to hexagon in milling machine.
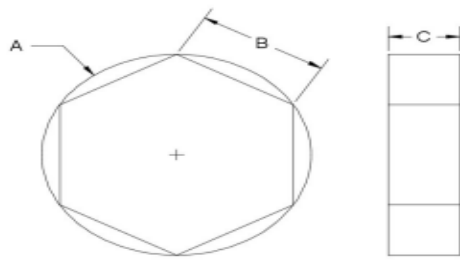
Dimensions			
Sl.No	Part Name	Actual	Obtained

5. Make Spur Gear using milling machine.
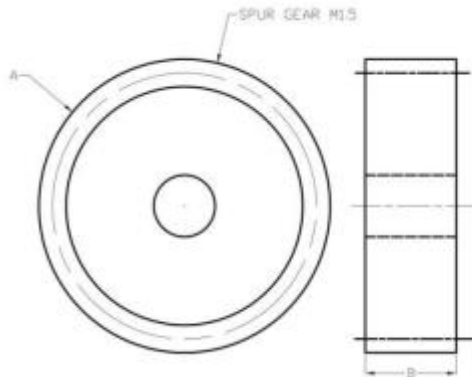
Dimensions			
Sl.No	Part Name	Actual	Obtained

6. Make Helical Gear using milling machine.
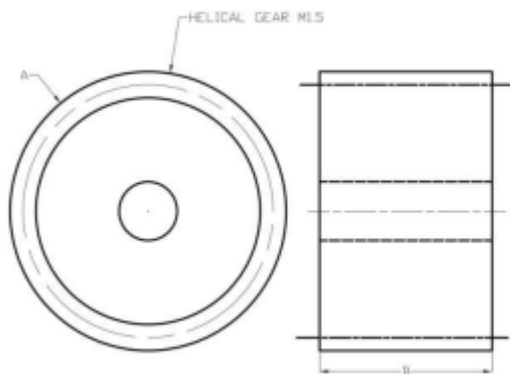
Dimensions			
Sl.No	Part Name	Actual	Obtained

7. Make slot cut using milling machine.
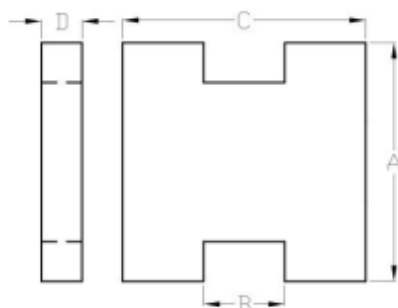
Dimensions			
Sl.No	Part Name	Actual	Obtained

8. Make Progressive type Plug gauge using Cylindrical Grinding machine
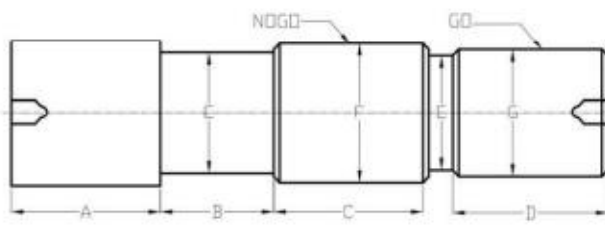
Dimensions			
Sl.No	Part Name	Actual	Obtained

9. Make a turning tool using Tool and Cutter Grinder
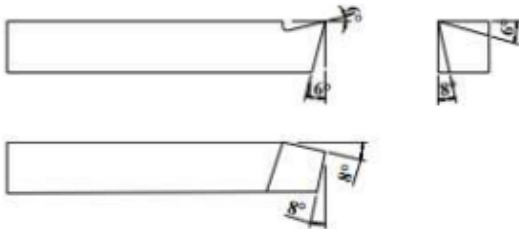
Dimensions			
Sl.No	Part Name	Actual	Obtained

10. Make plain surfaces (four surfaces)using surface Grinder

Dimensions			
Sl.No	Part Name	Actual	Obtained

11. Make the component in the CNC Turing Centre.
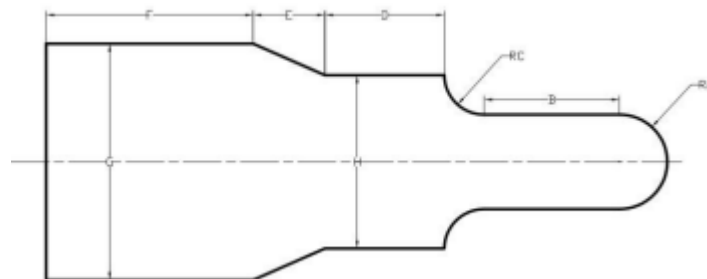
12. Make the component in the CNC Milling Centre.
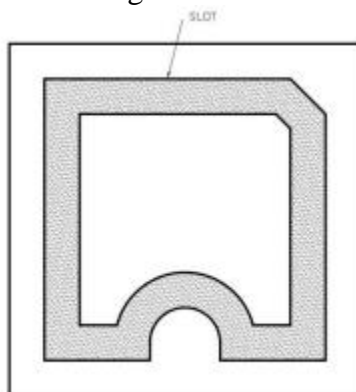
BOARD EXAMINATION

Note:
- All the exercises should be completed. Any one exercise will be given for examination.
- All the exercises should be given in the question paper and students are allowed to select by a lot or Question paper issued from the PONDICHERRY UNIVERSITY should be followed
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Description	Marks
Procedure	10
Preparation of the Specimen	15
Setting and Machining	30
Dimensions	25
Finishing	10
Viva-voce	10
Total	**100**

LIST OF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

Si. No	EQUIPMENTS	Quantity
1	Vertical milling machine / Vertical attachment	02
2	Universal Milling Machine	02
3	Surface Grinding Machine	01
4	Cylindrical Grinding Machine	01
5	Tool and Cutter Grinder	01
6	Shaping Machine	02
7	Slotting Machine	01
8	CNC Turning centre	01
9	CNC Milling Centre	01
10	Tools and Measuring instruments	Sufficient quantity
11	Consumables	Sufficient quantity

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   EE407L
Semester   :   IV
Subject Title :   Electrical Drives and Control Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Electrical Drives and Control Practical	**Hours / Week**	**Hours / Semester**	**Marks**				**Duration**
			Internal Assessment	**Board Examinations**	**Total**		
	4	**64**	**60**	**100***	**100**		**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

OBJECTIVES:
- Identify starters for different motors.
- Study and prepare earthing
- Test the characteristics of DC and AC machines.
- Identify and select controlling elements.
- Explore the performance of ELCB, MCB.
- Design regulated power supplies.
- Identify display devices–LED, 7 segment LED, LCD.
- Identify the drive circuit for special motors. Test the speed control circuit of the special motors.

EE407L - ELECTRICAL DRIVES AND CONTROL PRACTICAL

EXPERIMENTS:

Part A:
1.   Verification of Ohm's Law
2.   Load test on DC shunt motor
3.   Load test on single phase induction motor
4.   Load test on three phase squirrel cage motor
5.   Testing of relays, contactors, push buttons and limit switch
6.   Connection and Testing of MCB, ELCB

Part B:
1.   Construction and testing of Half wave and Full wave rectifier.
2.   Construction and testing of IC voltage regulator using IC 7805.
3.   Verification of truth tables for logic gates.
4.   Verification of universal gates.
5.   Identification and testing of display devices - LED, 7segment LED, Laser diode.
6.   Testing of Stepper motor drive.
7.   Testing of Servomotor drive.

BOARD EXAMINATION

Note:

- All the experiments in both sections have to be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the PONDICHERRY UNIVERSITY should be followed.
- All the students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILLED ALLOCATION OF MARKS

Part A:	45
Circuit diagram	10
Connections & Readings	20
Calculations & Graph	15
Part B:	**45**
Circuit diagram	10
Connections & Readings	20
Execution	15
Viva Voce	**10**
Total	**100**

LISTOF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

Electrical Lab 1

1. DC ammeter 0-5A   - 1 no
2. DC ammeter 0-25A   - 1 no
3. DC voltmeter 0-30V   - 1 no
4. DC voltmeter 0-300V   - 1 no
5. Rheostat 10.8, 8.5A   - 1 no
6. AC ammeter 0-5A   - 1 no
7. AC ammeter 0-10A   - 2 nos
8. AC voltmeter 0-50V   - 3 nos
9. AC wattmeter 5A-10A   - 3 nos
10. (0-750W, 0-600V)
11. Loading rheostat 5A, 230V   - 1 no
12. Tachometer 0-1000rpm   - 1 no
    (Analog type)
13. Variac 20A, 250V   - 2 nos
    (Auto transformer)
14. Over load relay1 to 2.5A   - 1 no
15. Air break contactors 20A, 220V   - 4 nos

16. Push button 2A, 220V   - 2 nos
17. Limit switch 20A, 220V   - 1 no
18. MCB 20A single pole   - 1 no
19. MCB 20A double pole   - 1 no
20. ELCB 2pole 20A, 100mA   - 1 no
21. ELCB 4POLE 20A, 100mA   - 1 no

Electronics Lab

1. Transformer 230 / 9-0-9V, 1A   - 4nos
2. Resistor 1 Kδ/ ½W   - 3nos
3. Capacitor 1000 $^{\mu}$F/25V   - 4nos
4. IC 7805   - 1no
5. Logic Gates IC (7400,7408,7432,7404,7402,7486) - 1 each
6. Stepper Motor Drive kit   - 1no
7. Servo Motor Drive Kit   - 1no
8. Digital Multimeter   - 1no
9. LED, 7 Segment LED, Laser diode - 1 each

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   ME501T
Semester   :   V
Subject Title   :   Design of Machine Elements

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Design of Machine Elements	**Hours / Week**	**Hours / Semester**	**Marks**				**Duration**
			Internal Assessment	**Board Examinations**	**Total**		
	4	**96**	**40**	**100***	**100**		**3Hrs.**

* Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Engineering Materials and Joints	18
II	Design Of Shafts, keys and Couplings	18
III	Design of Flat Belts and V-Belts	18
IV	Design of Bearings & Spur Gears	18
V	Computer Aided Design (CAD) and Geometrical Modeling	17
	Test and Model Exam	7
	Total	**96**

RATIONALE:

The main objective of Machine Design is to create new and better machine components to improve the existing one. A mechanical engineer should have thorough knowledge of design of machine elements to avoid the failure of machines or components.

OBJECTIVES:
 • Design sleeve and cotter joint, knuckle joint and Welded joints
 • Design shafts, keys and couplings required for power transmission.
 • Compare the different types of couplings.
 • Design flat and V-belt for power transmission.
 • Study the various types of bearings and their applications.
 • Design journal bearings.
 • Design Spur gear.
 • Role of CAD in design and analysis.

ME501T - DESIGNS OF MACHINE ELEMENTS
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Engineering Materials and Joints** **Chapter: 1.1:** General Considerations in Machine Design. Engineering materials - Factors affecting selection of material – BIS designation of Ferrous materials – Preferred number - Factor of safety and allowable stress – Stresses: Tension, Compression, Shear, Bearing pressure Intensity, Crushing, bending and torsion - problem. Creep strain and Creep Curve- Fatigue, S-N curve, Endurance Limit - Stress Concentration – Causes & Remedies. Theories of Elastic Failures – Principal normal stress theory, Maximum shear stress theory & maximum distortion energy theory. **Chapter: 1.2:** **Joints:** Design of sleeve and cotter joint, knuckle joint and welded joint.	18
II	**Design Of Shafts, Keys and Couplings** **Chapter: 2.1:** **Shafts:** Design of shafts subjected to – twisting moment – bending moment – combined twisting and bending moments – fluctuating loads – design of shafts based on rigidity. **Chapter: 2.2:** **Keys:** Types of keys - design of sunk keys only - Effect of keyways on shaft - problems. **Couplings:** Requirements of good couplings – types - design of - rigid protected type flange couplings - marine couplings – pin type flexible coupling (Description only).	18
III	**Design of Flat Belts and V-Belts:** **Chapter: 3.1:** Flat Belts: Types of belts - materials for belt -– types of belt drives – Speed ratio – effect of slip - length of flat belts –Tension Ratio $T1/T2=e^{\mu\theta}$ – centrifugal tension - power transmitted – condition for maximum power - transmission – Initial Tension - problems - design procedure of flat belts - design of flat belt based on manufacturer's data only – problems. **Chapter: 3.2:** V-belt drive - comparison with flat belt drive - designation of Vbelts – length of belt - power transmitted – Design of V-belt using manufacturer's data only – Problem.	18
IV	**Design of Bearings & Spur Gears** **Chapter: 4.1:** Bearings: Classifications of bearings – sliding contact and rolling contact bearings - radial and thrust bearings - roller bearing – types - Designation of ball bearings - materials used for bearings - journal bearings - heat generated - heat dissipated - cooling oil requirement – problems - design of journal bearings – Problems. (Design based on approved data books only.). **Chapter: 4.2:** Spur Gears: Gear drives - Types of gears - applications -materials - spur gear terminology - design of spur gear based on Lewis and Buckingham equation (design	18

	procedure only) - speed reducer – types.	
V	**Computer Aided Design (CAD) and Geometric Modelling** **Chapter: 5.1:** CAD – Roles of CAD in design – Development and uses - Applications – Advantages – Product cycle – Design process: Shigley Model - Pahl and Beitz Model – Sequential Engineering – Concurrent Engineering – 2D and 3D Transformation. **Chapter:5.2** **5.2: Geometric Modelling:** Solid modeling – entities – advantages and disadvantages – Boolean operations - Boundary representation – Constructive Solid Geometry – Comparison – Finite Element analysis – Steps.	**17**

Reference Book:
- Machine Design, Pandya & Shah, Edn. 1995, Charotar Publishing House.
- Machine Design, T. V. Sundararajamoorthy & N. Shanmugam, Revised Edition June-2003– Anuradha Publications.
- Design Data Book – by PSG College of Technology, DPV Printers.
- A text book of Machine Design, R.S. Khurmi & J.K.Gupta, Edn. 18, Eurosia Publishing House Pvt. Limited.
- Machine Design, Bandari,
- Theory and Problems of Machine Design, Holowenko, Laughlin, Schaum's outline series.
- R.Radhakrishnan, and Subramanian, "CAD/CAM/CIM", New Age International Pvt Limited.

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Course Name : Diploma in Mechanical Engineering
Subject Code : ME502T
Semester : V
Subject Title : Thermal Engineering - II

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Thermal Engineering – II	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	Duration
	5	80	40	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Formation and Properties of Steam & Thermodynamic Processes of Vapor	15
II	Steam Boilers and Performance of Boiler	15
III	Thermal Power Plant and Steam Turbines and Condensers	15
IV	Conventional Sources of Energy and Nuclear Power Plant	13
V	Air Compressors and Gas Turbines	15
	Test and Model Exam	7
	Total	**80**

RATIONALE:

This subject is one of the core subjects. Diploma engineers have to work with various power producing and power absorbing devices. This subject will enable students to establish foundation required to operate and maintain the devices. This subject emphasizes on steam boilers and allied components that are used in industrial sectors. Thermal power plants are still contributing major share in electricity production in India.

OBJECTIVES:
- Define various types of steam.
- Explain the working of Boiler.
- Compare various types of Boilers.
- Familiarize boiler mounting and accessories.
- Describe various circuits used in the thermal power plant.
- Explain working of steam turbine and condensers.
- Compare conventional energy sources with Non-Conventional Sources of energy.
- Explain working of nuclear power plant.

ME502T -THERMAL ENGINEERING - II
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Formation and Properties of Steam & Thermodynamic Processes of Vapor** Steam - Properties – formation of steam– saturation temperature – enthalpy of water – enthalpy of evaporation – conditions of steam – wet, dry and superheated steam - dryness fraction – enthalpy of wet, dry and superheated steam - advantages of superheated steam – Property diagrams – p-v diagram - T-H 10 125 diagram – T-V diagram – T-S diagram - phase diagram-H-S diagram – P-H diagram – critical conditions of water – specific volume of water and steam – density of steam – external work done during evaporation – internal latent heat – internal energy of steam – entropy of water and steam – steam tables - Mollier chart – Description only. Determination of dryness fraction of steam – bucket calorimeter - combined separating and throttling calorimeters - problems. Expansion processes of steam - constant volume, constant pressure, constant temperature, hyperbolic, polytrophic, isentropic and throttling processes – problems.	15
II	**Steam Boilers And Performance Of Boilers** Introduction -Classification of boilers – comparison of fire tube and water tube boilers– high pressure boilers – advantages of high pressure boilers - BHEL high pressure boilers – boiler mountings and function- construction and working – boiler accessories and function - construction and working – comparison of mountings and accessories – feed water treatment – internal and external treatments - starting boiler from cold condition – safety precautions in boiler operation – clauses of Indian boiler act. Evaporation rate - actual, equivalent and factor of evaporation – boiler efficiency – factors influencing boiler efficiency - boiler power - problems – boiler plant - efficiency of economizer and super heater - problems – boiler trial – heat losses in a boiler heat balance sheet – problems.	15
III	**Thermal Power Plant And Steam Turbines and condensers** Selection of site for thermal power plant -Layout of thermal power plant – fuel and ash circuit – water and steam circuit – air and flue gas circuit – cooling water circuit – merits and demerits of thermal power plant — air pollution by thermal power plants – pollutants, effects and control – cyclone separator – wet scrubber – electrostatic precipitator – control of No2 and SO2.fiudised bed combustion- thermal and noise pollution. Basic steam power cycles – Carnot, Rankine and modified Rankine cycles. Classification of steam turbine-Impulse and reaction turbines- Difference - necessity of compounding – Methods of compounding – special turbines. Steam condensers – elements of condensing plant – classification of condensers – jet condenser – surface condensers – Comparison of jet and	15

	surface condensers – sources of air in condenser – condenser vacuum – vacuum efficiency – condenser efficiency - mass of cooling water required – mass of air present – number of tubes – simple problems.	
IV	**Conventional Sources Of Energy And Nuclear Power Plant** Conventional sources of energy – layout of hydel and diesel power plants – merits and demerits. Nuclear fuels –fissile and fertile fuels – Nuclear fission and fusion – chain reaction – radio activity – layout of nuclear power plant – merits and demerits – Nuclear reactors -Components–Reactor Core -moderators – control rods – coolant – reflectors – biological shield-Reactor Vessels-Classification of Reactor- pressurized water reactor – boiling water reactor – Candu type reactor – fast breeder reactor — effect of nuclear radiation – Fuel Cycle –Site selection – Safety-Floating Nuclear Power Plants-Uranium Enrichment – Methods-disposal of nuclear wastes- comparison of nuclear power plants with thermal power plants- Nuclear Power Plant in India.	**15**
V	**Air Compressors And Gas Turbines** Air Compressors-uses of compressed air – classifications of Air compressor – reciprocating compressor - single stage reciprocating compressor – compression processes – power required to drive the compressor (Neglecting clearance Volume) – clearance volume and its effects – volumetric efficiency –power required to drive the compressor with clearance volume – problems – multi stage compression – merits and demerits - work input – ratio of cylinder diameters for minimum work input. Rotary compressors – Roots blower - vane blowers – centrifugal and axial flow air compressors. Gas turbines – uses - classifications – merits and demerits of gas turbines - constant pressure combustion gas turbine – gas turbine with – intercooler – reheater - regenerator -effects – closed cycle gas turbines - merits and demerits of open and closed cycle gas turbines Jet propulsion -turbojet engines– merits and demerits – turbo propeller engines – merits and demerits – ramjet – merits and demerits – Rocket engines – solid propellant rocket -applications of rockets.	**15**

Reference Books:

1. Thermal Engg, R.K. Rajput, 8th Edition, Laxmi publications Pvt Ltd, New
2. Delhi.
3. Applied Thermodynamics, P.K. Nag, 2nd Edition, TATA Mcgraw – Hill
4. Publishing Company, New Delhi
5. Thermal Engineering, R.S. Khurmi and J.K. Gupta, 18th Edition, S.Chand & Co, New Delhi
6. Thermal Engineering, P.L Ballaney, 24th Edition, Khanna Publishers, New
7. Delhi.
8. Thermal Engineering, B.K. Sarkar, 3rd Edition, Dhanpat Rai & Sons New Delhi.
9. Applied Thermodynamics, Domkundwar and C.PKothandaraman, 2ndEdition Khanna publishers, New Delhi.

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Course Name	:	**Diploma in Mechanical Engineering**
Subject Code	:	**ME503T**
Semester	:	**V**
Subject Title	:	**Computer Integrated Manufacturing**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Computer Integrated Manufacturing	**Hours / Week**	**Hours / Semester**	**Marks**			
			Internal Assessment	**Board Examinations**	**Total**	**Duration**
	5	80	40	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Computer Aided Design	15
II	Computer Aided Manufacturing	14
III	CNC programming	16
IV	FMS, AGV, AS/RS, Robotics	14
V	Advanced concepts of CIM	14
	Test and Model Exam	7
	Total	**80**

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of Computer Aided Design and Manufacturing. They are able to operate CNC machines and write part program. They are able to understand the advanced concepts adopted in automated industries.

OBJECTIVES:

- Acquire knowledge in the field of Computer aided Design
- Explain the various concepts of Computer Aided manufacturing
- Write part program for manufacturing components in CNC machines
- Explain the concepts of automatic material handling and storage systems and robotics
- Explain the advanced concepts of CIM

ME503T - Computer Integrated Manufacturing
DETAILED SYLLABUS

Contents: Theory

Units	Name of the Topics	Hours
I	**Computer Aided Design** Computer Aided Design: Introduction – definition – Shigley's design process – CAD activities – benefits of CAD - CAD software packages – point plotting, drawing of lines, Bresenham's circle algorithm, Transformations: 2D & 3D transformations – translation, scaling, rotation and concatenation. Geometric modelling: Techniques - Wire frame modelling – applications – advantages and disadvantages. Surface modelling – types of surfaces – applications – advantages and disadvantages – Solid modelling – entities – advantages and disadvantages – Boolean operations - Boundary representation – Constructive Solid Geometry – Comparison. Graphics standard: Definition – Need - GKS –IGES – DXF. Finite Element Analysis: Introduction – Development - Basic steps – Advantages.	15
II	**Computer Aided Manufacturing** CAM – Definition - functions of CAM – benefits of CAM. Introduction of CIM – concept of CIM - evolution of CIM – CIM wheel – Benefits – integrated CAD/CAM. Group technology: Part families - Parts classification and coding - coding structure – Opitz system, MICLASS system and CODE System. Process Planning: Introduction – Computer Assisted Process Planning (CAPP) – Types of CAPP - Variant type, Generative type – advantages of CAPP. Production Planning and Control (PPC): Definition – objectives - Computer Integrated Production management system – Master Production Schedule (MPS) – Capacity Planning – Materials Requirement Planning (MRP) – Manufacturing Resources Planning (MRP-II) – Shop Floor Control system (SFC) - Just In Time manufacturing philosophy (JIT) - Introduction to Enterprise Resources Planning (ERP).	14
III	**CNC Programming** NC in CAM, tooling for CNC – ISO designation for tooling – CNC operating system. Programming for CNC machining – part program - Manual part programming - coordinate system – Datum points: machine zero, work zero, tool zero - reference points - NC dimensioning – G codes and M codes – linear interpolation and circular interpolation - CNC program procedure - sub-program – canned cycles - stock removal – thread cutting – mirroring – drilling cycle – pocketing. Rapid prototyping: Classification – subtractive – additive – advantages and applications – materials – Virtual machining.	16
IV	**FMS, AGV, AS/RS, Robotics** FMS: Introduction – FMS components – FMS layouts – Types of FMS: Flexible Manufacturing Cell (FMC) – Flexible Turning Cell (FTC) – Flexible	14

	Transfer Line (FTL) – Flexible Machining System (FMS) – benefits of FMS - introduction to intelligent manufacturing system. Material handling in CIM environment: Types – AGV: Introduction – AGV - working principle – types – benefits. AS/RS – working principle –types – benefits. Robotics: Definition – robot configurations – basic robot motion – robot programming method – robotic sensors – end effectors – mechanical grippers – vacuum grippers – robot programming concepts - Industrial applications of Robot: Characteristics - material transfer and loading – welding - spray coating - assembly and inspection.	
V	**Advanced Concepts Of CIM** Concurrent Engineering: Definition – Sequential Vs Concurrent engineering – need of CE – benefits of CE. Quality Function Deployment (QFD): Definition – House of Quality (HOQ) – advantages – disadvantages. Steps in Failure Modes and Effects Analysis (FMEA) – Value Engineering (VE) – types of values – identification of poor value areas – techniques – benefits. Guide lines of Design for Manufacture and Assembly (DFMA). Product Development Cycle: Product Life Cycle - New product development processes. Augmented Reality (AR) – Introduction - concept – Applications.	**14**

REFERENCES BOOKS:

1. R.Radhakrishnan, and S.Subramanian, "CAD/CAM/CIM", New Age International Pvt. Ltd.
2. Mikell P.Groover, and Emory Zimmers, "CAD/CAM", Jr.Prentice Hall of India Pvt., Ltd.
3. Dr.P.N.Rao, "CAD/CAM Principles and Applications,", Tata Mc Graw Hill Publishing Company Ltd.
4. Ibrahim Zeid, "Mastering CAD/CAM", Tata McGraw-Hill Publishing Company Ltd., New Delhi.
5. Mikell P. Groover, "Automation, Production Systems, and ComputerIntegrated Manufacturing", Pearson Education Asia.
6. Yoram Koren, "Computer control of manufacturing systems," McGraw Hill Book.
7. Chris Mcmahon and Jimmie Browne, "CAD/CAM – Principle Practice and Manufacturing Management", Addision Wesley England, SeconEdition,2000.
8. Dr.Sadhu Singh, "Computer Aided Design and Manufacturing," Khanna Publishers, New Delhi, Second Edition, 2000.
9. S.Kant Vajpayee, "Principles of Computer Integrated Manufacturing,", Prentice Hall Of India, 1999.
10. David Bed worth, "Computer Integrated Design and Manufacturing," TMH, 1998.

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Course Name	:	**Diploma in Mechanical Engineering**
Subject Code	:	**GE504T**
Semester	:	**V**
Subject Title	:	**Green Energy and Energy Conservation**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Green Energy and Energy Conservation	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	Duration
	5	80	40	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Fundamentals of Energy, Geothermal energy, Wind energy	15
II	Bio mass energy, Solar Energy	15
III	Photovotaic (PV)	15
IV	PV Technologies, Applications	14
V	Energy conservation	14
	Test and Model Exam	7
	Total	**80**

RATIONALE:

There is an ever increasing demand for energy in spite of the rising prices of oil & other fossil fuel / depletion of fossil fuels. Energy demand, in particular electricity production has resulted in creation of fossil fuel based power plants that let out substantial greenhouse gas / carbon emission into the atmosphere causing climate change and global warming. We have various forms of renewable energy sources viz., Wind, Solar, Biomass, Biogas, etc. Municipal and Industrial wastes could also be useful sources of energy while ensuring safe disposal. This subject is introduced to learn about the major renewable energy sources and more focus on the PV module solar energy. The government act and guidelines are discussed for the benefit of the Diploma Engineers.

OBJECTIVES:

1. Study about the fundamentals of Energy.
2. Study of construction and principle of Wind energy, Solar energy, Geo thermal and Bio energy.
3. Understand the solar energy.
4. Understand the PV design and its components.
5. Study the energy conservation process.
6. Understand the Government Policies and Acts.
7. Study the TEDA projects in state government.

GE504T - GREEN ENERGY AND ENERGY CONSERVATION
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Fundamentals of Energy, Geothermal energy, Wind Energy:** Introduction – Energy need and trends - Forms of Energy – First Law of Thermodynamics - Second Law of Thermodynamics – energy requirement and supply – Fossil fuels and climate changes – need of renewable energy sources – Current renewable energy uses – Renewable energy policies in India. **Geothermal energy:** Introduction – Essential characteristic – Sources – Power Plants – Single flash power plant – double flash power plant – Flow diagram and principle only. Wind energy: Introduction – energy conversion – site selection considerations – Components of wind energy conversion system – Classification. Wind mill: Horizontal axis machines - Vertical axis machines – working principle, advantages and disadvantages. Schemes for electric generation.	15
II	**Bio mass energy, Solar Energy** **Bio mass energy:** Introduction – conversion technologies: Wet processes – dry processes. Bio gas generation – factors affecting the bio gas generation – classification of bio gas plants – Bio gas plant – construction - advantages and disadvantages. Materials used for bio gas generation – factors to be considered for the selection of site. **Solar Energy:** Introduction – Sun's energy: advantages – conversion challenges– The Sun-Earth movement - Solar radiation - Different angles - optimal angle for fixed collector, in summer and winter. Sun tracking - measuring instruments of solar radiation – methods to estimate solar radiation.	15
III	**Photovotaic (PV)** Photovotaic (PV): Semiconductors as solar cell – types of unit cells - electronic arrangement of silicon atom – intrinsic semiconductor – extrinsic semiconductor – Description only. P-N junction diode - forward bias - reverses bias. Solar cell - characteristics - description of short circuit current, open circuit voltage, fill factor and efficiency - losses in solar cells. Growth of solar PV and silicon (Si) requirement – production of metallurgical grade (MGS) – production of electronic grade (EGS) – Production of Si wafers: ingot making - monocrystalline - multicrystalline – wafer dicing. Si sheets. Solar grade silicon (SoG) – refining processes – Si usage in Solar PV. Process flow of commercial Si cell technology – Description of saw damage removal and surface texturing, diffusion process, thin-film layers for anti reflection coating and surface passivation, metal contacts and their deposition.	15

IV	**PV Technologies, Applications** PV Technologies: Thin film Technologies – materials for thin film technologies – Thin film deposition techniques: Physical vapour deposition – Evaporation – Sputtering. Chemical vapour deposition – Low pressure – plasma enhanced. Advantages of thin film Si solar cell technologies. Solar cell structures – substrate arrangement – superstrate arrangement. Solar PV module: series and parallel connections of cells – mismatch in cell / moduleDesign and structure of PV module. Batteries for PV systems – factors affecting battery performance – DC to DC converters – Charge controllers – DC to AC converter (inverter) (Description only). Applications: Flat plate collector - concentrating solar collectors – solar pond – solar water heating – space heating and cooling – solar pumping – solar cooking – solar green house. Principle and applications only.	14
V	**Energy conservation** Energy conservation act 2001 - Power of state government to facilitate and enforce efficient use of energy and its conservation - Finance, Accounts and Audit of bureau - Penalties and Adjudication - Appellate tribunal for energy conservation – Energy Conservation Guidelines for Industries by BEE, Govt of India - Guide lines – heating, cooling and heat transfer – waste recovery and usage – conversion of heat to electricity – Prevention of energy loss due to heat radiation and electric resistance – Industry energy management system. Net-metering policies – State Energy Development Agencies – Projects in Tami Nadu: Solar energy, Bio energy and Wind energy –State Solar policy 2019.	14

Reference Books

1. Non Conventional Energy Sources, G.D.Rai, Khanna Publishers.
2. Non Conventional Energy Sources and Utilisation, R.K.Rajput, S.Chand & Company Ltd.
3. Renewable Energy, Stephen Peake, Oxford press
4. Non Conventional Energy Resources, B.H.Khan, Tata Mc Graw Hill.
5. Industrial energyconservation- D. A. Ray- Pergaman Press
6. Energy resource management, Kirpal Singh Jogi, Sarup and sons.
7. Solar Photovltaics, Chetan Singh Solanki, PHI Learning Pvt. Ltd.
8. Renewable Energy Engineering and Technology, V V N Kishore, TERI.
9. Principles of Solar Engineering, D.Yogi Goswami, Frank Kreith, Jan F.Kreider, T&F.
10. Energy conservation act 2001, Government of India.
11. Energy Conservation Guidelines for Industries, Bureau of energy Efficiency, Ministry of Power, Government of India.
    a. State Solar policy 2019
    b. https://teda.in/achievements/solar-energy-4/
    c. https://teda.in/achievements/bio-energy-2/
    d. https://teda.in/achievements/wind-energy-2/

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   ME505T
Semester   :   V
Subject Title   :   Mechatronics

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Mechatronics	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	Duration
	5	80	40	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Introduction, Sensors & Transducers	15
II	Actuation systems	14
III	Basic system models, Input / Output systems	14
IV	Programmable Logic Controller	14
V	Design examples & advanced applications in Mechatronics	16
	Test and Model Exam	7
	Total	**80**

RATIONALE:

As per the latest requirements in the automation industries this enables to learn the various concepts of automation components. They are able to write program, and operate PLCs. They are able to select the electronic components for various industry applications.

OBJECTIVES:

- Explain the working of sensors and transducers
- Acquire knowledge about actuation systems
- Explain the system models and I/O systems
- Write program and operate PLCs
- Explain the applications of mechatronics

ME505T - MECHATRONICS
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Introduction, Sensors & Transducers** Introduction – Systems – Measurement Systems – Control Systems – Microprocessor Based Controllers. Examples – Mechatronics approach. Measurement System terminology – Displacement, Position & Proximity Sensors – Velocity and Motion Sensors – Force Sensors – Fluid Pressure Sensors – Flow Sensors – Liquid Level Sensors – Temperature Sensors – Light Sensors – Selection of Sensors – Calibration of sensors.	15
II	**Actuation Systems** Mechanical Actuation Systems – Types of motion – Freedom and constraints – Loading – Gear Trains – Pawl & Ratchet – Belt & Chain drive – Bearing – Selection – Ball & Roller bearings – Mechanical aspects of motor selection. Electrical Actuation Systems – Switches & Relays – Solenoids – D.C Motors – A.C. Motors – Stepper Motors – Specification and control of stepper motors – Servomotors: D.C Servomotor and A.C Servomotor. Pneumatic & Hydraulic Systems – Power supplies – DCV – PCV – Cylinders – Rotary actuators.	14
III	**Basic System Models, Input/output System** Mathematical Model – Introduction to mathematical model – Mechanical System building blocks – Electrical System building blocks – Fluid System building blocks – Thermal System building blocks. System Model – Engineering Systems – Rotational – Translational Systems – Electro-Mechanical System – Hydro- Mechanical System. Interfacing – Input/output ports – Interface requirements: Buffers, Handshaking, Polling and interrupts, Serial interfacing – Introduction to PIA – Serial communications interface – Example of interfacing of a seven-segment display with a decoder.	14
IV	**Programmable Logic Controller** Definition – Basic block diagram and structure of PLC – Input/output processing – PLC Programming: Ladder diagram, logic functions, latching and sequencing – PLC mnemonics – Timers, internal relays and counters – Shift registers – Master and jump controls – Data handling – Analog input/output – Selection of PLC – sample ladder programs.	14
V	**Design Examples & Advanced Applications In Mechatronics** Design process stages – Traditional Vs Mechatronics designs – Possible design solutions: Timed switch, Wind- screen wiper motion, Bath room scale – Case studies of mechatronics systems: A pick-and place robot, Car park barrier, Car engine management system, Automatic Camera and Automatic Washing Machine. Sensors for condition monitoring systems of production systems – Examples of monitoring methods: Vibration monitoring, Temperature monitoring, Wear behavior monitoring – Mechatronics control in automated manufacturing: Monitoring of manufacturing processes, On-line quality monitoring, Model-based systems, Hardware-in-the-loop simulation, Supervisory control in manufacturing inspection, Integration of heterogeneous systems.	16

REFERENCES BOOKS:

1. W.Bolton, "Mechatronics", 2nd Edition 2001, Pearson Education, New Delhi.
2. R.K.Rajput, A Text Book of Mechatronics, 1st Edition 2007, S.Chand & Co. Ltd., New Delhi.
3. HMT, "Mechatronics", 1st Edition 1998, Tata McGraw Hill, New Delhi.
4. Devdas Shetty & Kolk, "Mechatronics System Design", 1st Reprint, 2001,   PWS
5. Publishing Co., Boston. James H.Harter, "Electromechanics", 1st Edition 2003, Prentice-Hall of India, New - Delhi.
6. M.D.Singh & J.G.Joshi, "Mechatronics", 1st Edition 2006, Prentice-Hall of India, New Delhi

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Course Name : **Diploma in Mechanical Engineering**
Subject Code : **ME506L**
Semester : **V**
Subject Title : **Process Automation Practical**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Process Automation Practical	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	Duration
	4	64	60	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

OBJECTIVES:

- Design and operate pneumatic circuits.
- Design and operate fluid power circuits
- Use PLC system and its elements for process control
- Familiarize the working of function blocks in PLC
- Use ON-Delay timer to control a motor
- Use OFF-Delay timer to control a motor
- Use counter function block (Up counter and Down counter)
- Control the automatic operation of pneumatic cylinder using PLC
- Record of work to be prepared.

EXERCISES

PART A

a. Pneumatics Lab.

1. Direct operation of single and double acting cylinder.
2. Operation of double acting cylinder with quick exhaust valve.
3. Speed control of double acting cylinder using metering-in and metering-out Circuits.
4. Automatic operation of double acting cylinder in single cycle - using limit Switch.

b. Hydraulics Lab.

1. Direct operation of double acting cylinder.
2. Direct operation of hydraulic motor.
3. Speed control of double acting cylinder metering-in and metering-out Control.

PART B

PLC Lab

1. Direct operation of a motor using latching circuit.
2. Operation of a motor using 'AND' logic control.
3. Operation of a motor using 'OR' 'control.
4. On-Delay control of a motor and Off –Delay control of a motor.
5. Automatic operation of a Double acting cylinder-single cycle - forward, time Delay, return.
6. Automatic operation of Double acting cylinder-Multi cycle.
7. Sequential operation of double acting cylinder and a motor.

BOARD EXAMINATION

Note:

• All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.

• All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the PONDICHERRY UNIVERSITY should be followed.

• All regular students appearing for first attempt should submit record notebook for the examination.

• The external examiner should verify the availability of the facility   for the batch strength before commencement of practical examination.

• The external examiner should verify the working condition of machinery's / equipment before commencement of practical Examination.

Detailed Allocation of Marks

Part A:	**45**
Procedure / Circuit diagram	10
Identification of Components	15
Connection and execution	20
Part B:	**45**
Procedure / Circuit diagram	10
Ladder diagram / Programming	25
Execution	10
Viva Voce	**10**
Total	**100**

LIST OF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

• Pneumatic Trainer Kit   –   3 Nos
(All Cylinders, Control Valves, Limit switches and other accessories)
• Hydraulics Trainer Kit   –   2 No.
(All Cylinders, Control Valves, Limit switches and other accessories)
• PLC kit   –   3 Nos.
• Computer with software   –   10Nos. Nos.

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Course Name	:	**Diploma in Mechanical Engineering**
Subject Code	:	**ME507L**
Semester	:	**V**
Subject Title	:	**Thermal Engineering Practical**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
	Hours / Week	**Hours / Semester**	**Marks**			
Thermal Engineering Practical			**Internal Assessment**	**Board Examinations**	**Total**	**Duration**
	4	64	60	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

OBJECTIVES:
- Determine the flash and fire point and viscosity of oil.
- Draw the valve timing diagram of petrol and diesel engines.
- Draw the port timing diagram of petrol and diesel engines.
- Conduct performance test on petrol and diesel engines.
- Prepare heat balance sheet for an IC engine.
- Conduct of C.O.P of Refrigerators.
- Determine the volumetric efficiency of the Air Compressor.

EXPERIMENTS:

PART - A
1. Determine flash and fire point of the given oil using open cup and closed cup apparatus.
2. Determine the absolute viscosity of the given lubricating oil using Redwood viscometer.
3. Determine the absolute viscosity of the given lubricating oil using Say bolt viscometer.
4. Port timing diagram of two stroke petrol Engine
5. Valve time diagram for four stroke petrol Engine.
6. Valve time diagram for four stroke diesel engines.

PART - B
1. Load test (Performance test) on Four Stroke Petrol Engine.
2. Load test (Performance test) on Four Stroke diesel Engine.
3. Morse test on Multi-cylinder petrol engine.
4. Heat balance test on Four Stroke Diesel / Petrol Engine.
5. Volumetric efficiency of Air Compressor.
6. Determination of COP of Refrigeration System.

BOARD EXAMINATION

Note:

- All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the PONDICHERRY UNIVERSITY should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

Part A:	**35**
Observation and Tabular Column	05
Calculations	20
Result / Graph	10
Part B:	**55**
Observation and Tabular Column	10
Formulae, Calculations	30
Result / Graph	15
Viva Voce	**10**
Total	**100**

LIST OF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

1.	Open cup apparatus	- 2 Nos.
2.	Close cup apparatus	- 2 Nos.
3.	Redwood viscometer	- 2 Nos.
4.	Say bolt viscometer	- 2 Nos.
5.	Four stroke petrol engine Model	- 2 Nos.
6.	Four stroke diesel engine Model	- 2 Nos.
7.	Two stroke petrol engine Model	- 2 Nos.
8.	Four stroke Petrol Engine Test rig	- 1 no.
9.	Four stroke Diesel engine Test rig	- 1 no.
10.	Multi -cylinder petrol engine test rig	- 1 no.
11.	Air compressor test rig	- 1 no.
12.	Refrigeration Test rig	- 1 no.
13.	Measuring instruments	- Required quantity
14.	Consumables	- Required quantity

****

Course Name : Diploma in Mechanical Engineering
Subject Code : ME508L

Semester : V
Subject Title : Computer Integrated Manufacturing Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Computer Integrated Manufacturing Practical	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	Duration
	4	64	60	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

RATIONALE:
As per the latest requirements in the Industries this enables to learn the various concepts of Computer Integrated Manufacturing. They are able to write part program and able operate CNC lathe and Milling machines. They are able to understand the advanced concepts adopted in CIM.

OBJECTIVES:
- Acquire knowledge in the field of Computer Integrated Manufacturing
- Create 3D Solid models of machine components using modelling software
- Execute and perform machining operations in CNC Lathe and CNC Milling machines.
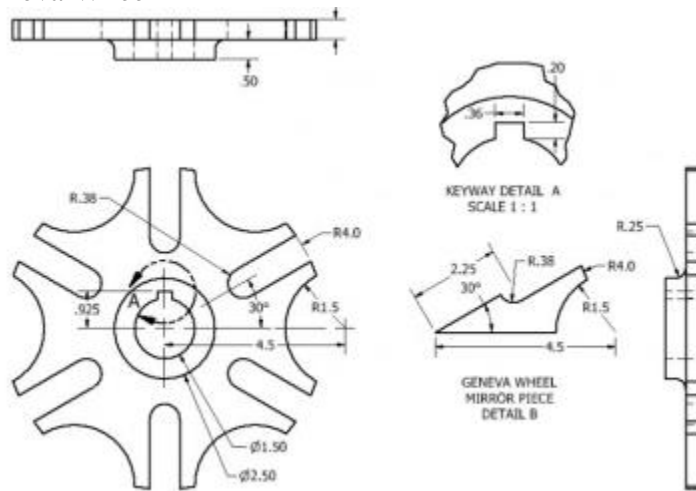
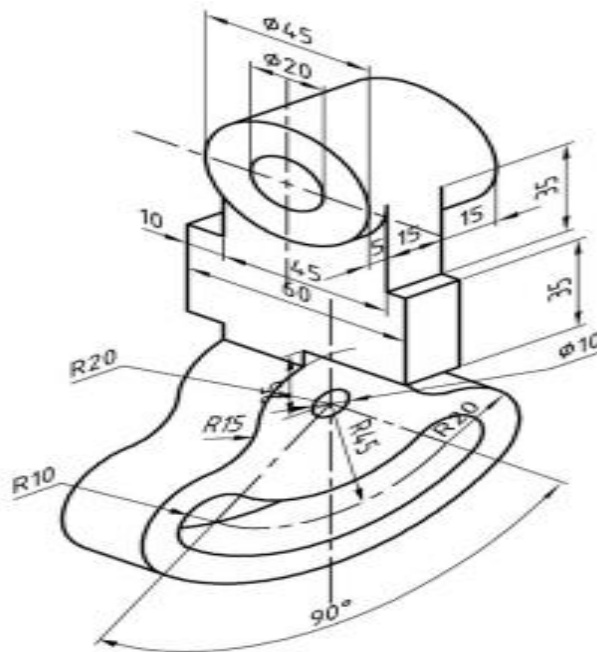# DETAILED SYLLABUS

CONTENTS: PRACTICAL

PART A: SOLID MODELLING
Introduction to Part modeling extrude – revolve – sweep – round – chamfer – copy – mirror – creating assembly views
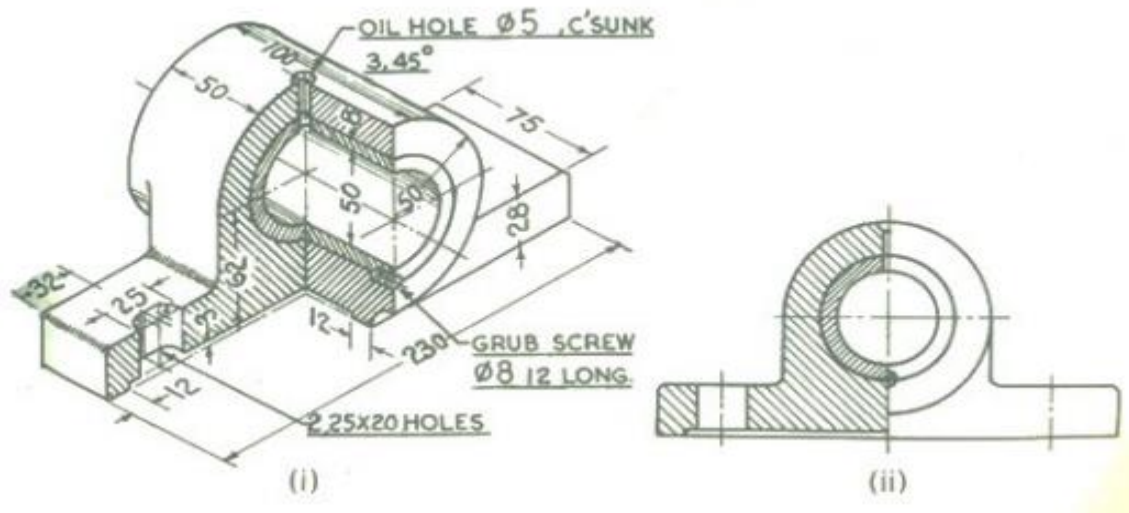Exercise No. 1. Geneva Wheel

Exercise No. 2. Bearing Block

Exercise No. 3. Bushed bearing

OIL HOLE Ø5 ,C'SUNK
3,45°

100
50
8
75
50
50
28
GRUB SCREW
Ø8 12 LONG
32
25
62
12
230
12
2,25X20 HOLES

(i)   (ii)

Exercise No. 4. Gib and Cotter joint

47   41

□38

□38

2. Square Rod

147

12   42   47   38   20

R12

38   □38

12   12   □38

1. Fork

25

16

62   22   22   136

16

R10   14

12   12

3. Gib and 4. cotter

Exercise No. 5. Screw Jack

NUT (GUN METAL)

CUP (CAST STEEL)

SCREW (MILD STEEL)

TOMMY BAR (MILD STEEL)

BODY (CAST IRON)

SCREW SPINDLE (MILD STEEL)

SPECIAL WASHER (MILD STEEL)
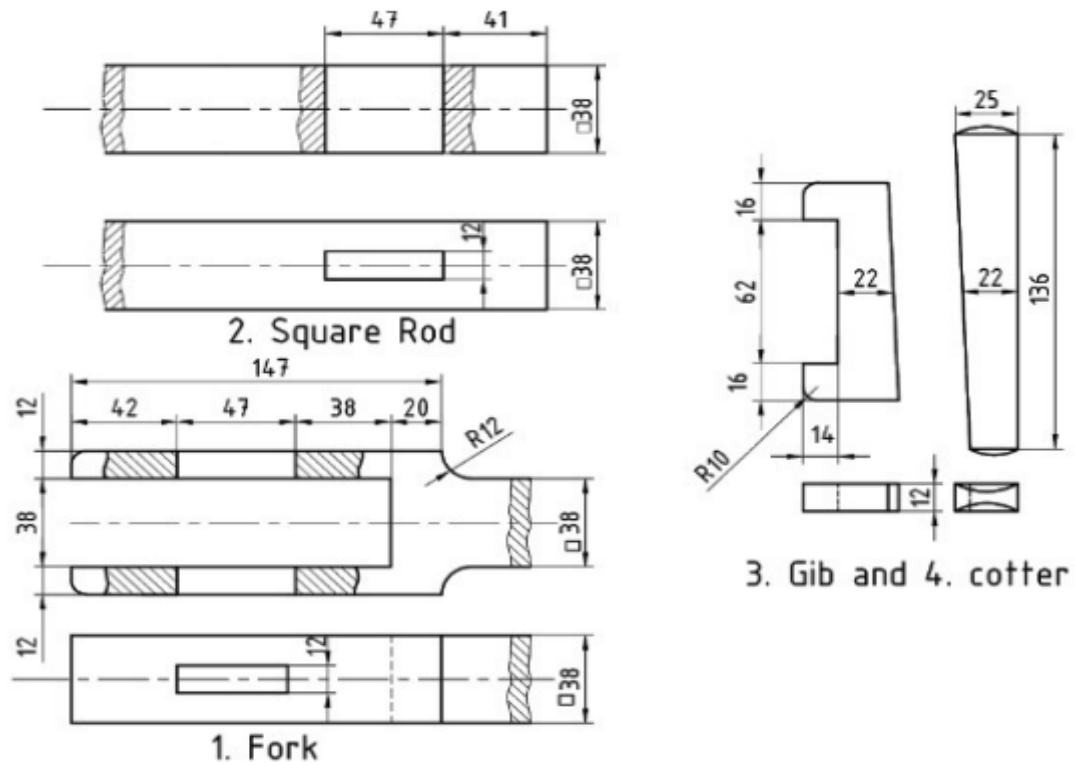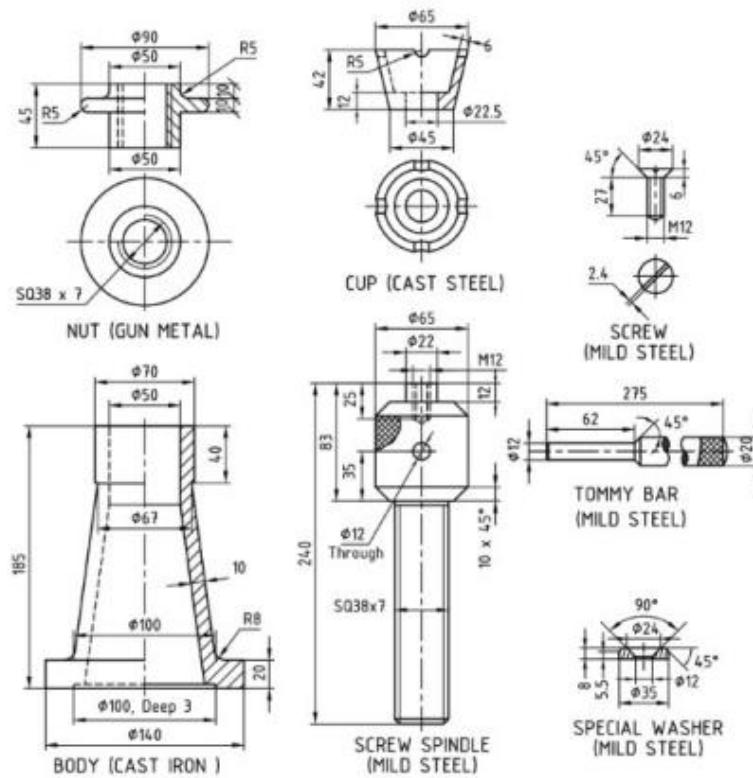
Exercise No. 6. Universal Coupling

TAPER PIN—MS.2 OFF

PIN&COLLAR,M.S—2OFF

FORK,C.I—2 OFF

CENTRE BLOCK,C.I—1 OFF
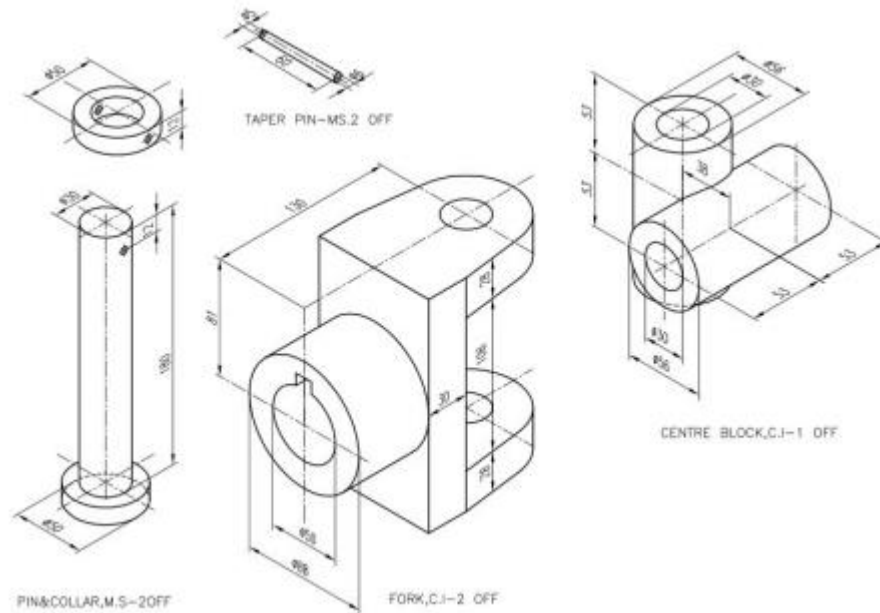
Note: Print the orthographic view and sectional view from the above assembled 3D drawing.

PART B: CNC Programming and Machining

Introduction:
1. Study of CNC lathe, milling.
2. Study of international standard codes: G-Codes and M-Codes
3. Format – Dimensioning methods.
4. Program writing – Turning simulator – Milling simulator, IS practice – commands menus.
5. Editing the program in the CNC machines.
6. Set the machine and execute the program in the CNC machines.

Note: Create and edit the part program in the simulation software for verification of the part program. Enter / transfer the program to make the component in the CNC machine.

<u>**CNC Turning Machine**</u>   Material: M.S / Aluminum / Acrylic fiber / Plastic

1. Using Linear and Circular interpolation - Create a part program and produce component   in the Machine.
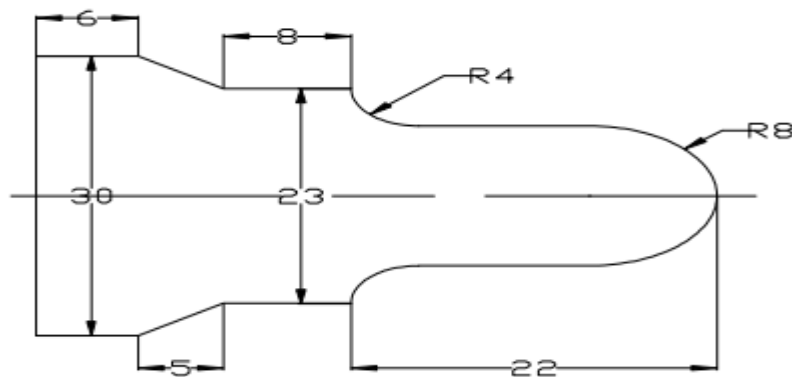
2. Using Stock removal cycle – Create a part program for multiple turning operations and produce component in the Machine.

3. Using canned cycle - Create a part program for thread cutting, grooving and produce component in the Machine.

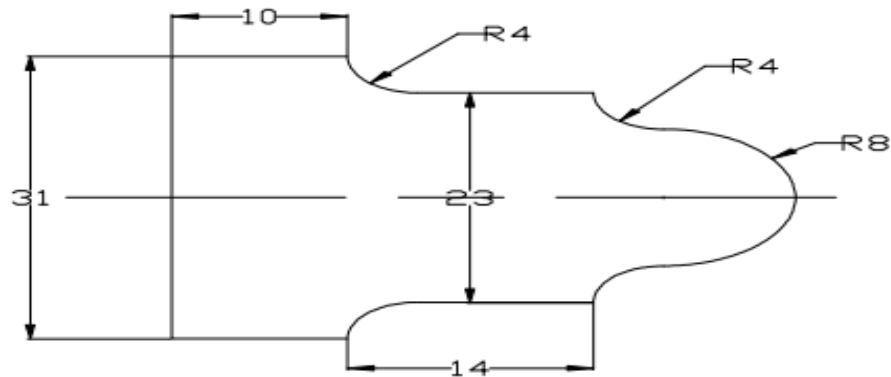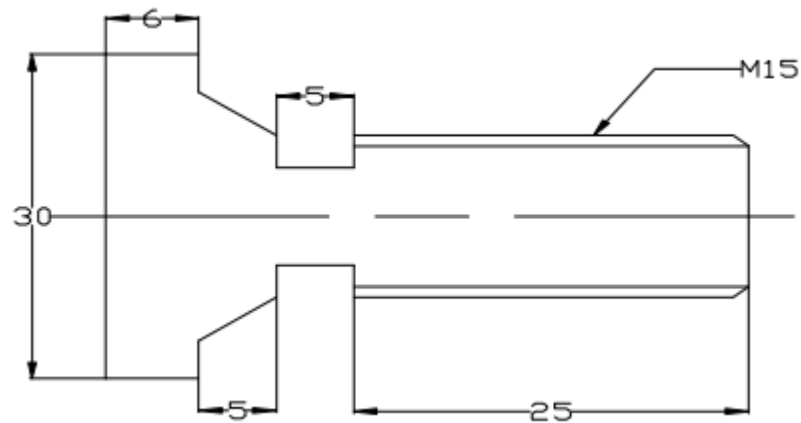**CNC Milling Machine**   Material: M.S / Aluminum / acrylic fibre / plastic

4. Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine.
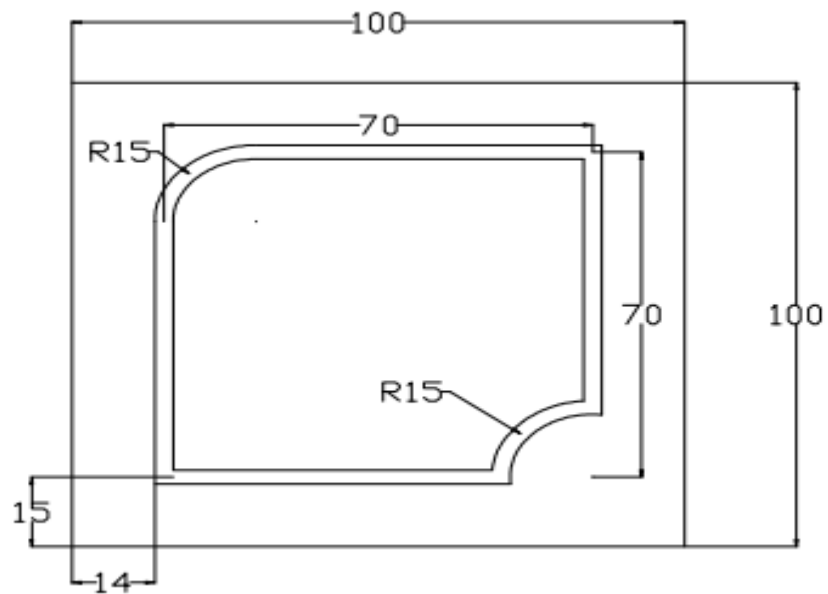
5. Using canned cycle - Create a part program for drilling, tapping, counter sinking and produce component in the Machine.
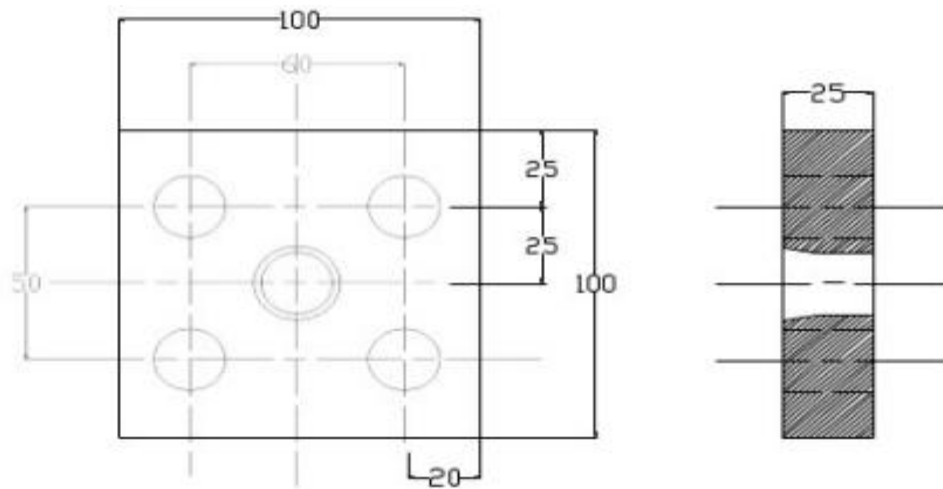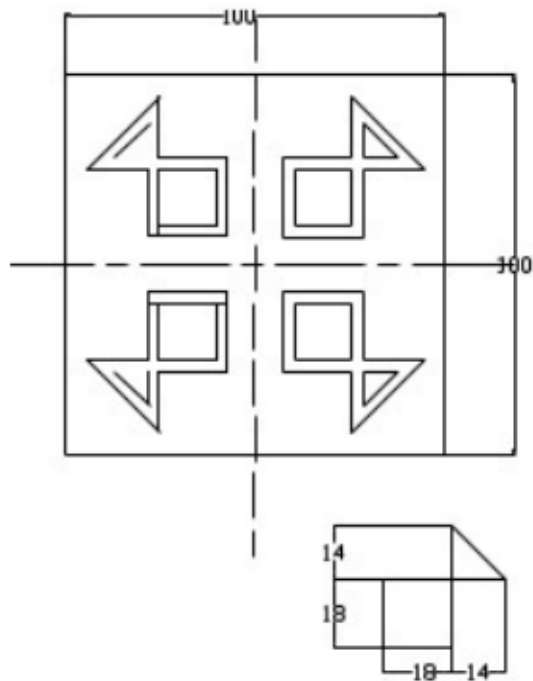

6. Using subprogram - Create a part program and produce component in the Machine.

BOARD EXAMINATION

Note:

- All the exercises in both sections should be completed. Two exercises will be given for examination by selecting one exercise from PART A and one exercise from PART B.
- All the exercises should be given in the question paper and students are allowed to select by a lot or question paper issued from the PONDICHERRY UNIVERSITY should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Note:

Part A: The given component drawing should be created and solid modeling after assembly should be printed and submitted along with the answer paper for evaluation by the external examiner.

Part B: The program for the given component should be written in the answer paper. The program should be entered in the CNC machine and the component should be submitted for evaluation by the external examiner. The machined component should be kept under the custody of examiner.

Allocation of marks for Board Examination

PART A: Solid Modeling

Creation of sketch	:	15
Modeling	:	25
Accuracy	:	5

PART B: CNC Programming

Program writing	:	15
Setting	:	10
Editing and Machining	:	20
Viva voce	:	10
Total Marks	:	10

LIST OF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

1. Personal computer - 30 Nos.
2. 3D Solid Modeling and Simulation software - Sufficient to the strength
3. CNC Lathe –2 Nos.
4. CNC Mill –2 Nos.
5. Consumables - Sufficient quantity
6. Laser / Inkjet Printer – 1 No.

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Course Name	:	Diploma in Mechanical Engineering
Subject Code	:	GE509L
Semester	:	V
Subject Title	:	Green Energy and Energy Conservation Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Green Energy and Energy Conservation Practical	Hours / Week	Hours / Semester	Marks			
			Internal Assessment	Board Examinations	Total	Duration
	4	64	60	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

Objectives:

- To demonstrate the I-V and P-V Characteristics of PV module.
- To show the effect of variation in tilt angle on PV module power.
- To study the characteristics of battery.
- To understand how a solar PV standalone system works
- To workout power flow calculations of standalone PV system AC load DC load with battery.
- To understand how to use various electrical measuring equipments.
- To study the different electrical parameters of a monocrystalline and polycrystalline silicon solar panel
- To study the effect of shading on the output of solar panel.
- To understand and determine the power flow in a solar DC system.

GREEN ENERGY AND ENERGY CONSERVATION PRACTICAL DETAILED SYLLABUS

EXPERIMENTS

PART A

1. Study and demonstrate the I-V and P-V Characteristics of PV module with varying radiation and temperature level.
2. Study and demonstrate the I-V and P-V characteristics of series and parallel combination of PV modules.
3. Study and demonstrate the effect of shading on module output power.
4. Do a shading analysis on the site where solar PV system needs to be setup.
5. Study the wind power generation status in government.
6. Study the biogas generation status in government.

PART B

1. Conduct experiment to show the effect of variation in tilt angle on PV module power.
2. Conduct the experiment to demonstrate the working of diode as Bypass diode and blocking diode.
3. Conduct the experiment to draw the charging and discharging characteristics of battery.

4. Conduct the experiment for the power flow calculations of standalone PV system of AC load with battery.

5. Conduct the experiment for the power flow calculations of standalone PV system of DC load with battery.

6. Conduct the experiment to determine the different electrical parameters of a mono crystalline and polycrystalline silicon solar panel.

BOARD EXAMINATION

Note:

• All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.

• All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the Pondicherry University should be followed.

• All regular students appearing for first attempt should submit record notebook for the examination.

• The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.

• The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

ALLOCATION OF MARKS

Part - A
Study explanation   **:** **30**
Part - B
Procedure   **:** **15**
Observation / Reading / Calculation **:** **35**
Result   **:** **10**
Viva-voce   **:** **10**
Total   **:** **100**

LIST OF EQUIPMENTS / TOOLS REQUIRED
(To accommodate a batch of 30 students in Practice / Board Examinations)

S. No.	Description	Qty.
1	150 /160 Wp Polycrystalline Solar PV Modules	2 Nos.
2	340/350 Wp Mono crystalline Solar PV Modules	2 Nos.
3	80 / 90 Wp Thin film Solar PV Modules	2 Nos.
4	1000W/1500W Off-grid Grid Inverter with MPPT Charge Controller	1 No.
5	Solar Structure	1 No.
6	Wall mountable ACDB Box	1 No.
7	Earthing kit	3 No.
8	DC Wire , AC Wire, PVC items	1 No.
9	Accessories like MC4 connectors, Lugs, Screws etc.	Sufficient Quantity
10	Solar System Analyzer	1 No.

11	Solar Power Meter	1 No.
12	Solar Module Analyzer	1 No.
13	Thermal Imaging Camera	1 No.
14	Drill m/c, Multimeters, Clamp meters, Tools & Tackles, Safety gear	1 No.
15	Electrical Measuring Instruments	Sufficient Quantity
16	Shop Floor Tools	Sufficient Quantity

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Course Name   :   **Diploma in Mechanical Engineering**
Subject Code   :   **ME510L**
Semester   :   **V**
Subject Title   :   **Mechatronics Practical**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
Mechatronics Practical	**Hours / Week**	**Hours / Semester**	**Marks**			
			Internal Assessment	**Board Examinations**	**Total**	**Duration**
	4	**64**	**60**	**100***	**100**	**3 Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced for 40 marks for result

RATIONALE:

As per the latest requirements in the Industries this enables to learn the various concepts of industrial automation. They are able to write ladder logic program and able operate PLCs. They are able to understand the advanced concepts adopted in industrial automation.

OBJECTIVES:
- Acquire knowledge in the field of mechatronics
- Explain the various components of electro pneumatics and electro hydraulics
- Handle PLC, HMI, SCADA and DCS components

MECHATRONICS PRACTICAL
DETAILED SYLLABUS

ELECTRO PNEUMATICS: Introduction to Electro Pneumatics -Applications of pneumatics - Pneumatic and electro pneumatic controllers - Components and assemblies in the electrical signal control section: Power supply unit - Push button and control switches - Sensors for measuring displacement and pressure - Relays and contactors. Electrically actuated directional control valves - Construction and mode of operation - Functions - Electrical connection of solenoid coils. Procedure for developing a control system.

ELECTRO HYDRAULICS: Basic principles of electro hydraulics - Function and use of electrohydraulic components - Production and interpretation of standard hydraulic and electrical circuit diagrams

PROCESS CONTROL INSTRUMENTATION: Process control - Types of processes – Structure of control system – Controllers - Digital controllers – Types of process control – ON/OFF Control – Analog control – Digital control. Data Acquisition System - Objectives of DAS - Types of DAS: Single channel DAS – Multichannel DAS – Computer based DAS. Data Loggers - Block diagram of Data Loggers – Control facilities in Data Logger – Uses of Data Logger - Different stages of Direct Digital Control.

SCADA - Fundamental principles of modern SCADA systems - SCADA hardware - SCADA software - Landlines for SCADA - SCADA and local area networks - Modem used in SCADA systems - Remote terminal units. Human Machine Interface – components of HMI.

Distributed Control System - Parts of DCS – Layered structure of DCS – Communication options in DCS. Variable Frequency Drives - Construction, Working, Operation, Applications and Specifications

EXPERIMENTS

PART A

(ELECTRO PNEUMATICS)
1. Direct control of a 3/2 NC Single solenoid valve and a 3/2 NO Single solenoid valve
2. Direct control of a 5/2 single solenoid valve and a 5/2 double solenoid valve
3. Simple circuit using OR Logic & AND Logic
4. Limit switch and proximity switch application circuits

(ELECTRO HYDRAULICS)
1. Sorting device using double acting cylinder, directly actuated, manually
2. Component selection on conveyor belt using double acting cylinder and directly actuated, manually
3. Lifting station using single acting cylinder and directly actuated, manually
4. Door control using double acting cylinder and interlocking

PART B
PROCESS CONTROL INSTRUMENTATION
1. Wiring practice of HMI
2. Design of HMI screen
3. HMI Configuration and Interfacing with PLC and PC
4. Configuring Alarms in SCADA
5. Real time project development and interfacing with PLC
6. Monitoring & Control of Pneumatic System using HMI

BOARD EXAMINATION

Note:
1. All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.
2. All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the PONDICHERRY UNIVERSITY should be followed.
3. All regular students appearing for first attempt should submit record notebook for the examination.
4. The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
5. The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

ALLOCATION OF MARKS

PART A: Electro Pneumatic circuit / Electro Hydraulic circuit (by lot):

Circuit diagram	:	15
Components connections & execution	:	20
Output	:	10

PART B: Process Control Instrumentation

Circuit diagram	:	15
Execution &Programming	:	20
Output	:	10
Viva voce	:	10
Total Marks	:	100

LIST OF EQUIPMENTS

(To accommodate a batch of 30 students in Practice / Board Examinations)

Electro Pneumatics:

- Basic Pneumatic Trainer Kit with FRL Unit, Compressor and Accessories   - 2 Nos
- 3/2 NC Single Solenoid Valve   - 2Nos
- 3/2 NO Single Solenoid Valve   - 2Nos
- 5/2 Single Solenoid Valve   - 2Nos
- 5/2 Double Solenoid Valve   - 2Nos
- Limit Switch   - 6 Nos
- Proximity Sensor (Inductive, Capacitive & Optical)   - Each 2 Nos
- Single Acting Pneumatic Cylinder   - 4 Nos
- Double Acting Pneumatic Cylinder   - 2 Nos
- Power Supply Unit, Connecting Leads and Hoses   – As per Requirements

Electro Hydraulics:

- Basic Hydraulics Trainer Kit with Hydraulic Pump, Regulator and Hoses
- Accessories   – 2 Nos
- Double Acting Cylinder   – 2 Nos
- Single Acting Cylinder   – 2 Nos
- Manual Actuator Switch   – 4 Nos
- Material Sorting assembly set up   – 1 No
- Conveyor Assembly set up   – 1 No
- Lifting Station Assembly Set up   – 1 No
- Limit Switch   – 4 Nos

Process Control Instrumentation:

- Programmable Logic Controller (PLC) with Software   – 3 Nos
- Human Machine Interface (HMI) with Software   – 3 Nos
- SCADA Software   – 1 No

(No or Integrated Software for PLC, HMI and SCADA)

- Personnel Computer   – 3 Nos

- Water Tank Assembly set up with Level Sensor and Flow Controller (Actuator) to interface with PLC and HMI   – 1 No

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Course Name : **1020 Diploma in Mechanical Engineering**
Subject Code : **GE511L**
Semester : **V**
Subject Title : **Entrepreneurship & Startups**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours / Week	Hours / Semester	Marks			
Entrepreneurship & Startups			Internal Assessment	Board Examinations	Total	Duration
	4	64	60	100*	100	3 Hrs.

*Examinations will be conducted for 100 marks and it will be reduced for 40 marks for result

Topics and Allocation of Hours

Unit No	Topics	Hours
I	Entrepreneurship – Introduction and Process	10
II	Business Idea and Banking	10
III	Startups, E-cell and Success Stories	10
IV	Pricing and Cost Analysis	10
V	Business Plan Preparation	10
	Test and Model Exam	14
	Total	**64**

RATIONALE:
Development of a diploma curriculum is a dynamic process responsive to the society and reflecting the needs and aspiration of its learners. Fast changing society deserves changes in educational curriculum particularly to establish relevance to emerging socio-economic environments; to ensure equity of opportunity and participation and finally promoting concern for excellence. In this context the course on entrepreneurship and startups aims at instilling and stimulating human urge for excellence by realizing individual potential for generating and putting to use the inputs, relevant to social prosperity and thereby ensure good means of living for every individual, provides jobs and develop Indian economy.

OBJECTIVES:
At the end of the study of 5th semester the students will be able to
o To excite the students about entrepreneurship
o Acquiring Entrepreneurial spirit and resourcefulness
o Understanding the concept and process of entrepreneurship
o Acquiring entrepreneurial quality, competency and motivation
o Learning the process and skills of creation and management of entrepreneurial venture

o Familiarization with various uses of human resource for earning dignified means of living
o Know its contribution in and role in the growth and development of individual and the nation
o Understand the formation of E-cell
o Survey and analyze the market to understand customer needs
o Understand the importance of generation of ideas and product selection
o Learn the preparation of project feasibility report
o Understand the importance of sales and turnover
o Familiarization of various financial and non-financial schemes
o Aware the concept of incubation and starts ups

DETAILED SYLLABUS

Unit	Name of the Topics	Hours
I	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS** Concept, Functions and Importance Myths about Entrepreneurship Pros and Cons of Entrepreneurship Process of Entrepreneurship Benefits of Entrepreneur Competencies and Characteristics Ethical Entrepreneurship Entrepreneurial Values and Attitudes Motivation Creativity Innovation Entrepreneurs - as problem solvers Mindset of an employee and an entrepreneur Business Failure – causes and remedies Role of Networking in entrepreneurship	10
II	**BUSINESS IDEA AND BANKING** Types of Business: Manufacturing, Trading and Services Stakeholders: Sellers, Vendors and Consumers E- Commerce Business Models Types of Resources - Human, Capital and Entrepreneurial tools Goals of Business and Goal Setting Patent, copyright and Intellectual Property Rights Negotiations - Importance and methods Customer Relations and Vendor Management Size and Capital based classification of business enterprises Role of Financial Institutions Role of Government policy 10 174 Entrepreneurial support systems Incentive schemes for State Government	10

	Incentive schemes for Central Government	
III	**STARTUPS, E-CELL AND SUCCESS STORIES** Concept of Incubation center's Activities of DIC, financial institutions and other relevance institutions Success stories of Indian and global business legends Field Visit to MSME's Various sources of Information Learn to earn Startup and its stages Role of Technology – E-commerce and Social Media Role of E-Cell E-Cell to Entrepreneurship	**10**
IV	**PRICING AND COST ANALYSIS** Calculation of Unit of Sale, Unit Price and Unit Cost Types of Costs - Variable and Fixed, Operational Costs Break Even Analysis Understand the meaning and concept of the term Cash Inflow and Cash Outflow Prepare a Cash Flow Projection Pricing and Factors affecting pricing Understand the importance and preparation of Income Statement Launch Strategies after pricing and proof of concept Branding - Business name, logo, tag line Promotion strategy	**10**
V	**BUSINESS PLAN PREPARATION** Generation of Ideas, Business Ideas vs. Business Opportunities 10 175 Selection the Right Opportunity Product selection New product development and analysis Feasibility Study Report – Technical, financial and commercial analysis Market Research - Concept, Importance and Process Marketing and Sales strategy Digital marketing Social Entrepreneurship Risk Taking-Concept Types of business risks	**10**

REFERNCE BOOKS:

1. Dr. G.K. Varshney, Fundamentals of Entrepreneurship, Sahitya Bhawan Publications, Agra 282002
2. Dr. G.K. Varshney, Business Regulatory Framework , Sahitya Bhawan Publications, Agra - 282002
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship , McGraw Hill (India) Private Limited, Noida - 201301

4. M.Scarborough, R.Cornwell, Essentials of Entrepreneurship and small business management, Pearson Education India, Noida - 201301
5. Charantimath Poornima M. Entrepreneurship Development and Small Business Enterprises, Pearson Education, Noida - 201301
6. M N Arora, A Textbook of Cost and Management Accounting, Vikas Publishing House Pvt. Ltd., New Delhi-110044
7. Prasanna Chandra, Financial Management, Tata McGraw Hill education private limited, New Delhi
8. Simon Daniel, HOW TO START A BUSINESS IN INDIA, BUUKS, Chennai – 600018
9. Ramani Sarada, The Business Plan Write-Up Simplified - A practitioners guide to writing the Business Plan, Notion Press Media Pvt. Ltd., Chennai - 600095.

Board Examination – Evaluation Pattern

Internal Mark Allocation

Assignment (Theory portion)*	-	10
Seminar Presentation	-	10
Attendance	-	5
Total	**-**	**25**

Note: * Two assignments should be submitted. The same must be evaluated and converted to 10 marks.

Guidelines for assignment:

First assignment	– Unit I
Second assignment	– Unit II
Guidelines for Seminar Presentation	- Unit III

Each assignment should have five three marks questions and two five marks questions.

BOARD EXAMINATION

Note:

• The students should be taught all units and proper exposure and field visit also arranged. All the portions should be completed before examinations.

• The students should maintain theory assignment and seminar presentation. The assignment and seminar presentation should be submitted during the Board Practical Examinations.

• The question paper consists of theory and practical portions. All students should write the answers for theory questions (45 Marks) and practical portions (55 Marks) should be completed for board examinations.

• All exercises should be given in the question paper and students are allowed to select by lot. If required the dimensions of the exercises may be varied for every batch. No fixed time allotted for each portion and students have liberty to do the examination for 3Hrs.

• For Written Examination: theory question and answer: 45 Marks Ten questions will be asked for 3 marks each. Five questions from each unit 1 & 2. (10 X 3 = 30).

- Three questions will be asked for 5 marks each. One question from each unit 1, 2 & 3. (3 X 5 = 15)
- For Practical Examination: The business plan/Feasibility report or Report on Unit 4 & 5 should be submitted during the board practical examinations. The same have to be evaluated for the report submission (40 marks).

DETAILED ALLOCATION OF MARKS

SI. No	Description	Marks
Part A	Written Examination - Theory Question and answer 10 questions x 3 marks = 30 marks 3 questions x 5 marks = 15 marks	45
Part B	Practical Examination – Submission on Business Plan/Feasibility Report or Report on Unit 4 & 5	40
Part C	Viva voce	15
	Total	100

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Course Name : **Diploma in Mechanical Engineering**
Subject Code : **GE601T**
Semester : **VI**
Subject Title : **Industrial Engineering and Management**

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Industrial Engineering and Management	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	6	**96**	**40**	**100***	**100**	**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Plant Engineering and Plant Safety	18
II	Work Study, Method Study and Work Measurement	18
III	Principles, Personnel Management and Organizational Behavior:	19
IV	Financial and Material Management	18
V	Engineering Ethics and Human Values	16
	Test and Model Exam	07
	Total	**96**

RATIONALE:

In the Indian Economy, Industries and Enterprises always find prominent place. After globalization, the students should be trained not only in manufacturing process but also in managing activities of industries. The knowledge about plant, safety, work study techniques, personnel management, financial management and engineering ethics and human values will definitely help the students as managers to suit the industries.

OBJECTIVES:
- To study the different types of layout.
- To study the safety aspects and its impacts on an organization.
- To study different work measurement techniques.
- To study engineering ethics and human values.
- To study the staff selection procedure and training of them.
- To study capital and resources of capital.
- To study inventory control system.
- To study about organization and it's behavior.

GE601T - INDUSTRIAL ENGINEERING AND MANAGEMENT
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Plant Engineering and Plant Safety** **Chapter: 1.1: Plant Engineering :** Plant – Selection of site of industry – Plant layout – Principles of a good layout – types – process, product and fixed position – techniques to improve layout – Principles of material handling equipment – Plant maintenance – importance – Breakdown maintenance, preventive maintenance and scheduled maintenance. **Chapter: 1.2: Plant Safety:** Importance – accident - causes and cost of an accident - accident proneness - prevention of accidents - Industrial disputes - settlement of Industrial disputes – Collective bargaining, conciliation, Mediation, arbitration - Indian Factories Act 1948 and its provisions related to health, welfare and safety.	18
II	**Work Study, Method Study and Work Measurement** **Chapter: 2.1: Work Study:** Productivity – Standard of living – method of improving productivity – Objectives – Importance of good working conditions. **Chapter: 2.2: Method Study:** Definition – Objectives – Selection of a job for method study – Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart, Man Machine chart, String diagram and flow diagram. **Chapter: 2.3: Work Measurement:** Definition – Basic procedure in making a time study – Employees rating factor – Application of time allowances – Rest, Personal, Process, Special and Policy allowances – Calculation of standard time – Problems – Basic concept of production study – Techniques of work measurement - Ratio delay study, Synthesis from standard data, analytical estimating and Pre determined Motion Time System (PMTS).	18
III	Principles, Personnel Management and Organizational Behavior: **Chapter: 3.1: Principles of Management:** Definition of management – Administration - Organization – F.W. Taylor's and Henry Fayol's Principles of Management – Functions of Manager – Directing – Leadership –Types of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation - Modern management techniques- Management Information Systems – Strategic management – SWOT Analysis - Business Process Re-engineering (BPR) – Enterprises Resource Planning (ERP) –Activity Based Management (ABM) – Global Perspective – Principles and brief description. **Chapter: 3.2: Personnel Management:** Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school training – Job evaluation and merit rating – objectives and importance – wages and salary administration – Components of wages – Wage fixation – Type of wage payment – Halsey's 50% plan, Rowan's plan and Emerson's efficiency plan – Problems. **Chapter: 3.3: Organizational behavior:** Definition – organization - Types of Organization – Line, Staff, Taylor's Pure functional types – Line and staff and committee type – Organizational Approaches, individual behavior - causes - Environmental effect -	19

	Behavior and Performance, Perception - organizational implications.	
IV	**Financial and Material Management** **Chapter: 4.1: Financial Management:** Fixed and working capital – Resources of capital – shares preference and equity shares – debentures – Type of debentures – Public deposits, Factory costing – direct cost – indirect cost – Factory overhead – Selling price of a product – Profit – Problems. Depreciation – Causes – Methods - Straight line, sinking fund and percentage on diminishing value method – Problems. **Chapter: 4.2: Material Management:** Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Minimum Stock, Lead Time, Reorder Level - Economic order quantity - problems – supply chain management - Introduction – Purchasing procedure – Store keeping – Bin card.	18
V	**Engineering Ethics and Human Values** **Chapter: 5.1: Engineering Ethics:** Definition - engineering ethics - personal and business ethics - duties and rights - engineering as a profession - core qualities of professional practitioners – environment and their impact - code of ethics - procedure for solving ethical conflicts - ethical judgment - Kohiberg's stages of moral development – value based ethics - engineers as managers, consultants and leaders - environmental ethics - computer ethics - Intellectual Property Rights (IPRs). **Chapter: 5.2: Human values :** Morals – values – integrity – service learning - civic virtue - respect for others - living peacefully - caring – sharing – honesty - courage - valuing time cooperation – commitments – empathy – self-confidence – character - stress management.	16

Reference Books:

- Industrial Engineering and Management, O.P. Khanna, Revised Edition Publications (P) Ltd – 2004, 67/4 Madras House, Daryaganj, New Delhi–110002.
- Engineering Economics and Management, T.R. Banga& S.C. Sharma, McGraw Hill Editiion. 2 – 2001, New Delhi.
- Herald Koontz and Heinz Weihrich, Essentials of Management, McGraw Hill Publishing Company, Singapore International Edition. Latest
- Govindarajan .M, Natarajan. S, Senthilkumar V.V, Engineering ethics, prentice hall of India New Delhi, 2004.
- Management, Aglobal perspective, Heinz Weihrich, Harold Koontz, 10th Edition, McGraw Hill International Edition. Latest.
- Essentials of Management,4th Edition, Joseph L. Massie, Prentice - Hall of India, New Delhi 2004.
- S.Chandran, Organizational Behaviours, Vikas Publishing House Pvt. Ltd. Latest
- M.Govindarajan and S.Natarajan, Principles of Management, Prentce Hall of India Pvt.Ltd. New Delhi. Latest.
- Charles B. Fledderman, Engineering ethics, pearson prentice hall, New Jersey, 2004.

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   EE602T
Semester   :   VI
Subject Title   :   E Vehicle Technology & Policy

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
E Vehicle Technology & Policy	**Hours / Week**	**Hours / Semester**	**Marks**			**Duration**
			Internal Assessment	**Board Examinations**	**Total**	
	4	**64**	**40**	**100***	**100**	**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Environmental impact and history, Types of Electric vehicles	**12**
II	Electric vehicle, Electrical Propulsion System	**12**
III	Energy Storages, Charging System, Effects and Impacts	**11**
IV	Electric Mobility Policy Frame Work	**11**
V	E-Vehicle Policy 2019	**11**
Test and Model Exam		**07**
Total		**64**

RATIONALE:

The world is transitioning to cleaner mobility options with the aim at improving air quality and reducing dependency on fossil fuels. Electric Vehicles (EVs) have emerged a popular clean mobility choice to reduce emissions. EVs are powered fully or partially by batteries, they can help to reduce dependence on fossil fuels also air quality. Due the rapid depletion of fossil fuel and increase in fuel cost, environmental pollution, the shift to clean transport is necessary. This subject introduced by keeping all the above factors.

OBJECTIVES:

- To learn the environmental impact and history of Electric Vehicles.
- To understand the concept of Electric Vehicle and its types.
- To study the configurations of Electric Vehicles
- To acquire knowledge about Energy Storages, Charging System, Effects and Impacts
- To appreciate the Electric Mobility Policy Frame work India and EV Policy.

DETAILED SYLLABUS

Unit	Name of the Topics	Time
I	**Environmental impact and history:** Environmental impact of conventional vehicle - Air pollution – Petroleum resources – History of Electric vehicles & Hybrid Electric Vehicles - Conventional drive train system – Rear Wheel, Front Wheel and All wheel - Parts of Drive train system **Types of Electric Vehicles:** Introduction to Battery Electric Vehicle (BEV) – Definition BEV – Necessity BEV – Different between BEV and Conventional Vehicle - Advantages of BEV - Block diagram of BEV – Hybrid electric Vehicle (HEV) - Plug-in Hybrid Electric Vehicle (PHEV) – Fuel Cell Electric Vehicle (FCEV) – Description.	12
II	**Electric Vehicles:** Configurations of Electric Vehicle – Performance of Electric Vehicles –Tractive Effort in Normal Driving – energy consumption. Hybrid Electric Vehicles: Concept of Hybrid electric drive trains – Architecture of Hybrid Electric Drive trains – Series, Parallel and Series & Parallel **Electric Propulsion Systems:** Types of EV motors - DC motor drives– Permanent Magnetic Brush Less DC Motor Drives (BLDC) – Principles, Construction and Working – Hub motor Drive system – Merits and Demerits of DC motor drive, BLDC motor drive	12
III	**Energy Storages:** Electrochemical Batteries – Battery Technologies – Construction and working of Lead Acid Batteries, Nickel Based Batteries and Lithium Based Batteries - Role of Battery Management System (BMS)– Battery pack development Technology– Cell Series and Parallel connection to develop battery pack. **Charging:** Battery Charging techniques - Constant current and Constant voltage, Trickle charging – Battery Swapping Techniques – DC charging – Wireless charging – Maintenance of Battery pack – Latest development in battery chemistry. **Effects and Impacts:** Effects of EV – Impacts on Power grid – Impacts on Environment – Impacts on Economy.	10
IV	**Electric Mobility Policy Frame Work** Government of India Electric Mobility Policy Frame work – Global Scenario of EV adoption – Electric mobility in India – National Electric Mobility Mission Plan 2020 – Action led by Original Equipment Manufacturers – Need of EV Policy – Advantage of EV Eco system –Scope and Applicability of EV Policy – ARAI Standards for Electric Vehicle – AIS 038, AIS 039 &AIS 123 - Key Performance Indicator - Global impact – Trends and Future Developments	11
V	**State E-Vehicle Policy 2019** State E-vehicle Policy 2019: Vehicle Population in concern state – Objectives of EV Policy – Policy Measures – Demand side incentives – Supply side incentives to promote EV manufacturing – Revision of Transport Regulation of EV – City building codes – Capacity Building and skilling – Charging structure – implementing agencies – Reasearch & Development and Business Incubation – Recycling Ecosystem – Battery and EVs	11

Reference Books

- Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York.
- Comparison of Electric and Conventional Vehicles in Indian Market: Total Cost of Ownership, Consumer Preference and Best Segment for Electric Vehicle (IJSR), Akshat Bansal, Akriti Agarwal
- A Comprehensive Study of Key Electric Vehicle (EV) Components, Technologies, Challenges, Impacts, and Future Direction of Development (MDPI), Fuad Un-Noor, Sanjeevikumar Padmanaban, Lucian Mihet-Popa, Mohammad Nurunnabi Mollah and Eklas Hossain.
- Electric Vehicles: A future Projection CII October 2020 report.
- Design and analysis of aluminum/air battery system for electric vehicles, Shaohua Yang, Harold Knickle, Elsevier.
- Propelling Electric Vehicles in India, Technical study of Electric Vehicles and Charging Infrastructure
- ZERO EMISSION VEHICLES (ZEVs): TOWARDS A POLICY FRAMEWORK – NTI Aayog.
- FASTER ADOPTION OF ELECTRIC VEHICLES IN INDIA: PERSPECTIVE OF CONSUMERS AND INDUSTRY, The Energy and Resources Institute, New Delhi.
- India EV Story: Emerging Opportunities by Innovation Norway.
- Automotive Industry Standards – AIS 038, AIS 039 & AIS 123 – Manual

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   ME603T
Semester   :   VI
Subject Title   :   Industrial Robotics and 3D Printing

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Industrial Robotics and 3D Printing	**Hours / Week**	**Hours / Semester**	**Marks**			**Duration**
			Internal Assessment	**Board Examinations**	**Total**	
	5	**80**	**40**	**100***	**100**	**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Fundamentals of Robot Technology	12
II	Drive Systems, End Effecters, Sensors and Machine Vision System	12
III	Robot Programming, Robot Applications in Manufacturing	12
IV	Introduction and Design for Additive Manufacturing	18
V	Additive Manufacturing Processes	19
Test and Model Exam		07
Total		**80**

RATIONALE:

Rapid industrialization and globalization needs industries to be more competitive and deliver cost effective quality products. This needs industries to implement flexible manufacturing systems where Robotic technology plays major role. Hence study of robotic technology is very essential. 3D printing is often utilized when manufacturers need to create a product accurately, quickly and at a low quantity. This has lead to 3D printers being brought in to prototype industrial robots, helping to aid the development of better, more efficient robots in the industrial sector.

OBJECTIVES:

- Understand fundamentals of robotics
- Acquire knowledge structure and elements of robot
- Gain knowledge on controller and various drives used in robotics
- Develop knowledge on role of sensors and vision system
- Acquire skill to program and control robot
- Understand to adopt robot to various industrial applications.
- To acquire the knowledge on 3D Printing and design principles for additive manufacturing
- To understand the principles of latest manufacturing processes in Additive Manufacturing.

ME603T - INDUSTRIAL ROBOTICS AND 3D PRINTING
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Time
I	**Fundamentals of Robot Technology** Introduction – History of robot– Definitions– Basic configuration of Robotics – Robot Components – Manipulator, End effecter, Driving system, Controller and Sensors – Degrees of freedom – Links and joints – Types of joints – Joint notation scheme – Pitch, Yaw, Roll – Classification of robots – Work envelope and Work Volume – Effect of structure on Control ,Work envelop and Work volume- Introduction to PUMA robot- Robot controller Configuration - Four types of controls – Open loop and closed loop controls – Speed of response and stability – Precision of movements: Spatial resolutions, accuracy and repeatability.	12
II	**Drive Systems, End Effecters, Sensors and Machine Vision System** Pneumatic drives – Hydraulic drives – Mechanical drives –Electrical drives – Stepper motors, DC Servo motors and AC Servo motors– Applications and Comparisons of Drives. End effecters – Grippers – Mechanical Grippers, Magnetic Grippers, Vacuum Grippers- Selection and design considerations in robot gripper- Requirements of Sensors – Position sensors: LVDT, Resolvers, Optical encoders- Proximity sensors: Inductive, Capacitive, Ultrasonic and Optical proximity sensors- Touch Sensors – Range Sensors- Machine Vision System: Sensing & Digitizing Image Data – Image Processing and Analysis - Application	12
III	**Robot Programming, Robot Applications In Manufacturing** Forward kinematics, Inverse kinematics and differences – Forward kinematics and Reverse kinematics of manipulators with Two and Three degrees of freedom – Derivations. Robot Programming – Lead through programming, Textual programming – Teach Pendant for Robot system – Robot programming languages – Motion commands, Sensor commands, End effecter commands. Robot applications – Material handling - Spot welding – Arc welding – Spray painting – Assembling – Finishing-AGV-RGV.	12
IV	**Introduction and Design for Additive Manufacturing** **Introduction to Additive Manufacturing** Additive Manufacturing – 3D Printing – Rapid prototyping – Overview – Need – Additive manufacturing Vs CNC Machining - Development of Additive Manufacturing Technology – Principle of AM Process – Generalised Additive Manufacturing Process Chain - Classification - Benefits – Direct and Indirect process, Prototyping, Manufacturing and Tooling. **Design for Additive Manufacturing** Design tools: Data processing -CAD model preparation - STL file - Part orientation and support structure generation - Model slicing - Tool path generation. Design for Additive Manufacturing: Concepts and objectives - AM unique capabilities - DFAM for part quality improvement – strategies – Design Rules - Quality aspects - Software for AM - MIMICS, etc.	18
V	**Additive Manufacturing Processes**	19

	Photo polymerization and Powder Bed Fusion Processes	
	Photo polymerization: SLA – Photo curable materials – Process – reaction rates – scan patterns – Advantages and Applications. Powder Bed Fusion: SLS – Process description – powder fusion Mechanism – material feed system – Process Parameters – Materials and Applications. Electron Beam Melting **Extrusion Based And Sheet Lamination Processes** Extrusion Based System: FDM – Introduction – Basic Principle – plotting and path control – Materials – Applications and Limitations – Bio-extrusion. Sheet Lamination Process: LOM – Materials – Gluing or Adhesive bonding – Thermal bonding- Ultrasonic AM. **Printing Processes And Beam Deposition Processes** Droplet formation technologies – Continuous mode – Drop on Demand mode – Three Dimensional Printing - Advantages - Bioplotter – Beam Deposition Process: LENS- Process description – Material delivery – Process parameters – Materials – Benefits.Applications of AM technologies in Automotive, Manufacturing, Architectural, Healthcare, and Consumer products.	

Reference Books:
1. Industrial Robotics – Technology, Programming and Applications, P.Groover, MCGraw Hill, 2001
2. Chua C.K., Leong K.F., and Lim C.S., "Rapid prototyping: Principles and applications", Third edition, World Scientific Publishers, 2010.
3. Ian Gibson, David W. Rosen, Brent Stucker "Additive Manufacturing
4. Technologies: Rapid Prototyping to Direct Digital Manufacturing" Springer, 2010.
5. Robotics Control, Sensing, Vision and Intelligence, Fu.K.S.Gonzalz.R.C., and Lee C.S.G, McGraw-Hill Book Co., 1987
6. Robotics for Engineers, Yoram Koren, McGraw-Hill Book Co., 1992
1. Robotics and Image Processing, Janakiraman.P.A, Tata McGraw-Hill, 1995
2. Andreas Gebhardt "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Manufacturing" Hanser Gardner Publication 2011.
3. Kamrani A.K. and Nasr E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.
4. Liou L.W. and Liou F.W., "Rapid Prototyping and Engineering applications: A tool box for prototype development", CRC Press, 2007.
5. Tom Page, "Design for Additive Manufacturing" LAP Lambert Academic Publishing, 2012.
6. Amit Bandyopadhyay, and Susmita Bose, "Additive Manufacturing", CRC Press.
7. John O Milewski., "Additive Manufacturing of Metals: From Fundamental Technology to Rocket Nozzles, Medical Implants, and Custom Jewellery", Springer Series in Materials Science
8. Sabrie Soloman. "Additive Manufacturing: Advanced Manufacturing Technology in 3d Print Deposit"
9. David Ian Wimpenny and Pulak M Pandey, "Advances in 3D Printing and Additive Manufacturing Technologies"
10. Andreas Gebhardt, Hanser, "Understanding Additive Manufacturing"

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   ME604T
Semester   :   VI
Subject Title   :   Refrigeration and Air-Conditioning

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Refrigeration and Air-Conditioning	**Hours / Week**	**Hours / Semester**	**Marks**				**Duration**
			Internal Assessment	**Board Examinations**	**Total**		
	5	**80**	**40**	**100***	**100**		**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Refrigeration System And Refrigeration Equipments	15
II	Vapour Compression Refrigeration System And Vapour Absorption Refrigeration System	15
III	Refrigerant Flow Controls, Refrigerants And Lubricants, Applications Of Refrigeration	15
IV	Psychrometry And Comfort Air Conditioning	14
V	Air Conditioning Systems And Cooling Load Calculations	14
	Test and Model Exam	07
	Total	80

RATIONALE:

Requirement of human comfort, maintenance of machines and preserving perishables through air conditioning is very essential. Hence learning the study of refrigeration principles, refrigeration system, Concept of air-conditioning and methods of facilitates quality design of air conditioners is essential.

OBJECTIVES:

- Explain the working of open and closed air system of refrigeration.
- Describe the working and construction of compressors used for airconditioning
- Explain the vapour compression refrigeration system.
- Explain the vapour absorption refrigeration system.
- Compare the properties and applications of various refrigerants.
- Define the parameters used for air conditioning.
- To Use the psychometric chart.
- Estimate the cooling load for the given requirement.
- Explain the industrial application of refrigeration.

ME604T - REFRIGERATION AND AIR-CONDITIONING
DETAILLED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Time
I	**REFRIGERATION SYSTEM** Thermodynamic state of a pure substances - modes of heat Transfer - laws of heat transfer - mechanisms of production of cold - unit of refrigeration - types of refrigeration - reversed Carnot cycle - C.O.P of heat engine - heat pump - refrigerating machine - principle of working of open and closed air system of refrigeration - Advantages and disadvantages – problems. **REFRIGERATION EQUIPMENTS** Compressor - principle of working and constructional details of reciprocating and rotary compressors, hermetically and semi hermetically sealed compressors - condensers - principle of working and constructional details of air cooled and water cooled Condensers, evaporative condensers – advantages and disadvantages – natural and forced draught cooling towers. Evaporators – natural circulation and forced circulation type – principle of working constructional details.	15
II	**VAPOUR COMPRESSION REFRIGERATION SYSTEM** Principle of working of vapour compression system – analysis of vapour compression cycle using T-s diagram and p-H diagram refrigerating effect - compression work – C.O.P – effect of superheating and under cooling – problems – effect of evaporative pressure – condenser pressure – liquid – vapour refrigeration heat exchangers – advantages and disadvantages of superheating and Under cooling – use of flash chamber and accumulator. **VAPOUR ABSORPTION REFRIGERATION SYSTEM** Simple absorption system – Electrolux system – Solar absorption system - absorption system comparison with Mechanical (Compression) refrigeration system.	15
III	**REFRIGERANT FLOW CONTROLS, REFRIGERANTS AND LUBRICANTS AND APPLICATION OF REFRIGERATION** Capillary tube - automatic expansion valve – thermostatic expansion valve - solenoid valve - evaporator pressure regulator – suction pressure regulator - selection of a refrigerant – properties and Applications of following refrigerants SO2, CH4, F11, F12, F22, and NH3 – lubricants used in refrigeration and their applications, Cryogenics. **APPLICATIONS OF REFRIGERATION** Slow freezing – quick freezing – cold storage – frozen storage freeze drying – dairy refrigeration – ice cream cabinets – ice making – Water cooler, milk cooler, bottle cooler – frost free refrigeration.	15

IV	**PSYCHROMETRY AND COMFORT AIR CONDITIONING** Definitions of dry air, moist air, water vapour, Avogadro's law, Dalton's law of partial pressure – dry and wet bulb temperature dew point – humidity – specific and absolute – relative humidity - degree of saturation – enthalpy of moist air - adiabatic saturation of air by evaporation of water – psychometric chart and its uses – psychometric processes – sensible heating and cooling – humidifying and heating – dehumidifying and cooling – adiabatic cooling with humidification – total heating or cooling processes – sensible heat factor – by pass factor with simple problems – governing optimum effective temperature – comfort chart – design consideration.	14
V	**AIR CONDITIONING SYSTEMS** Equipment for air conditioning and insulation factors – airpurification – temperature control – humidity control – dry and wet filters - centrifugal dust collector – air washer humidifier – dehumidifier – fans and blowers – grills and registers – summer and winter air conditioning, window type air conditioner – split type air conditioner system – properties of ideal insulator, types of insulating materials – air distribution and duct systems – tools and Installation, servicing and maintenance of R & AC systems. **COOLING LOAD CALCULATIONS** Different heat sources – conduction heat load – radiation Load of sun – occupants load – equipment load – infiltration air load–miscellaneous heat sources – fresh air load – simple problems.	14

Reference books:
1. Refrigeration and air conditioning, P.L. Ballaney, Khanna Publishers, 2B,North Market, Naisarak, New Delhi 110 006.
2. Refrigeration and air conditioning, V.K. Jain,
3. Industrial Refrigeration Hand Book, Wilbert F. Steocker
4. A course in refrigeration and air conditioning, Domkundwar,
5. Principles of refrigeration, Dossat ,
6. Home refrigeration and air conditioning, Audels, Theo.Audel & Co. publisher,199 Edn.49, West 23rd Street, New York. – 1998
7. Refrigeration and air conditioning, C.P Arora,
8. Cryogenic systems Randell Fd Barron.

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Course Name : Diploma in Mechanical Engineering
Subject Code : ME605T
Semester : VI
Subject Title : Automobile Technology

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Automobile Technology	**Hours / Week**	**Hours / Semester**	**Marks**				**Duration**
			Internal Assessment	**Board Examinations**	**Total**		
	5	**80**	**40**	**100***	**100**	**3Hrs.**	

*Examinations will be conducted for 100 marks and it will be reduced to 60 marks for result.

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Automobile Engines	14
II	Fuel Feed Systems and Alternative fuels	14
III	Transmission and Power Trains	15
IV	Automobile Chassis	15
V	Electrical Equipment & Hybrid Electric Vehicles	15
Test and Model Exam		07
Total		80

RATIONALE:

Automobile is one of the key areas of development in India facilitated by multinational companies. As Automobile is the Major sources of employing man power a thorough knowledge on Automobile Engine construction and its functioning is required with due consideration on pollution control.

OBJECTIVES:

• Explain about the constructional details of an Automobile engine including cooling and lubrication system.

• Describe fuel feed systems for petrol and diesel engines with all devices involved in it.

• Explain the construction and functional features of the power transmission systems and various parts involved in it.

• Explain the functions of different types of steering, suspension and brake systems.

• Describe the different types of chassis and their functions.

• Familiarize electrical and electronic equipments used in automobile.

• To understand the emerging trends of electric vehicles, hybrid electric vehicles and solar vehicles.

• To know the automobile emissions and its effects on environment.

ME605T - AUTOMOBILE TECHNOLOGIES
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Time
I	**Automobile Engines** Basic Engine Components – Functions , types , materials and construction of –Cylinder block – Crankcase – oil pan – Cylinder head – Gaskets – cylinder liners– Comparison of liners – Piston – piston rings – types of compression rings and oil control rings – piston pin – Connecting rod - methods of connecting piston and Connecting rod – Crankshaft – flywheel – Cam shaft – Valve and Valve mechanism – L-I-F-T.Cooling systems – purpose – types –air and water cooling systems – merits and demerits –pump assisted water cooling systems –components – water pump, fan - thermostat – types - radiator –types –pressure cap - troubles in cooling system. Lubrication systems – purpose – types of lubricants – additives – Service rating of oil – types of lubricating systems - Full pressure system – techniques of cylinder and piston lubrication – oil filters – full flow and bypass filter systems - Troubles in lubrication system.	14
II	**Fuel Feed Systems And Alternative fuels** Requirements of good fuel-Types of fuel feed systems- S.U. Electrical fuel pump – fuel filter – Air cleaners – types- petrol injection –merits and demerits – DTSI – VTI – CCVTI – PGMFI – MPFI system. Layout of diesel and petrol fuel feed system – single acting fuel feed pump – fuel injection pumps – Construction and working of distributor type pump – CRDI system - fuel injectors – types – Single & Multi hole – pintle and pintaux - fuel filters – primary and secondary filters. Alcohol, Hydrogen, Compressed Natural Gas, Liquefied Petroleum Gas and Bio Diesel - Properties, Suitability, Merits and Demerits - Engine Modifications	14
III	**Transmission And Power Trains** General arrangement of power transmission system –arrangement of front engine rear drive – rear engine rear drive – front engine front drive - four wheel drive – applications – clutch – function – Components – Types - Single plate ,multi plate and diaphragm spring clutch – fluid coupling – Clutch troubles and their causes. Gear box – purpose – various resistance to motion – types of gear boxes –constant mesh and synchromesh-gear box troubles and their causes. Drive line – propeller shaft – Universal joint – Cross type only – slip joint – final drive – function – types of gear arrangement – straight & spiral Bevel , Hypoid, Worm and Worm Wheel – merits , demerits and application – Hotch kiss drive –Torque tube drive – radius rod. Differential – purpose – Construction and operation – Self-locking and non-slip differential – Differential troubles and their Causes – Semi floating, three quarter floating and full floating rear axles.	15

IV	**Automobile Chassis** Front axle – Types – Stub axle – Types – Steering system – ackermann Principle of Steering – Wheel alignment – Factors – Camber , Caster , King pin inclination, Toe in and Toe out on turns - Steering linkages – Steering gears –Cam and double roller , recirculating ball type , Rack and Pinion – Steering troubles and causes – power steering – Necessity – types – Layout of any one type – Collapsible Steering system. Suspension system – Functions – Type of springs – Leaf , coil and Torsion bar– Front suspension systems – independent front suspension –merits and demerits – types – rear end suspension – air suspension - shock absorber –purpose – telescopic type – construction and working. Brake system – functions – classification of brakes – drum brakes – leading shoe and trailing shoe – Self energizing action – hydraulic brake – brake bleeding - Air assisted hydraulic brakes – Air brake – layout , functions of each component and application only – disc brakes – construction and working – comparison of disc and drum type – brake troubles and their causes – anti lock Brake system. Wheels – types of wheels – brief description and applications –tyres – function– construction of tyres – cross and radial ply tyres – comparison.		15
V	**Electrical Equipment & Hybrid Electric Vehicles** Battery – lead acid battery – Nickel alkaline battery – construction – battery rating – charging - testing – starting circuit – construction and operation of starter motor – starting motor drives – over running clutch and Bendix drive – construction and operation – solenoid switch - Charging circuit – alternator construction and operation – regulators – Dynamo. Ignition system – Types – High tension magneto – electronic ignition – Ignition system troubles and remedies. Lighting system – circuit – Head light – Aiming and adjustment – sealed beam head lights – directional signal circuits – fluorescent lamp - Horn circuits - Wind screen wiper. Introduction: Concept and environmental importance of EVs, HEVs and solar vehicles. Electric vehicles: Layout, construction and working. Hybrid electric vehicles: Types, layout, hybridization factor, plug in hybrid electric vehicles, fuel efficiency analysis. Challenges and future scope of EVs and HEVs. EMISSION STANDARDS: Euro I, II, III and IV norms, Bharat Stage II, III, IV norms. Motor Vehicle Act.		15

Reference Books:

- Automobile Engineering, G.B.S.Narang, Khanna Publishers, New Delhi.
- Automotive Mechanics,William H. crouse and Donald .L. Anglin, Tata McGraw– Hill Publishing Company Ltd, NewDelhi.
- The Automobile, Harbans Singh Reyat, S.Chand &Co Ltd, NewDelhi
- Vehicle and Engine technology. Vol. I, Heinz Heisler, , ELBS
- Automotive Mechanics, Joseph Heitner, East–west Press (P) Ltd, New Delhi
- Internal Combustion engines, M.L. Mathur & R.P. Sharma, Dhanpat Rai & Sons,
- Modern Electric, Hybrid Electric and Fuel Cell Vehicles, Mehrdad Ehsani, Yimin Gao, Sebastien E.Gay, Ali Emadi, CR Press, London, New York
- Electric & hybrid Vehicle, A.K.babu, Khanna Publications, New delhi.

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   ME606L
Semester   :   VI
Subject Title   :   Solid Modeling Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			
Solid Modeling Practical	**Hours / Week**	**Hours / Semester**	**Internal Assessment**	**Board Examinations**	**Total**	**Duration**
	6	**96**	**60**	**100***	**100**	**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

RATIONALE:

A Mechanical Engineering Diploma Engineer is expected to possess a thorough understanding of drawing, which includes clear visualization and proficiency in reading and interpreting a wide variety of production drawing. The market driven economy demands frequent changes in product design to suit the customer requirements. The introduction of this subject is to provide hands on experience in sketching and modeling of the industrial components using any one of the Computer Aided Design and Modeling packages. The aim of this subject is to help the student to attain the industry identified competency through practice in CAD software.

OBJECTIVES:

- Prepare 2D Drawing using sketcher or part modelling of any parametric CAD software.
- Generate 3D Solid models from 2D sketch or part modelling of any parametric CAD software.
- Prepare assembly of part models using assembly of any parametric CAD software.
- Generate orthographic views of 3D solid models/assemblies using drafting of any parametric software.
- Plot a drawing for given part model/assembly.

DETAILED SYLLABUS

CONTENTS: PRACTICAL
INTRODUCTION

Parametric CAD software – sketch – elements – entities: line – circle – arc – ellipse – polygon – text – dimensions – sketch tools – fillet – chamfer – offset – trim – extend – mirror – rotate – block. Part modeling– reference planes – reference point – reference axes – co-ordinate system – extrude – revolve – swept – helix and spiral – lofts – dome – shell – draft – rib – wrap – intersect – holes – patterns. Assembly – approaches – mate – coincident – sub assembly –rebuild – isolate. Drawing views – save – Plot – model view – exploded view – projected view – section view – import – export – Appearance – rendering.

EXERCISES
PART A:
Draw the given 3D drawing using 3D modeling commands.
1. Model 1
2. Model 2
3. Model 3
4. Model 4
5. Model 5
6. Model 6
PART B:
Draw the part models and assemble the components using 3D modelling.
1. Revolving Centre
2. Tail stock
3. Machine Vice
4. Crane hook
5. Petrol Engine Connecting Rod
6. Pipe Vice

<h2 style="text-align:center">BOARD EXAMINATION</h2>

Note: All the exercises should be completed all the exercises should be given for examination, the students are permitted to select by lot or the question paper from the Pondicherry University should be followed. Record note book should be submitted during examination. Two exercises will be given for examination by selecting one exercise in each PART. The printout of exercises of the student work should be submitted with answer paper and the same have to be evaluated as per the allocation.

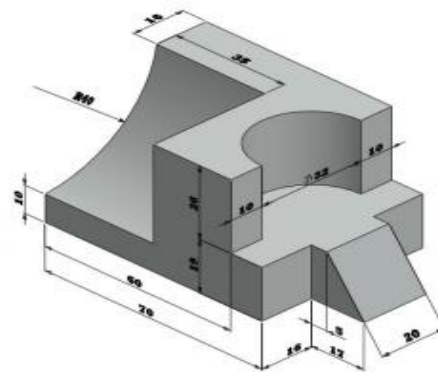<h1 style="text-align:center"><u>DETAILLED ALLOCATION OF MARKS</u></h1>

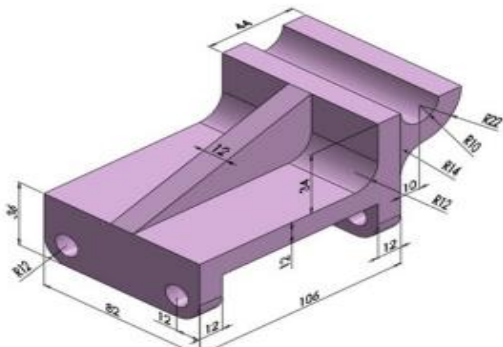| SI. No.	Performance Indicator	Marks
Part A – 3D Component Modeling		
1	Sketching	15
2	3D Modeling	15
Part B – Assemble Drawing Modeling		
3	Sketching / Part modeling	20
4	Assembly	30
5	Solid Model / Views	10
6	Viva voce	10
Total		100

Exercises

PART A: Draw the given 3D drawing using 3D modeling commands.
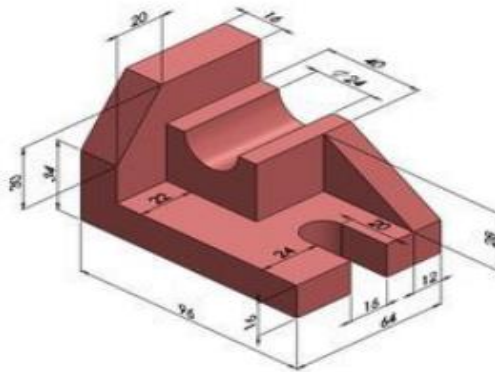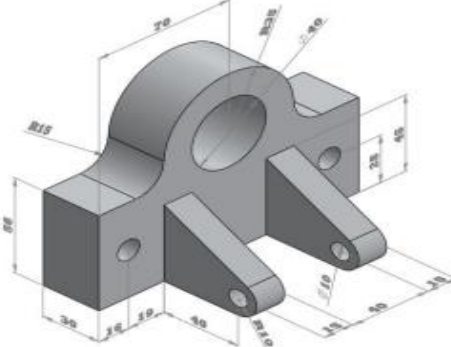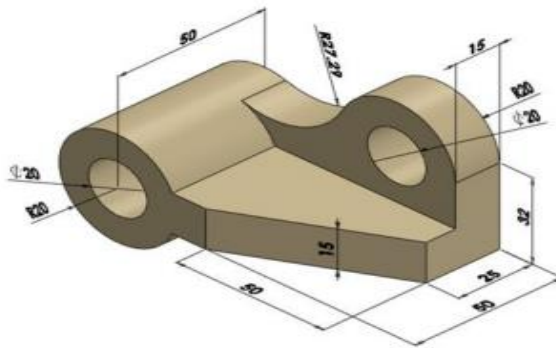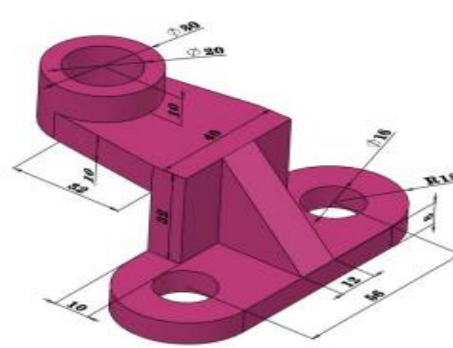

Model 1

Model 2

Model 3

Model 4

Model 5

Model 6

LIST OF EQUIPMENTS

(To accommodate a batch of 30 students in Practice / Board Examinations)

Personal computer : 30 Nos.
Laser Printer   : 1 No.
Software   : GUI System Software
                    : Modeling package – Sufficient to the strength.

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   ME606L
Semester   :   VI
Subject Title   :   Industrial Robotics and 3D Printing Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Industrial Robotics and 3D Printing Practical	**Hours / Week**	**Hours / Semester**	**Marks**			**Duration**
			Internal Assessment	**Board Examinations**	**Total**	
	5	**80**	**60**	**100***	**100**	**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

Objectives:
- Study of Robot / Study of robot simulation software
- To study the components required.
- To study the techniques of programming for various industrial manufacturing applications.
- Prepare a record of work done.
- Acquire knowledge in the field of Additive Manufacturing
- Explain the various concepts of Solid Modeling
- Create STL files to manufacture components using 3D Printer

ME606L - INDUSTRIAL ROBOTICS AND 3D PRINTING PRACTICAL DETAILED SYLLABUS

Contents:

3D Printing: Getting to know the user Interface of the Modeling software – Home screen – navigating the main Screen – options bar – application menu & quick access Toolbar – Describe the function of a sketch - Describe the various types of sketches. Create sketches of 3D models. Basic Modeling Considerations – Describe part creation within the design process. Add placed features to existing parts. Create complex shapes by sweeping or lofting profiles. Assemblies - Managing the assemblies - Assemble a mechanical piece of equipment using constraints. STL files – introduction – conversion of parts from other file formats to STL file – Additive Manufacturing – types of 3D Printers – orientation and positioning of parts - producing 3D working models using 3D Printers.

Exercises:

PART A - Robot Programming

1. Position recording using Cartesian co-ordinate system - (No. of positions - 9)
2. Position recording using Polar co-ordinate system - (No. of positions - 9)
3. Pick and place the objects - No. of objects - 6)
4. Pick and stack the objects - (No. of objects - 6)
5. Spray painting practice - (Area - 300mm x 300mm)
6. Spot welding practice - (No. of spots - 9)
7. Arc welding practice – (Length of weld 50 mm)

8. Assembling practice - (Minimum 3 Components)
9. Profile cutting practice - (Complicated profile – combination of lines and arcs)

PART B - 3D Printing
1. Create the model and produce the Gear Train in 3D printing.
2. Create the model and produce the Geneva Gear & Ratchet mechanism.
3. Create the model and produce the Slide-crank mechanism.

Note: Every student is asked to design and produce only one component of an assembly. After the completion of the product, individual parts are checked for its precision and matting in the assembly. Hence group exercises can be given. The models can be scaled according to the print area of the 3D Printer.

BOARD EXAMINATION

Note: All the exercises should be completed all the exercises should be given for examination, the students are permitted to select by lot or the question paper from Pondicherry University should be followed. Record note book should be submitted during examination.

Two exercises will be given for examination by selecting one exercise in each PART.

DETAILLED ALLOCATION OF MARKS

SI. No.	Performance Indicator	Marks
Part A – Robot Programming		
1	Robot Programming	20
2	Simulate / Execution	30
3	Result	10
Part B – 3D Printing		
4	CAD - Modeling	15
5	3D Printing	15
6	Viva voce	10
Total		100

LIST OF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

Personal computer   : 10 Nos.
6 Axis Robot   : 1 No.
3D Printer   : 1 No.
Software   : GUI System Software
                      : Modeling package / 3D Printer (Sufficient to the strength)

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Course Name : Diploma in Mechanical Engineering
Subject Code : ME608L
Semester : VI
Subject Title : Refrigeration and Air-Conditioning Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination				
Refrigeration and Air-Conditioning Practical	Hours / Week	Hours / Semester	Marks				Duration
			Internal Assessment	Board Examinations	Total		
	5	80	60	100*	100		3Hrs.

*Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

Objectives:
- Identify the various tools used in R & AC
- Demonstrate the construction and working of window air conditioner
- Demonstrate the construction and working of split type air conditioner
- Set parameters for comfortable operation of an air conditioner.
- Determine the C.O.P of air conditioner.
- Determine the capacity of window air conditioner.
- Describe the wiring of refrigerator and coolers.
- Perform servicing on air conditioner.

Experiments:
PART A
1. Determine the refrigerating effect, C.O.P and the compressor capacity of a open type system with any one expansion device. (Thermostatic expansion valve / Capillary tube / Automatic Expansion Valve)
2. Determine the C.O.P of sealed system by using electrical measurements.
3. Determine the capacity of a window air conditioner.
4. Determine the efficiency of a cooling tower.
5. Conduct Leak tests in a split air conditioning system, detect the failures and suggest the remedies. Conduct the Refrigerant Charge Test.
6. Conduct the flush test to remove the contaminants of refrigeration system and recharge.

PART- B
1. Study the various sizes of copper and steel tubing. To study the various tools used for operations.
2. Study and carry out the various operations on copper and steel tubing– Flaring, Swaging and Soldering methods used in R& A.C.
3. Study the methods to set and adjust the following a) Thermostats, b) Low pressure and high pressure cut-outs c) Thermostatic expansion valve d) Automatic Expansion Valve.
4. Conduct the service to change refrigerant into service cylinder from storage cylinder.
5. Conduct the service to pump down the system and to purge air from the system.

6. Conduct the service to check the oil level in the compressor and trace the common faults in R & A.C units and their remedies.

BOARD EXAMINATION

Note:

1. All the experiments in both sections should be completed. Two experiments will be given for examination by selecting one from PART A and one from PART B.

2. All the experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the PONDICHERRY UNIVERSITY should be followed.

3. All regular students appearing for first attempt should submit record notebook for the examination.

4. The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.

5. The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

Detailed Allocation of Marks

PART A

Procedure	-	10
Formulae / Observation	-	20
Calculation / Result	-	20

PART B

Description / Procedure	-	15
Tool handling	-	15
Conclusion / Report	-	10
Viva voce	**-**	**10**
TOTAL	**-**	**100**

LIST OF EQUIPMENTS

(To accommodate a batch of 30 students in Practice / Board Examinations)

WORKING MODELS OF THE FOLLOWING WITH ARRANGEMENTS FOR CONDUCTING TESTS

1. Refrigerator with test rig
2. Water cooler
3. Window A/C with test rig
4. Split A/C
5. Cooling tower

WORKING MODEL OF THE FOLLOWING TO CONDUCT EXPERIMENTS

1. Thermostat units
2. Cut off units
3. Thermostatic expansion valve unit
4. Automatic expansion valve unit
5. Sealed compressor with experimental setup

TOOLS:
1. Mechanics tool set
2. Tube cutter
3. Tube bender type
4. Tube bender spring
5. Swaging tool
6. Flaring block
7. Flaring nut
8. Pinching tool
9. Capillary tube testing gauge
10. Blow Lamp

SERVICE TOOLS:
1. Gas cylinder with receiver valve and key
2. Charging System
3. Blow lamp
4. Stem key
5. Spring remover
6. Service valve
7. 't' connector
8. High pressure gauge
9. Compound gauge
10. Leak detector
11. Soldering and Brazing kit.

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Course Name   :   Diploma in Mechanical Engineering
Subject Code   :   ME609L
Semester   :   VI
Subject Title   :   Automobile Technology Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Automobile Technology Practical	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	5	**80**	**60**	**100***	**100**	**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

Objectives:
- Identify the various tools and their applications used in Automobile.
- Dismantle and assemble parts of petrol engine.
- Dismantle and assemble parts of diesel engine.
- Service AC fuel pump, oil pump and water pump.
- Dismantle and assemble fuel injection pump..
- Dismantle and assemble steering gear box.
- Testing and charging of batteries.
- Overhauling of starter motor, alternator.
- Troubleshoot the electrical circuits in automobile.

EXERCISES
PART-A
1. Dismantling and assembling of four stroke petrol engine and identification of parts.
2. Removing camshaft, replacing timing gears, removing valves, lapping and adjusting valve clearance.
3. Removing, servicing and replacing of fuel pump, oil pump & water pump.
4. Removing, servicing & replacing MPFI system.
5. Dismantling and assembling of inline fuel injection pump / CRDI system.
6. Test a battery with specific gravity test and charge the battery with constant amperage / voltage method.
PART-B
1. Removing and replacing of pressure plate and clutch plate, fingers adjustment.
2. Dismantling, inspecting and assembling of constant mesh gear box and find out the gear ratios.
3. Dismantling, assembling and adjusting of steering gear box.
4. Dismantling, overhauling and assembling of starter motor / alternator
5. Trace the automobile electrical system with respect to battery coil ignition system

6. Trace the automobile electrical system with respect to (i) horn relay circuit, (ii) Wiper circuit & explain with neat circuit diagram.

BOARD EXAMINATION

Note:
1. All the exercises in both sections should be completed. Two exercises will be given for examination by selecting one from PART A and one from PART B.
2. All the exercises should be given in the question paper and students are allowed to select by a lot or question paper issued from the Pondicherry University should be followed.
3. All regular students appearing for first attempt should submit record notebook for the examination.
4. The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
5. The external examiner should verify the working condition of machinery's / equipment before commencement of practical examination.

DETAILED ALLOCATION OF MARKS

PART A
Dismantling Procedure   -20
Tools handling methods   -15
Assembly / Report   -10

PART B
Dismantling Procedure   -25
Tools handling methods   -15
Assembly / Report   -10
Viva voce   **-10**
TOTAL   **-100**

LIST OF EQUIPMENTS
(To accommodate a batch of 30 students in Practice / Board Examinations)

1. Automobile Mechanic's tools-Complete Set
2. Internal circlip plier, bearing puller
3. Feeler gauge to check valve clearance, hammer and accessories
4. Compressor to supply high pressure air to clean oil and water filters.
5. 4 stroke petrol engine - with all accessories
6. 4 stroke Diesel engine - with all accessories
7. Engine cylinder with liner and cylinder bore dial gauge
8. Oil pump and water pump.
9. MPFI.
10. Inline Fuel Injection Pump
11. CRDI
12. Injectors.

13. Clutch set arrangement with tools
14. Complete gear box with tools
15. Complete steering arrangement
16. Battery and charging set up.
17. Measuring instruments
18. Consumables

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Course Name   : Diploma in Mechanical Engineering
Subject Code : ME610L
Semester   : VI
Subject Title : Project Work and Internship

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
Project Work and Internship	Hours / Week	Hours / Semester	Marks			Duration
			Internal Assessment	Board Examinations	Total	
	6	**96**	**60**	**100***	**100**	**3Hrs.**

*Examinations will be conducted for 100 marks and it will be reduced to 40 marks for result.

RATIONALE:
This subjects 'Project Work and Internship" is the continuation of the previous semester subjects. The students are to implement the detailed project plan, which they have prepared. This project is generally an integration of the various types of skills acquired during their course of study. Hence it is essential that students are given opportunity to develop and integrate the highly essential industry oriented competencies and skills. This subject builds up greater confidence to face in the world of work.

OBJECTIVES:
• Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment.
• Implement the planned activity as a team.
• Take appropriate decisions on collected information.
• Carryout cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions, as well as to prepare collaborative edition of the final project report.

PROJECT WORK AND INTERNSHIP:
The students of all the Diploma Courses have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the Pondicherry University. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise.

The Project work must be reviewed twice in the same semester.The project work is approved during the V semester by the properly constituted committee with guidelines.

a) Internal assessment mark for Project Work and Internship:

Project Review I ... 20 marks
Project Review II ... 20 marks
Attendance ... 20 marks
(Award of marks same as theory subject pattern)
Total ... 60 marks

Proper record should be maintained for the two Project Reviews and preserved for one semester after the publication of Board Exams results. It should be produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work and Internship in Board Examinations:

Demonstration/Presentation 25 marks
Report 25 marks
Viva Voce 30 marks
Internship Report 20 marks
Total *100 marks

*Examination will be conducted for 100 marks and will be converted to 40 marks.

c) Internship Report:

The internship training for a period of two weeks shall be undergone by every candidate at the end of IV / V semester during vacation. The certificate shall be produced along with the internship report for evaluation. The evaluation of internship training shall be done along with final year "Project Work & Internship" for 20 marks. The internship shall be undertaken in any industry / Government or Private certified agencies which are in social sector / Govt. Skill Centres / Institutions / Schemes.

A neatly prepared PROJECT REPORT as per the format has to be submitted by individual student during the Project Work and Internship Board examination.