GOVERNMENT OF TAMIL NADU

SYLLABUS

DIPLOMA IN MECHANICAL ENGINEERING (FULL TIME, SANDWICH, PART TIME)

SECOND & THIRD YEAR

2011-2012

L - SCHEME

DIRECTORATE OF TECHNICAL EDUCATION

TAMIL NADU

SYLLABUS

DIPLOMA IN MECHANICAL ENGINEERING

FULL TIME, SANDWICH & PART TIME

Course Code: 1020/2020/3020

2011-2012

L - SCHEME

DIRECTORATE OF TECHNICAL EDUCATION
GOVERNMENT OF TAMILNADU

DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2011- 2012)

L – SCHEME

R E G U L A T I O N S*

* *Applicable to the Diploma Courses other than Diploma in Hotel Management & Catering Technology and the Diploma Courses offered through MGR Film Institute, Chennai.*

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. Sandwich (3½ years)

The Course for the Sandwich Diploma in Engineering shall extend over a period of three and half academic years, consisting of 7 semesters❖ and the First Year is common to all Engineering Branches. The subjects of three years full time diploma course being regrouped for academic convenience.

During 4th and/or during 7th semester the students undergo industrial training for six months/ one year. Industrial training examination will be conducted after completion of every 6 months of industrial training

c. 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 2011 – 2012 academic year 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, Tamilnadu.

(Or)

The Anglo Indian High School Examination with eligibility for Higher Secondary Course in Tamilnadu

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other Examinations recognized as equivalent to the above by the Board of Secondary Education, Tamilnadu.

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 Tamilnadu affiliated to the Tamilnadu Higher Secondary Board with eligibility for university Courses of study or equivalent examination, & Should have studied the following subjects

Sl. No	Courses	H.Sc Academic	H.Sc Vocational	
		Subjects Studied	Subjects Studied	
			Related subjects	Vocational subjects
1.	All the Regular and Sandwich Diploma Courses	Maths, Physics & Chemistry	Maths / Physics / Chemistry	Related Vocational Subjects Theory & Practical
2.	Diploma Course in Modern Office Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretary ship.

Subject to the approval of the AICTE

- For the Diploma Courses related with Engineering/Technology, the related / equivalent subjects prescribed along with Practicals 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 Modern Office 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. 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 the State Board of Technical Education and Training, Tamilnadu, 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
Sandwich	3½ Years	6½ Years
Part Time	4 Years	7 Years

6. 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**

7. 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 25 marks are allotted for internal assessment and 75 marks are allotted for Board Examination.

8. Continuous Internal Assessment:

A. For Theory Subjects:

The Internal Assessment marks for a total of 25 marks, which are to be distributed as follows:

i) Subject Attendance **5 Marks**

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

80% - 83%	1 Mark
84% - 87%	2 Marks
88% - 91%	3 Marks
92% - 95%	4 Marks
96% - 100%	5 Marks

ii) Test # **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Out of which the best one will be taken and the marks to be reduced to:	05 marks
The Test – III is to be the Model test covering all the five units and the marks so obtained will be reduced to :	05 marks
Total	10 marks

TEST	UNITS	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** - **Compulsory** Covering all the 5 Units. (Board Examinations-question paper-pattern).	End of 16th week	75	3 Hrs

 # - From the Academic year 2011-2012 onwards.

Question Paper Pattern for the Periodical Test :(Test - I & Test- II)

	14 Questions X 1 mark	… …	14 marks
	6 Questions X 6 marks	… …	36 marks
(OR)	3 Questions X 12 marks		----------
	Total		50 marks
			----------

iii) Assignment **10 Marks**

For each subject Three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 10 marks

All Test Papers and Assignment notebooks after getting the signature with date from the students must be kept in the safe custody in the Department for verification and audit. It should be preserved for 2 Semesters 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 25 marks which are to be distributed as follows:-

a)	Attendance	:	**5**	**Marks** (Award of marks same as theory subjects)
b)	Procedure/ observation and tabulation/ Other Practical related Work	:	**10**	**Marks**
c)	Record writing	:	**10**	**Marks**

	TOTAL	:	**25**	**Marks**

- *All the Experiments/Exercises indicated in the syllabus should be completed and the same to be given for final Board examinations.*
- The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 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 and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)
- The students have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.

- *All the marks awarded for assignments, Tests and attendance should be entered in the Personal Log Book of the staff, who is handling the subject. This is applicable to both Theory and Practical subjects.*

9. Communication and Life Skills Practical:

The Communication and Life Skills Practical with more emphasis is being introduced in IV Semester for Circuit Branches and in V Semester for other branches of Engineering.
Much Stress is given on:

- ❖ Monodic Communication
- ❖ Dyadic Communication
- ❖ Professional Communication
- ❖ Pronunciation
- ❖ Writing Resumes
- ❖ Interview Techniques

Internal Assessment Mark ….. **25 Marks**

10. Project Work:

The students of all the Diploma Courses **(except Diploma in Modern Office Practice)** have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamilnadu. 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.**

a) Internal assessment mark for Project Work & Viva Voce:

Project Review I	…	**10 marks**
Project Review II	…	**10 marks**
Attendance	…	**05 marks** (Award of marks same as theory Subject pattern)
Total	…	**25 marks**

Proper record to be maintained for the two Project Reviews, and It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

b) Allocation of Marks for Project Work & Viva Voce in Board Examinations:

Viva Voce	…	**25 marks**
Demonstration/Presentation	…	**20 marks**
Total	…	**45 marks**

c) Written Test Mark (from 3 topics for 1 hour duration): $

i) Entrepreneurship	5 questions X 2 marks	=	**10 marks**
ii)Environment Management	5 questions X 2 marks	=	**10 marks**
iii)Disaster Management	5 questions X 2 marks	=	**10 marks**
			30 marks

$ **-** Selection of Questions should be from Question Bank, by the External Examiner.

No choice need be given to the candidates.

Project Work & Viva Voce in Board Examination	--	**45 Marks**
Written Test Mark (from 3 topics for 1 hour duration)	--	**30 Marks**
TOTAL	--	**75 Marks**

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

11. Scheme of Examinations:

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

12. 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 State Board of Technical Education & Training, Tamil Nadu 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 Board Examinations marks put together, subject to the condition that he/she secures at least a minimum of *30 marks out of 75 marks in the Board Theory Examinations and a minimum of 35 marks out of 75 marks in the Board Practical Examinations.*

13. Classification of successful candidates:

Classification of candidates who passed out the final examinations from April 2014 onwards (Joined in first year in 2011-2012) will be done as specified below.

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 semesters put together except I and II semesters and passes all the above semesters in the first appearance itself and completes all subjects including that of I & II semesters within the stipulated period of study 3/ 3½/ 4 years (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 semesters put together except I & II semesters and completes all subjects including that of the I & II semesters within the stipulated period of study 3/ 3½ / 4 years (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 mentioned classifications are also applicable for the Sandwich / Part-Time students who passed out Final Examination from October 2014 /April 2015 onwards (both joined in First Year in 2011-2012)

14. Duration of a period in the Class Time Table:

The duration of each period of instruction is1 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).

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Chairperson

Thiru.Ramesh Chand Meena, I.A.S

Commissioner of Technical Education
Directorate of Technical Education
Chennai-600025

Co-ordinator

B.Nandagopal, Principal,
Murugappa Polytechnic College,
Avadi, Chennai – 62

Convener

B.Nandagopal, Principal
Murugappa Polytechnic College,
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HIGHLIGHTS OF CURRICULUM AND SYLLABUS OF II & III YEAR

DIPLOMA IN MECHANICAL ENGINEERING – L SCHEME

SALIENT FEATURES OF CURRICULUM & SYLLABI

- Seven subjects per semester (3 Theory + 4 Practicals) / (4 Theory + 3 Practicals).

- Machine Drawing is introduced as two subjects namely:
  1. Machine Drawing (Manual Drafting)
  2. Computer Aided Machine Drawing Practical

- A new Practical Subject on "Mechanical Testing and Quality Control Practical" is introduced in III Semester.

- A new Practical Subject on "Metrology & Measurement and Machine Tool Testing Practical" is introduced in IV Semester.

- A new theory subject on "Renewable Energy Sources" is introduced in IV Semester.

- A new practical subject "Process Automation Practical" is introduced in VI Semester.

Elective Subjects

In V semester the following electives Theory subjects are offered:

1. Total Quality Management
2. Modern Machining Processes
3. Power Plant Engineering

In VI Semester the following elective theory and related practical subjects are offered

Elective Theory	**Elective Practical**
Automobile Engineering	**Automobile Engineering Practical**
Robotics	**Robotics Practical**
Refrigeration & Air Conditioning	**Refrigeration & Air Conditioning Practical**
Rapid Proto-typing	**Rapid Proto-typing Practical**

CLASSIFICATION OF SUBJECTS AS PER AICTE NORMS

Sl.no.	Category of Subjects	Percentage of subjects as per AICTE norm(Range)	No. of Subject in L-Scheme	Percentage of Subjects in L-Scheme
1.	Basic Subjects	20-35%	12	26.67
2.	Core Subjects	15-25%	10	22.22
3.	Applied Engineering and Technology Subjects	40-55%	20	44.44
4.	Diversified subjects	5-10%	3	6.67

COMPARISON OF L - SCHEME SYLLABUS WITH K - SCHEME SYLLABUS

STRENGTH OF MATERIALS

The title of the subject is changed from Mechanics of Materials to Strength of Materials considering the contents of the syllabus and various book titles of different authors.

Strength of material is the backbone for design. The strength of material deals generally with the behaviour of objects, when they are subjected to forces.

FLUID MECHANICS AND FLUID POWER

The main objective of this subject Fluid mechanic and Fluid power is to study the behavior of fluids under the condition of rest and motion. This chapter deals with fluid pumps, turbines, hydraulic and pneumatic operation. The overall objective is to impart knowledge of pumps (which play a major role in day today life) hydraulic & pneumatic operation of tools & equipments.

THERMAL ENGINEERING-I

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.

MACHINE DRAWING

Manual Drafting and Computer Aided Drafting are given as two separate subjects. Machine Drawing is carried out by the students by Manual drafting.

In K-Scheme Manual Drafting and Computer Aided Machine Drawing were being provided in the same subject and learning was found to be difficult.

Manufacturing of various machine parts and production of various equipments in small scale to big scale industries 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 supervisor cadre students to carry and complete the production and assembly process successfully.

MECHANICAL TESTING & QUALITY CONTROL PRACTICAL

In K-Scheme only testing of materials alone were studied such as tensile strength, compressive strength, shear strength etc.

In L-Scheme in addition to the above Microscopic structure of metals using metallurgical microscope and quality of metals (crack & defect detection) are also included.

FLUID POWER PRACTICAL

In K-Scheme Fluid Mechanics experiments were studied as a part of Mechanics of Materials and Fluid Mechanics Lab with little focus on Fluid Power.

In L-Scheme Fluid Power Practical is being introduced comprising of pneumatic exercises(low cost Automation) and Oil Hydraulics considering the trend of industries towards fluid power.

MANUFACTURING TECHNOLOGY - I

In K-Scheme the title of the subject was “Manufacturing Processes” where as in L-Scheme it has been changed to Manufacturing Technology-I

Manufacturing, the major and the most important aspect in industries needs utmost care and attention. Knowledge about casting processes and allied areas will be of great use to the personnel involved in production.

The areas like heat treatment, powder metallurgy and knowledge in centre lathe and special purpose lathes will provide the students an opportunity to train themselves with the skills needed for the present day industrial scenario.

RENEWABLE ENERGY SOURCES

Electrical Energy requirement is the major crisis and hence any saving in Electrical energy is equivalent to production of Electrical Energy. Saving can be achieved by the utilization of Renewable Energy Sources.

Hence in L-Scheme a new Subject on Renewable Energy Sources is being introduced covering Solar Energy, Wind Energy, Bio Energy, Geothermal Energy etc.

ELECTRICAL DRIVES AND CONTROL

In K-Scheme the title of the subject was “Electrical & Electronics Engg.” covering the fundamentals.

In L-Scheme the title of the subject has been changed to Electrical Drives and Control considering the application requirements of the Mechanical Engineer.

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.

COMPUTER AIDED MACHINE DRAWING PRACTICAL

Manual Drafting and Computer Aided Drafting are given as two separate subjects.

The contemporary progressing world is fast with the latest production systems. The advanced manufacturing of products is developed instantly using CAD Software. Even a small scale industry is now using a CAD software as it has become the heart of the Design department. So CAD has now become inevitable in industries.

Accuracy and Precision are the two important things that decide the quality of a product to survive its competitors in the market. Using CAD software design, the uniform accuracy, multiples of copies and storing in a small space for long time are assured.

The CAD software considerably improves the creativity and flexibility of a designer. The syllabus here enables a candidate to draw an industrial drawing within the optimum reach of a Diploma cadre.

MANUFACTURING TECHNOLOGY – I PRACTICAL

In K-Scheme the title of the subject was “Workshop - I” where as in L-Scheme it has been changed to Manufacturing Technology-I Practical. In L-Scheme it includes skill training on Foundry, Welding and Lathe.

The exercises in lathe are logically arranged so that the output of one exercise becomes the input (Raw Material) for the next exercise. Thus Raw material can be saved and preservation of finished jobs becomes easier.

METROLOGY & MEASUREMENT AND MACHINE TOOL TESTING PRACTICAL

In K-Scheme the title of the subject was “Metrology, Machine Tool Maintenance and Testing Lab” was offered as an Elective subject.

In L-Scheme considering the significance of this subject “Metrology & Measurement and Machine Tool Testing Practical“ is being offered as a Core subject.

ELECTRICAL DRIVES AND CONTROL PRACTICAL

In K-Scheme the title of the subject was “Electrical and Electronics Engineering Lab”.

In L-Scheme the title of the subject is “Electrical Drives and Control Practical” focusing on Electrical drives and Controlling Devices.

MANUFACTURING TECHNOLOGY – II

In K-Scheme the title of the subject was “Machine Shop Technology”.

In L-Scheme the title of the subject is “Manufacturing Technology – II” covering reciprocating machines, milling machines, abrasive processes, press tools and jigs and fixtures.

TOTAL QUALITY MANAGEMENT

In K-Scheme the concept of TQM was studied in the subject

“Industrial Engineering and Management”.

In L-Scheme in addition to the above an Elective subject on “Total Quality Management“ is introduced with detailed study of elements of TQM.

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

MODERN MACHINING PROCESSES

In L-Scheme a new Elective on “Modern Machining processes” is introduced with detailed study of different machining processes such as Mechanical energy based processes, Thermal energy based processes, Chemical energy based processes etc.

POWER PLANT ENGINEERING

In L-Scheme a new Elective on “Power Plant Engineering” is introduced with greater focus on different types of power generation such as Thermal power, Nuclear Power plant etc

COMMUNICATION AND LIFE SKILLS PRACTICAL

In K-Scheme the title of the subject was “English communication practical”.

In L-Scheme the title of the subject is “Communication and Life Skills Practical” covering Communication Skills in English. In addition to that Life Skills (soft skills) are also being included in the content as it is the requirement of stake holders.

COMPUTER INTEGRATED MANUFACTURING

In K-Scheme the title of the subject was “Computer Aided Design and Manufacturing”.

In L-Scheme the title of the subject is “Computer Integrated Manufacturing” covering computer aided design, manufacturing, CNC part programming, FMS and Computer aided material handling.

COMPUTER INTEGRATED MANUFACTURING PRACTICAL

In K-Scheme the title of the subject was “Computer Aided Design and Manufacturing Lab”.

In L-Scheme the title of the subject is “Computer Integrated Manufacturing Practical” covering skill training on CNC part programming in Turning machines and milling machines including simulation and part production.

PROCESS AUTOMATION PRACTICAL

In L-Scheme a new subject on Process Automation Practical is being introduced as core course considering the significance of automating a process in Industries.

The study and utilization of PLC and various sensors for industrial automation is provided for basic applications.

Diploma in Mechanical Engineering L-Scheme
(with effect from 2011)

List of Alternative Subjects for K-Scheme to L - Scheme

III Semester

	K-SCHEME		L-SCHEME	
Sl.No.	Subject code	Name of the Subject	Subject code	Name of Subject
1.	12031	Mechanics of Materials	22031	Strength of Materials
2.	12032	Manufacturing Process	22041	Manufacturing Technology – I
3.	12033	Fluid Mechanics and Fluid Power	22032	Fluid Mechanics & Fluid Power
4.	12034	Machine Drawing-CAD	22044	Computer Aided Machine Drawing Practical
5.	12035	Mechanics of Materials and Fluid Mechanics Lab	22035	Mechanical Testing & Quality Control Practical
6.	12036	Workshop-I (Smithy, Foundry & Welding)	22045	Manufacturing Technology – I Practical

IV Semester

	K-SCHEME		L-SCHEME	
Sl.No.	Subject code	Name of the Subject	Subject code	Name of Subject
1.	12041	Applied Thermodynamics	22042	Thermal Engineering – I
2.	12042	Machine Shop Technology	22052	Manufacturing Technology – II
3.	12043	Electrical and Electronics Engineering	22043	Electrical Drives & Control
4.	12044	Thermodynamics Lab	22055	Thermal Engineering Practical
5.	12045	Electrical and Electronics Engineering Lab	22047	Electrical Drives & Control Practical
6.	12046	Workshop II(Turning, Drilling and Shaping)		No Equivalent

V Semester

	K-SCHEME		L-SCHEME	
Sl.No.	Subject code	Name of the Subject	Subject code	Name of Subject
1.	12051	Design of Machine Elements	22054	Design of Machine Elements
2.	12052	Thermal Engineering	22051	Thermal Engineering – II
3.	**Elective Theory-I**		**Elective Theory-I**	
	12071	Refrigeration and air conditioning	22083	Refrigeration and Air-conditioning
	12072	Metrology, Machine Tool Maintenance and Testing		No Equivalent
4.	11011	English Communication Practical	20002	Communication & Life Skills Practical **
5.	**Elective Practical -I**		**Elective Practical -I**	
	12073	Refrigeration and air conditioning Lab	22087	Refrigeration and Air-conditioning Practical
	12074	Metrology, Machine Tool Maintenance and Testing Lab	22046	Metrology & Measurement and Machine Tool Testing Practical
6.	12056	Workshop-III (Slotting, Planning, Milling, Grinding & CNC Machines)	22056	Manufacturing Technology – II Practical

VI Semester

	K-SCHEME		L-SCHEME	
Sl.No.	Subject code	Name of the Subject	Subject code	Name of Subject
1.	12061	Industrial Engineering & Management	22061	Industrial Engineering and Management
2.	12062	Computer Aided Design and Manufacturing	22062	Computer Integrated Manufacturing
3.	**Elective Theory- II**		**Elective Theory- II**	
	12081	Automobile Technology	22081	Automobile Engineering
	12082	Mechatronics	22082	Robotics
4.	12064	Computer Aided Design and Manufacturing Practical	22064	Computer Integrated Manufacturing Practical
5.	**Elective Practical – II**		**Elective Practical - II**	
	12083	Automobile Technology Lab	22085	Automobile Engineering Practical
	12084	Mechatronics Lab	22086	Robotics Practical
6.	12066	Project Work, Entrepreneurship, Environment and Disaster Management	22067	Project Work

ANNEXURE-I

CURRICULUM OUTLINE
DIPLOMA IN MECHANICAL ENGINEERING (FULL TIME)(1020)

THIRD SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22031	Strength of Materials	6	-	-	6
22032	Fluid Mechanics & Fluid Power	6	-	-	6
22033	Renewable Energy Sources	5	-	-	5
22034	Machine Drawing	-	6	-	6
22035	Mechanical Testing & Quality Control Practical	-	-	4	4
22036	Fluid Power Practical	-	-	4	4
20001	Computer Applications Practical**	-	-	4	4
TOTAL		17	6	12	35

** Common to all Diploma Courses

FOURTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22041	Manufacturing Technology – I	5	-	-	5
22042	Thermal Engineering – I	6	-	-	6
22043	Electrical Drives & Control	5	-	-	5
22044	Computer Aided Machine Drawing Practical	-	-	5	5
22045	Manufacturing Technology – I Practical	-	-	6	6
22046	Metrology & Measurement and Machine Tool Testing Practical	-	-	4	4
22047	Electrical Drives & Control Practical	-	-	4	4
TOTAL		16	-	19	35

CURRICULUM OUTLINE

FIFTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22051	Thermal Engineering – II	5	-	-	5
22052	Manufacturing Technology – II	5	-	-	5
Elective - I Theory		5	-	-	5
22071	Total Quality Management				
22072	Modern Machining Processes				
22073	Power Plant Engineering				
22054	Design of Machine Elements	6	-	-	6
22055	Thermal Engineering Practical	-	-	4	4
22056	Manufacturing Technology – II Practical	-	-	6	6
20002	Communication and Life Skills Practical **	-	-	4	4
TOTAL		21	-	14	35

** Common to all Diploma Courses

SIXTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22061	Industrial Engineering and Management	5	-	-	5
22062	Computer Integrated Manufacturing	5	-	-	5
Elective - II Theory		5	-	-	5
22081	Automobile Engineering				
22082	Robotics				
22083	Refrigeration and Air-conditioning				
22084	Proto-Typing in Product Design				
22064	Computer Integrated Manufacturing Practical	-	-	6	6
22065	Process Automation Practical			4	4
Elective - II Practical		-	-	4	4
22085	Automobile Engineering Practical				
22086	Robotics Practical				
22087	Refrigeration and Air-conditioning Practical				
22088	Rapid Proto-Typing Practical				
22067	Project Work	-	-	6	6
TOTAL		15	-	20	35

ANNEXURE-II

SCHEME OF EXAMINATION
DIPLOMA IN MECHANICAL ENGINEERING(FULL TIME)(1020)

THIRD SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22031	Strength of Materials	25	75	100	40	3
22032	Fluid Mechanics & Fluid Power	25	75	100	40	3
22033	Renewable Energy Sources	25	75	100	40	3
22034	Machine Drawing	25	75	100	40	3
22035	Mechanical Testing & Quality Control Practical	25	75	100	50	3
22036	Fluid Power Practical	25	75	100	50	3
20001	Computer Applications Practical**	25	75	100	50	3

FOURTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22041	Manufacturing Technology – I	25	75	100	40	3
22042	Thermal Engineering – I	25	75	100	40	3
22043	Electrical Drives & Control	25	75	100	40	3
22044	Computer Aided Machine Drawing Practical	25	75	100	50	3
22045	Manufacturing Technology – I Practical	25	75	100	50	3
22046	Metrology & Measurement and Machine Tool Testing Practical	25	75	100	50	3
22047	Electrical Drives & Control Practical	25	75	100	50	3

FIFTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22051	Thermal Engineering – II	25	75	100	40	3
22052	Manufacturing Technology – II	25	75	100	40	3
Elective Theory-I						
22071	Total Quality Management	25	75	100	40	3
22072	Modern Machining Processes					
22073	Power Plant Engineering					
22054	Design of Machine Elements	25	75	100	40	3
22055	Thermal Engineering Practical	25	75	100	50	3
22056	Manufacturing Technology – II Practical	25	75	100	50	3
20002	Communication & Life Skills Practical **	25	75	100	50	3

SIXTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22061	Industrial Engineering and Management	25	75	100	40	3
22062	Computer Integrated Manufacturing	25	75	100	40	3
Elective-II Theory						
22081	Automobile Engineering	25	75	100	40	3
22082	Robotics					
22083	Refrigeration and Air-conditioning					
22084	Proto-Typing in Product Design					
22064	Computer Integrated Manufacturing Practical	25	75	100	50	3
22065	Process Automation Practical	25	75	100	50	3
Elective- II Practical						
22085	Automobile Engineering Practical	25	75	100	50	3
22086	Robotics Practical					
22087	Refrigeration and Air-conditioning Practical					
22088	Rapid Proto-Typing Practical					
22067	Project Work	25	75	100	50	3

ANNEXURE-I

CURRICULUM OUTLINE
DIPLOMA IN MECHANICAL ENGINEERING(SANDWICH)(2020)

THIRD SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22031	Strength of Materials	6	-	-	6
22032	Fluid Mechanics & Fluid Power	6	-	-	6
22033	Renewable Energy Sources	5	-	-	5
22034	Machine Drawing	-	6	-	6
22035	Mechanical Testing & Quality Control Practical	-	-	4	4
22036	Fluid Power Practical	-	-	4	4
20001	Computer Applications Practical**	-	-	4	4
TOTAL		17	6	12	35

** Common to all Diploma Courses

FOURTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22041	Manufacturing Technology – I*	*	-	-	*
22045	Manufacturing Technology – I Practical*	-	-	*	*
22091	Industrial Training I(Report Writing & Viva voce)	-	-	-	-
TOTAL		-	-	-	-

***** To be completed during Industrial training

FIFTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22042	Thermal Engineering – I	5	-	-	5
22043	Electrical Drives & Control	4	-	-	4
22051	Thermal Engineering – II	4	-	-	4
22054	Design of Machine Elements	5	-	-	5
22044	Computer Aided Machine Drawing Practical	-	-	5	5
22046	Metrology & Measurement and Machine Tool Testing Practical	-	-	4	4
22047	Electrical Drives & Control Practical	-	-	4	4
22055	Thermal Engineering Practical	-	-	4	4
TOTAL		18	-	17	35

CURRICULUM OUTLINE

SIXTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22052	Manufacturing Technology – II	4	-	-	4
Elective -I Theory		4	-	-	4
22071	Total Quality Management				
22072	Modern Machining Processes				
22073	Power Plant Engineering				
22061	Industrial Engineering and Management	4	-	-	4
22062	Computer Integrated Manufacturing	4	-	-	4
22056	Manufacturing Technology – II Practical	-	-	6	6
22064	Computer Integrated Manufacturing Practical	-	-	6	6
22065	Process Automation Practical	-	-	3	3
20002	Communication & Life Skills Practical **	-	-	4	4
TOTAL		16	-	19	35

** Common to all Diploma Courses

SEVENTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
Elective - II Theory*		*	-	-	-
22081	Automobile Engineering				
22082	Robotics				
22083	Refrigeration and Air-conditioning				
22084	Proto-Typing in Product Design				
Elective - II Practical*		-	-	*	-
22085	Automobile Engineering Practical				
22086	Robotics Practical				
22087	Refrigeration and Air-conditioning Practical				
22088	Rapid Proto-Typing Practical				
22067	Project Work*	-	-	*	-
22092	Industrial Training II (Report Writing & Viva voce)	-	-	-	-
TOTAL		-	-	-	-

***** To be completed during Industrial training

ANNEXURE-II

SCHEME OF EXAMINATION
DIPLOMA IN MECHANICAL ENGINEERING(SANDWICH)(2020)

THIRD SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22031	Strength of Materials	25	75	100	40	3
22032	Fluid Mechanics & Fluid Power	25	75	100	40	3
22033	Renewable Energy Sources	25	75	100	40	3
22034	Machine Drawing	25	75	100	40	3
22035	Mechanical Testing & Quality Control Practical	25	75	100	50	3
22036	Fluid Power Practical	25	75	100	50	3
20001	Computer Applications Practical**	25	75	100	50	3

FOURTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22041	Manufacturing Technology – I	25	75	100	40	3
22045	Manufacturing Technology – I Practical	25	75	100	50	3
22091	Industrial Training I(Report Writing & Viva voce)	25	75	100	50	3#

#- Industrial Training-I Board Examination will be conducted after completion of Industrial Training.

FIFTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22042	Thermal Engineering – I	25	75	100	40	3
22043	Electrical Drives & Control	25	75	100	40	3
22051	Thermal Engineering – II	25	75	100	40	3
22054	Design of Machine Elements	25	75	100	40	3
22044	Computer Aided Machine Drawing Practical	25	75	100	50	3
22046	Metrology & Measurement and Machine Tool Testing Practical	25	75	100	50	3
22047	Electrical Drives & Control Practical	25	75	100	50	3
22055	Thermal Engineering Practical	25	75	100	50	3

SIXTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22052	Manufacturing Technology – II	25	75	100	40	3
Elective - I Theory						
22071	Total Quality Management	25	75	100	40	3
22072	Modern Machining Processes					
22073	Power Plant Engineering					
22061	Industrial Engineering and Management	25	75	100	40	3
22062	Computer Integrated Manufacturing	25	75	100	40	3
22056	Manufacturing Technology – II Practical	25	75	100	50	3
22064	Computer Integrated Manufacturing Practical	25	75	100	50	3
22065	Process Automation Practical	25	75	100	50	3
20002	Communication & Life Skills Practical **	25	75	100	50	3

SEVENTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
Elective - II Theory						
22081	Automobile Engineering	25	75	100	40	3
22082	Robotics					
22083	Refrigeration and Air-conditioning					
22084	Proto-Typing in Product Design					
Elective - II Practical						
22085	Automobile Engineering Practical	25	75	100	50	3
22086	Robotics Practical					
22087	Refrigeration and Air-conditioning Practical					
22088	Rapid Proto-Typing Practical					
22067	Project Work	25	75	100	50	3
22092	Industrial Training II (Report Writing & Viva voce)	25	75	100	50	3#

#- Industrial Training-II Board Examination will be conducted after completion of Industrial Training.

ANNEXURE-I

CURRICULUM OUTLINE
DIPLOMA IN MECHANICAL ENGINEERING(PART TIME)(3020)

THIRD SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22031	Strength of Materials	4	-	-	4
22032	Fluid Mechanics & Fluid Power	4	-	-	4
20016	Engineering Graphics-I	-	4	-	4
22036	Fluid Power Practical	-	-	3	3
20001	Computer Applications Practical**	-	-	3	3
TOTAL		8	4	6	18

** Common to all Diploma Courses

FOURTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22033	Renewable Energy Sources	3	-	-	3
22034	Machine Drawing	-	4	-	4
22042	Thermal Engineering-I	4	-	-	4
20026	Engineering Graphics-II	-	3	-	3
22035	Mechanical Testing & Quality control Practical	-	-	4	4
TOTAL		7	7	4	18

FIFTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22041	Manufacturing Technology-I	4	-	-	4
22043	Electrical Drives & Control	3	-	-	3
22044	Computer Aided Machine Drawing Practical	-	-	4	4
22045	Manufacturing Technology-I Practical	-	-	4	4
22047	Electrical Drives & Control Practical	-	-	3	3
TOTAL		7	-	11	18

CURRICULUM OUTLINE

SIXTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22051	Thermal Engineering-II	4	-	-	4
22052	Manufacturing Technology-II	4	-	-	4
22046	Metrology & Measurement and Machine tool Testing Practical	-	-	3	3
22055	Thermal Engineering Practical	-	-	3	3
22056	Manufacturing Technology – II Practical	-	-	4	4
TOTAL		8	-	10	18

SEVENTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
Elective-I Theory					
22071	Total Quality Management	3	-	-	3
22072	Modern Machining Processes				
22073	Power Plant Engineering				
22054	Design of Machine Elements	4	-	-	4
22062	Computer Integrated Manufacturing	4	-	-	4
22064	Computer Integrated manufacturing Practical	-	-	4	4
20002	Communication & Life Skills Practical **	-	-	3	3
TOTAL		11	-	7	18

EIGHTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
22061	Industrial Engineering and Management	4	-	-	4
Elective-II Theory					
22081	Automobile Engineering	4	-	-	4
22082	Robotics				
22083	Refrigeration and Air-conditioning				
22084	Proto-Typing in Product Design				
22065	Process Automation Lab	-	-	3	3
Elective-II Practical		-	-	4	4
22085	Automobile Engineering Practical				
22086	Robotics Practical				
22087	Refrigeration and Air-conditioning Practical				
22088	Rapid Proto-Typing Practical				
22067	Project Work	-	-	3	3
TOTAL		8	-	10	18

ANNEXURE-II

SCHEME OF EXAMINATION
DIPLOMA IN MECHANICAL ENGINEERING(PART TIME)(3020)

THIRD SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22031	Strength of Materials	25	75	100	40	3
22032	Fluid Mechanics & Fluid Power	25	75	100	40	3
20016	Engineering Graphics-I	25	75	100	40	3
22036	Fluid Power Practical	25	75	100	50	3
20001	Computer Applications Practical**	25	75	100	50	3

FOURTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22033	Renewable Energy Sources	25	75	100	40	3
22034	Machine Drawing	25	75	100	40	3
22042	Thermal Engineering-I	25	75	100	40	3
20026	Engineering Graphics-II	25	75	100	40	3
22035	Mechanical Testing & Quality control Practical	25	75	100	50	3

FIFTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22041	Manufacturing Technology-I	25	75	100	40	3
22043	Electrical Drives & Control	25	75	100	40	3
22044	Computer Aided Machine Drawing Practical	25	75	100	50	3
22045	Manufacturing Technology-I Practical	25	75	100	50	3
22047	Electrical Drives & Control Practical	25	75	100	50	3

SIXTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22051	Thermal Engineering-II	25	75	100	40	3
22052	Manufacturing Technology-II	25	75	100	40	3
22046	Metrology & Measurement and Machine tool Testing Practical	25	75	100	50	3
22055	Thermal Engineering Practical	25	75	100	50	3
22056	Manufacturing Technology – II Practical	25	75	100	50	3

SEVENTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
Elective –I Theory						
22071	Total Quality Management	25	75	100	40	3
22072	Modern Machining Processes					
22073	Power Plant Engineering					
22054	Design of Machine Elements	25	75	100	40	3
22062	Computer Integrated Manufacturing	25	75	100	40	3
22064	Computer Integrated manufacturing Practical	25	75	100	50	3
20002	Communication & Life Skills Practical **	25	75	100	50	3

EIGHTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assess-ment	Board Exam.	Total		
22061	Industrial Engineering and Management	25	75	100	40	3
Elective –II Theory						
22081	Automobile Engineering	25	75	100	40	3
22082	Robotics					
22083	Refrigeration and Air-conditioning					
22084	Proto-Typing in Product Design					
22065	Process Automation Lab	25	75	100	50	3
Elective –II Practical						
22085	Automobile Engineering Practical	25	75	100	50	3
22086	Robotics Practical					
22087	Refrigeration and Air-conditioning Practical					
22088	Rapid Proto-Typing Practical					
22067	Project Work	25	75	100	50	3

III SEMESTER

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22031 - STRENGTH OF MATERIALS

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22031
Semester : III
Subject Title : **STRENGTH OF MATERIALS**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Strength of Materials	6	96	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	DEFORMATION OF METALS	18
II	GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS	18
III	LATERAL DEFORMATION (SF AND BM DIAGRAMS, DEFLECTION OF BEAMS)	18
IV	THEORY OF SIMPLE BENDING AND FRICTION	18
V	TORSION AND SPRINGS	18
	REVISION AND TEST	6
	Total	96

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 behaviour 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:

- Define various mechanical properties of materials.
- 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 Graphical representation of shear force and bending moment of the beam subjected to different loads.
- Construct SFD and BMD.
- Calculate the power transmitted by the solid & hollow shafts.
- Distinguish different types of spring and their applications.

STRENGTH OF MATERIALS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DEFORMATION OF METALS** **Mechanical properties of materials:** Engineering materials – Ferrous and non ferrous materials **-**Definition of mechanical properties such as strength – elasticity, plasticity, ductility, malleability, stiffness, toughness, brittleness, hardness, wear resistance, machinability, castability and weldability--Alloying elements-effect of alloying element - Fatigue, fatigue strength, creep – temperature creep – cyclic loading and repeated loading – endurance limit. **Simple stresses and strains:** Definition – Load, stress and strain – Classification of force systems – tensile, compressive and shear force systems – Behaviour of mild steel in tension up to rupture – Stress – Strain diagram – limit of proportionality – elastic limit – yield stress – breaking stress – Ultimate stress – percentage of elongation and percentage reduction in area – 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 force – Simple problems in tension, compression and shear force. Definition – Lateral strain – Poisson's ratio – volumetricstrain – bulk modulus – volumetric strain of rectangular and circular bars – problems connecting linear, lateral and volumetric deformation – Elastic constants and their relationship - Problems on elastic constants - Definition – Composite bar – Problem in composite bars subjected to tension and compression – Temperature stresses and strains – Simple problems – Definition – strain energy – 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.	**18 Hrs**
II	**GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS** **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 determine the centroid of angle, channel, T and I sections only - Definition-centroidal axis-Axis of symmetry. Moment of Inertia – Statement of parallel axis theorem and perpendicular axis theorem. 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. **Thin Shells:** Definition – Thin and thick cylindrical shell – Failure of thin cylindrical shell subjected to internal pressure – Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure – simple problems – change in dimensions of a thin cylindrical shell subjected to internal pressure – problems – Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure – simple problems – change in diameter and volume of a thin spherical shell due to internal pressure – problems.	**18 Hrs**
III	**LATERAL DEFORMATION** **(SF AND BM DIAGRAMS, DEFLECTION OF BEAMS)** Classification of beams – Definition – shear force and Bending moment – 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	**18 Hrs**

	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. Definition – slope, deflection, stiffness and flexural rigidity – Derivations of relationship between slope, Deflection and Radius of curvature – Derivation of slope and deflections of cantilever and simply supported beam by area moment method under point load and udl load– simple problems.	
IV	**THEORY OF SIMPLE BENDING AND FRICTION** 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 simple supported beam. Definition – force of friction – limiting friction- static – dynamic friction – angle of friction – co-efficient of friction – cone of friction – laws of static and dynamic friction – ladder problems	**18 Hrs**
V	**TORSION AND SPRINGS** Theory of torsion – Assumptions – torsion equation $\frac{T}{J}=\frac{f_s}{R}=\frac{C\theta}{l}$ – strength of solid 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. Types of springs – Laminated and coiled springs and applications – Types of coiled springs – Difference between open and closely coiled helical springs – closely coiled helical spring subjected to an axial load – problems to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs.	**18 Hrs**

Text Books:

1) Strength of Materials ,R. S. Khurmi, , S.Chand & Co., Ram Nagar, New Delhi – 2002

2) Strength of Materials, S. Ramamrutham, 15th Edn 2004, DhanpatRai Pub. Co., New Delhi.

Reference Books:

1) Strength of Materials ,R.K. Bansal,, Laxmi Publications Pvt. Ltd., New Delhi, 3rd Edition, 2010.
2) Strength of materials, S.S.Rattan, Tata Mcgraw hill, New Delhi,2008, ISBN 9780070668959,
3) Strength of Materials, B K Sarkar, I Edition, 2003 Tata Mcgraw hill, New Delhi.
4) Engineering mechanics, R.K. Bansal, Laxmi Publications Pvt. Ltd., New Delhi, 2nd Edition, 2007

22031 STRENGTH OF MATERIALS

MODEL QUESTION PAPER – I

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. Define Ductility
2. State the relationship between E and K
3. State Hooke's law
4. What is lateral strain
5. State the parallel axis theorem
6. Define Hoop Stress
7. Define Thin cylindrical shell
8. Define Moment of inertia
9. What is radius of curvature
10. Define Slope
11. Define Bending moment
12. State the relationship between BM and SF
13. What is neutral axis
14. Write a formula for bending equation
15. Define section modulus
16. Define centre of curvature
17. What is twisting moment
18. State the application of laminated spring
19. List out the types of springs
20. What is polar moment of inertia.

PART – B
Marks 5 x 12=60

Answer all the Questions

21	a. i)	A steel bar 2m long 20mm wide and 10mm thick is subjected to an axial pull of 20KN in the direction of its length. Determine the changes in length and volume.Take E = 2 x 10^5 N/mm^2 and 1/m = 0.3	(4)
	ii)	A brass tube of 50mm outside diameter, 45mm inside diameter and 300mm long is compressed between end washers with load of 24.5KN. Reduction in length is 0.0015mm. Determine the stress, strain and Young's modulus.	(8)
		(or)	
	b.	A weight of 9.8KN is dropped on to a collar at the lower end of a vertical bar 3m long and 32mm diameter. Calculate the height of drop, if the maximum instantaneous stress is not to exceed 240N/mm^2. What is the corresponding instantaneous elongation? Assume E = 2 x 10^5 N/mm^2.	(12)
22.	a.i)	Find the centroid of a channel section 100 x 50 x 15 mm	(4)
	ii)	Determine the change in diameter, change in volume of the spherical shell 2m in diameter and 12mm thick subjected to an internal pressure of 2 N/mm^2.e E = 2 x 10^5 N/mm^2 and 1/m = 0.25	(4)
		(or)	
	b.	A thin cylindrical shell of 1m internal diameter 5mm thick and 2.5m long is filled with a fluid under pressure until its volume increases by 40 x 10^6 mm^3. Determine the pressure exerted by the fluid on the shell. Take E = 2 x 10^5 N/mm^2 and 1/m = 0.25	(12)
23	a.	A beam is freely supported over a span of 8m. It carries a point load of 3KN at 2m from left hand support and an udl of 2KN/m from the centre upto the right hand support. Draw the SFD abd BMD.	(12)
		(or)	
	b.	A cantilever 2m long carries a point load of 20KN at 0.8m from the fixed end and another point load of 5KN at the free end. In addition, a udl of 15KN/m is spread over the entire length of the cantilever. Draw SFD and BMD	(12)
24	a.i)	State the assumptions made in the theory of Simple bending.	(4)
	ii)	A wooden beam of rectangular section 100 x 200 mm is simply supported over a span of 6m. Determine the udl it may carry, if the bending stress is not to exceed 7.5 N/mm^2. Estimate the concentrated load it may carry at the centre of the beam with the same permissible stress.	(8)
		(or)	
	b.i)	A beam of T-section flange 150mm x 50mm web thickness 50mm, overall depth 200mm and 10m long is simply supported a central point load of 10KN. Determine the maximum fibre stresses in the beam.	(6)
	ii)	Derive the flexural formula $\frac{M}{I} = \frac{f_b}{y} = \frac{E}{R}$	(6)

25. a) A truck weighing 30KN and moving at 5 Km/hr has to be brought to rest by buffer. Find how many springs, each of 18 coils will be required to the energy of motion during a compression of 200mm. The spring is made out of 25mm diameter steel rod coiled to a mean diameter of 240mm. Take N = 0.84×10^5 N/mm^2. (12)

(or)

b)i) A solid shaft 20mm diameter transmits 10KW at 1200rpm. Calculate the maximum intensity of shear stress induced and angle of twist in degrees in a length of 1m, if modulus of rigidity for the shaft material is 8×10^4 N/mm^2. (6)

ii) A closed coiled spring made of steel wire 100mm diameter has 10 coils of 120mm mean diameter. Calculate the deflection under an axial load of 100N and stiffness of the spring. Take C = 1.2mPa. (6)

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22031 STRENGTH OF MATERIALS

MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. Define toughness.
2. Define poission's Ratio.
3. Define proof resilience.
4. Write any two elastic constant.
5. Define centroid.
6. Write down the unit of moment of Inertia.
7. Define thin cuclinder.
8. Define Moment of inertia
9. List out the types of beams.
10. Define sheer force.
11. Define the term deflection.
12. Define radius of curvature.
13. Define the term bending stress.
14. Define Neutral axis.
15. What is limiting friction?
16. Define Static friction.
17. Define pure torsion.
18. Write any two advantages of hollow shafts over solid shafts.
19. Give the applications of tension springs.
20. Define stiffness of spring.

PART – B
Marks 5 x 12=60

Answer all the Questions

21	a. i)	Determine the value of Poisson's Ratio and Young's modulus of Rigidity of the material is 0.5 x 10^5 N/mm^2 and bulk modulus 0.8x 10^5 N/mm^2	(6)
	ii)	Draw stress – strain for a mild steel specimen loaded upto failure and explain the salient features.	(6)
		(or)	
	b.i)	A copper rod 30mm is surrounded tightly by a cast iron tube of 60mm outside diameter the ends being firmly fastened together. When put to a compressive load of 12kN. What load will be shared by each? Also estimate the amount by which the compound bar shortens in a length of 10mm. Assume ECI = 1.2 x 10^5 N/mm^2 and Ec = 1x10^5N/mm^2	(8)
	ii)	Calculate the Strain Energy that can be stored in a steel bar 40mm in diameter and 3m long subjected to a pull of 100KN. Given E=200KN/mm^2	(4)
22.	a.i)	State Parallel axis theorem.	(4)
	ii)	An I-Section has the top Flange 120mm x 120mm thick, web 180mm x 20mm thick and the bottom flange 200mm x 40mm thick. Calculate the Ixx, Iyy, Kxx and Kyy of the section.	(8)
		(or)	
	b.i)	What working pressure may be allowed in a boiler shell 1.8m diameters with plates 15mm thick, if the permissible tensile stress in the solid plate is not to exceed 70 N/mm^2	(3)
	ii)	A Cylindrical Shell 24 m long, 600mm in diameter is made up of 15mm thick plates. Fine the change in length, diameter and volume of the cylinder when the shell is subjected to an internal pressure of 2N/mm^2. E=2 x 10^5 N/mm^2 1/m=0.3	(9)
23	a. i)	A cantilever of span 5m is loaded with three poin load of 2KN at 2, 4, 5m from the fixed end in addition to a UDL of 1KN/m to a length of 4m from the fixed end. Draw SF and BM diagram.	(6)
	ii)	A simply supported beam of 5m span carries a UDL of 2 KN/m over the entire span. In addition the beam carries a point load of 4KN at a distance of 2m from the left support. Draw SFD and BMD.	(6)
		(or)	
	b.i)	A Cantilever 2m long, 100mm wide and 200mm deep carries a concentrated load of 5KN at the free end. Find the max slope and deflection. E= 2 x 10^5 N/mm^2	(4)
	ii)	A cantilever beam 6m long is subjected to a UDL of W KN/m speed over the entire span. Assuming Rectangular section with depth equal to twice the width determine the size of the beam so that the max deflection does not exceed 15mm. the max stress should not exceed 100 N/mm^2 E=2 x 10^5 N/mm^2	(8)
24	a.i)	Calculate the max stress in a piece of rectangular steel strip 25mm wide and 3mm thick when it is bend round a drum, 2.5m diameter. E= 2 x 10^5 N/mm^2	(6)
	ii)	Derive the relationship between the curvature slope and deflection of the beam.	(6)

(or)

	b.i)	Enumerate the laws of static and dynamic friction.	(8)
	ii)	Explain the term friction? What is limiting friction?	(4)
25.	a) i)	State the assumptions made in the derivation of the tension formula.	(4)
	ii)	A solid shaft has to transmit 10 kw at 210rpm. The max. torque transmitted is each revolution exceeds the mean by 30%. If the Shear stress is not to exceed 80 N/mm^2. Find a suitable diameter of the solid shaft. Calculate the angle of twist for a length of 2 meters. $C=0.8 X10^5$ N/mm^2	(8)

(or)

	b) i)	Distinguish between C closely coiled helical springs and an open coiled helical spring.	(4)
	ii)	Design a closely coiled spring of stiffness 20 N/mm deflection. The max. shear stress in the spring metal is not exceed 80 N/mm^2 under a load of 600 N. The diameter of the coil is to be 10 times the diameter of the wire. Take the modulus of Rigidity as 85 KN/mm^2.	(8)

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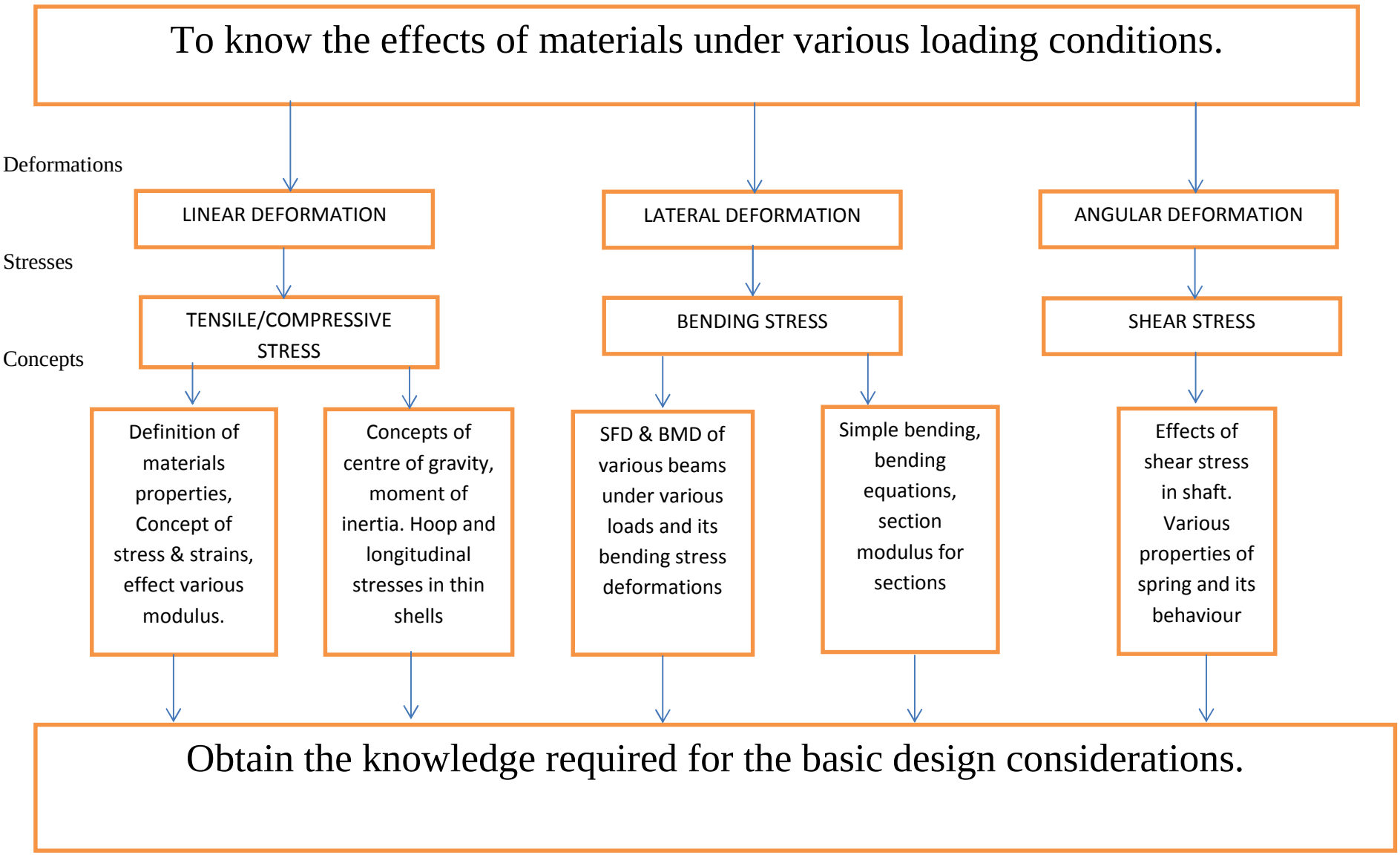
LEARNING STRUCTURE

22031 STRENGTH OF MATERIALS



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22032 - FLUID MECHANICS & FLUID POWER

DIRCETORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22032
Semester : III
Subject Title : **FLUID MECHANICS & FLUID POWER**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Sem7ster	Marks			Duration
Fluid Mechanics and Fluid Power	6	96	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS	18
II	FLOW OF FLUIDS AND FLOW THROUGH PIPES	18
III	IMPACT OF JETS, HYDRAULIC TURBINES, CENTRIFUGAL AND RECIPROCATING PUMPS	18
IV	PNEUMATIC SYSTEMS	18
V	HYDRAULIC SYSTEMS	18
	REVISION AND TEST	6
	Total	96

RATIONALE:

The main objective of this subject Fluid mechanic and Fluid power is to study the behavior of fluids under the condition of rest and motion. This chapter deals with fluid pumps, turbines, hydraulic and pneumatic operation. The overall object is to impart knowledge of pumps (which play a major role in day today life) hydraulic & pneumatic operation of tools & equipments.

OBJECTIVES:

- Define the properties of Fluids.
- Explain the working of pressure measuring devices
- Explain continuity equation and Bernoulli's Theorem
- Assess the impact of frictional loss of head in flow through pipes
- Estimate the discharge through orifices
- Distinguish the working principles of pumps and turbines.
- Explain the working of centrifugal pumps and reciprocating pumps.
- Compare pneumatic system with hydraulic system
- Draw Pneumatic circuits for industrial application.
- State the properties of hydraulic Systems
- Develop hydraulic circuit for machine tools applications.

FLUID MECHANICS & FLUID POWER

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS** Introduction - Definition of fluid - Classification of Fluids - ideal and real fluids - Properties of a fluid – definition and units - Pressure-units of Pressure - Pressure head-atmospheric, gauge and absolute pressure – problems - Pascal's law- proof - applications of Pascal's law - Hydraulic press - Hydraulic jack - Pressure measurement - Piezometer tube - Simple U-tube manometer - Differential U-tube manometer - Inverted Differential manometer - Micro-manometer - Inclined tube micro-manometer - Mechanical Gauges -Bourdon's Tube Pressure Gauge - Diaphragm pressure gauge - Dead weight pressure gauge.	**18 Hrs**
II	**FLOW OF FLUIDS AND FLOW THROUGH PIPES** Types of fluid flow - path line and stream line - mean velocity of flow - discharge of a flowing fluid - equation of continuity of fluid flow - energies of fluid - Bernoulli's theorem - statement, assumptions and proof - applications and limitations of Bernoulli's theorem - problems on Bernoulli's theorem – venturimeter - derivation for discharge - orifice meter - derivation for discharge - difference between venturimeter and orifice meter -problems on venturimeter and orifice meter - Pitot tube – description only – orifice –types – applications - hydraulic co-efficients - determining hydraulic co-efficients – problems - discharge through a small orifice discharging freely only - problems – experimental method of finding C_V, C_C and C_d - Flow through pipes - laws of fluid friction - hydraulic gradient line - total energy line - wetted perimeter - hydraulic mean radius - loss of head due to friction - Darcy-Weisbach equation and Chezy's formula –problems - minor losses (description only) - Power transmission through pipes - problems.	**18 Hrs**
III	**IMPACT OF JETS, HYDRAULIC TURBINES, CENTRIFUGAL AND RECIPROCATING PUMPS** Impact of jet - on a stationary flat plate held normal to the jet and inclined to the direction of jet - Impact of jet on a flat plate moving in the direction of jet - Impact of jet on a series of moving plates or vanes - force exerted and work done by the jet - problems. Hydraulic turbines – classifications - Pelton wheel - components and working - speed regulation (theory only) - Francis and Kaplan turbines - components and working - draft tube - functions and types - surge tank - differences between impulse and reaction turbines. Centrifugal Pumps – classifications - construction and working of single stage centrifugal pumps - components with types - theory only - multi stage pumps – advantages - priming – cavitation. Reciprocating Pumps – classifications - construction and working of single acting and double acting reciprocating pumps - plunger and piston pumps - discharge of a reciprocating pump - theoretical power required - coefficient of discharge – slip – problems - negative slip - indicator diagram – separation - air vessel (functions and working) - Special pumps - Jet pump - Turbine pump - Submersible pump.	**18 Hrs**

IV	**PNEUMATIC SYSTEMS** Pneumatic Systems **–** elements – filter – regulator - lubricator unit - pressure control valves - pressure relief valves - pressure regulation valves - directional control valves - 3/2 DCV - 5/2 DCV – 5/3 DCV flow control valves – throttle valves –shuttle valves – quick exhaust valves –ISO symbols of pneumatic components – pneumatic circuits – direct control of single acting cylinder – operation of double acting cylinder – operation of double acting cylinder with metering-in control - operation of double acting cylinder with metering-out control – use of shuttle valve in pneumatic circuits – use of quick exhaust valve in pneumatic circuits - automatic operation of double acting cylinder single cycle – multiple cycle – merits and demerits of pneumatic system - applications.	**18 Hrs**
V	**HYDRAULIC SYSTEMS** Hydraulic system – Merits and demerits – Service properties of hydraulic fluids Hydraulic accumulators – Weight of gravity type accumulator – Spring loaded type accumulator - Gas filled accumulator – Pressure intensifier – Fluid power pumps – External and internal gear pump, Vane pump, Radial piston pump – ISO symbols for hydraulic components – Hydraulic actuators – Cylinders and motors – Valves – Pressure control valves, Flow control valves and direction control valves – types – including 4/2 DCV and 4/3 DCV – their location in the circuit. Hydraulic operation of double acting cylinder with metering-in and metering-out control – application of hydraulic circuits – Hydraulic circuit for - shaping machine - table movement in surface grinding machine and milling machine – comparison of hydraulic and pneumatic systems.	**18 Hrs**

Text Books :

1) A Text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines, R.S. Khurmi, - Edn.18, S.Chand & Co., Ram Nagar, New Delhi – 110 055, Ram Nagar, New Delhi – 2002
2) A Text Book of Fluid Mechanics and Hydraulic Machines – by, R. K Rajput and S. Chand & Co,Ram Nagar, New Delhi – 110 055.

Reference Books:

1) Hydraulic Machines, Jagadishlal, , Metropolitan Book Co. Pvt. Ltd., 1, Faiz Bazaar, New Delhi – 110 006.
2) Hydraulics,Andrew Parr (A Technician's and Engineer's Guide)
3) Fundamentals of pneumatic control Engineering -FESTO Manual
4) Fluid Mechanics and Hydraulic Machines,R. K. Bansal, Laxmi Publications Pvt.,Ltd,22,Golden House, Daryaganj, New Delhi – 110 002

22032 FLUID MECHANICS & FLUID POWER
MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

PART-A
Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Define specific gravity.
2. Define pressure.
3. What is real fluid.
4. Define viscosity.
5. What is an orifice.
6. State any two application of Bernoulli's theorem.
7. Define turbulent flow.
8. What is vena-conteacta?
9. State the function of draft tube.
10. Define slip.
11. Define negative slip.
12. What is meant by priming?
13. What is the use of pressure regulator?
14. Name any two types of DCV's.
15. Mention any to pneumatic system.
16. Draw the ISO symbol for check valve.
17. List the service properties of hydraulic fluid.
18. State the function of counter balance valve.
19. Define de-emulsibility.
20. List any to applications of hydraulic system.

PART-B
Marks 5 x 12=60

Answer all the questions

21. a) i) A simple manometer is used to measure the pressure of oil of relative density 0.8 flowing in a pipe. Its right limb is open to the atmosphere and the left limb is connected to the pipe. The centre of the pipe is 150mm below the level of mercury in the right limb. If the difference of mercury level in the two limbs in 250mm. Determine the absolute pressure of oil in the pipe in KN/m pow 2.

ii) List the applications of Pascal's law and explain any one with a neat sketch.

(or)

b) i) Explain with a neat sketch the working principle of Bourdon's tube pressure gauge.

22 a) State and prove Bernoulli's theorem

(or)

b) Derive an expression for the discharge through venturimeter

23 a) i) What is meant by impact of jet?

ii) Sketch and explain working of pelt on wheel.

(or)

b) A single acting reciprocating pump having cylinder, diameter of 150mm and a stroke of 300mm is required to raise water through a height of 20m. The crank rotates at 60rpm and the discharge is 5 litres per second. Find

i) Theoretical discharge of the pump

ii) Percentage slip of the pump

iii) Theoretical power required to drive the pump.

iv) Compare impulse turbine and reaction turbine.

24. a) i) Explain FRL unit with a neat sketch.

ii) Explain the following i) check valve ii) shuttle valve.

(or)

b). Explain automatic operation of double acting cylinder with a sketch

25. a) i) Explain with neat sketch the elements of hydraulic system

ii) Explain the working of internal gear pump.

(or)

b) Draw and explain hydraulic circuit for shaping machine.

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22032 FLUID MECHANICS & FLUID POWER

MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. Define: Specific weight of fluid.
2. What is meant by pressure head?
3. State Pascal's law.
4. Mention the names of any two mechanical pressure gauges.
5. Define: Steady flow.
6. State Bernoulli's theorem.
7. What is a pilot tube?
8. What is vena-contracta?
9. What is a draft tube?
10. What are the types of casings employed in centrifugal pumps?
11. Why foot valve is necessary in a centrifugal pump?
12. Define slip in reciprocating pumps.
13. Name the elements of a pneumatic system.
14. Draw the ISO symbol of pressure relief valve.
15. Mention the types of directional control valves.
16. State any two applications of pneumatic system.
17. List any three service properties of hydraulic fluid.
18. What are additives?
19. Name any two types of accumulators.
20. Draw the ISO symbol of 4-way, 3 position directional control valve.

PART – B
Marks 5 x 12=60

Answer all the Questions

21	a. i)	Define Ideal & Real fluids.		(4)
	ii)	$1m^3$ of oil weighs 9kN. Calculate its density, specific weight and relative density.		(4)
	iii)	The pressure of water in a pipe line was measured by means of simple manometer containing mercury. The mercury level in the open tube is 150 mm higher than that of the left tube. The height of water in the left tube is 40mm. Determine the static pressure in the pipe in (a) head of water in metres and (b) kN/m2.		(4)
		(or)		
	b.i)	A gauge fitted to a gas cylinder records a pressure of $16.27kN/m^2$ vacuum. Compute the corresponding absolute pressure in (i) kN/m^2 and (ii) meter of water. The local atmospheric pressure is 700mm of Hg.		(4)
	ii)	Explain with a neat sketch the working principle of Bourdon's tube pressure gauge		(8)
22.	a.i)	State the differences between venturimeter and orifice meter.		(4)
	ii)	Calculate the flow of water in litres/hour through a 40cm x 15cm venturimeter when the differential gauge connected to the mouth and throat is 25cm of mercury, assuming the co-efficient of the meter as 0.98.		(8)
		(or)		
	b.i)	A 50mm diameter orifice is provided in a tank having water to a height of 1.5m above the centre of orifice. If the co-efficient of contraction and velocity of the orifice are 0.62 and 0.98 respectively, determine: - (i) co-efficient of discharge, (ii) theoretical discharge, (iii) actual discharge.		(6)
	ii)	Two reservoirs are connected by a pipe line 3km long. Diameter of the pipe is 0.5m. The difference of water level in the reservoir is 10m. Find the discharge in lit/min. Assume $f = 0.01$. Ignore all losses other than friction.		(6)
23	a. i)	A jet of water 80mm diameter moves with a velocity of 15m/s and strikes a series of vanes moving with a velocity of 10m/s. Find (a) the force exerted by the jet, (b) work done by the jet/s and (c) efficiency of the jet.		(6)
	ii)	Explain the construction & working of a centrifugal pump.		(6)
		(or)		
	b.i)	How hydraulic turbines are classified?		(3)
	ii)	Water is lifted to a height of 18m by a double acting reciprocating pump having piston diameter of 150mm and a stroke of 300mm. Find the theoretical power required and theoretical discharge, if the pump is running at 40 r.p.m. If the pump has an actual discharge of 400 litres/min. Find the percentage slip and co-efficient of discharge**.**		(9)

24	a.i)	State the merits and demerits of pneumatic system.	(6)
	ii)	Explain with a pneumatic circuit diagram, the use of shuttle valve.	(6)
		(or)	
	b.i)	Explain the working of an air lubricator.	(4)
	ii)	Draw the circuit diagram for the operation of a double acting cylinder with metering - in control.	(8)
25.	a) i)	Explain the working of gear pump with neat sketch.	(6)
	ii)	Explain the use of sequence valve in a hydraulic system with a neat sketch. Also draw the hydraulic circuit for the same.	6)
		(or)	
	b) i)	Compare hydraulic system with pneumatic system.	(4)
	ii)	Explain the hydraulic circuit with ISO symbols for quick return motion of a shaper	(8)

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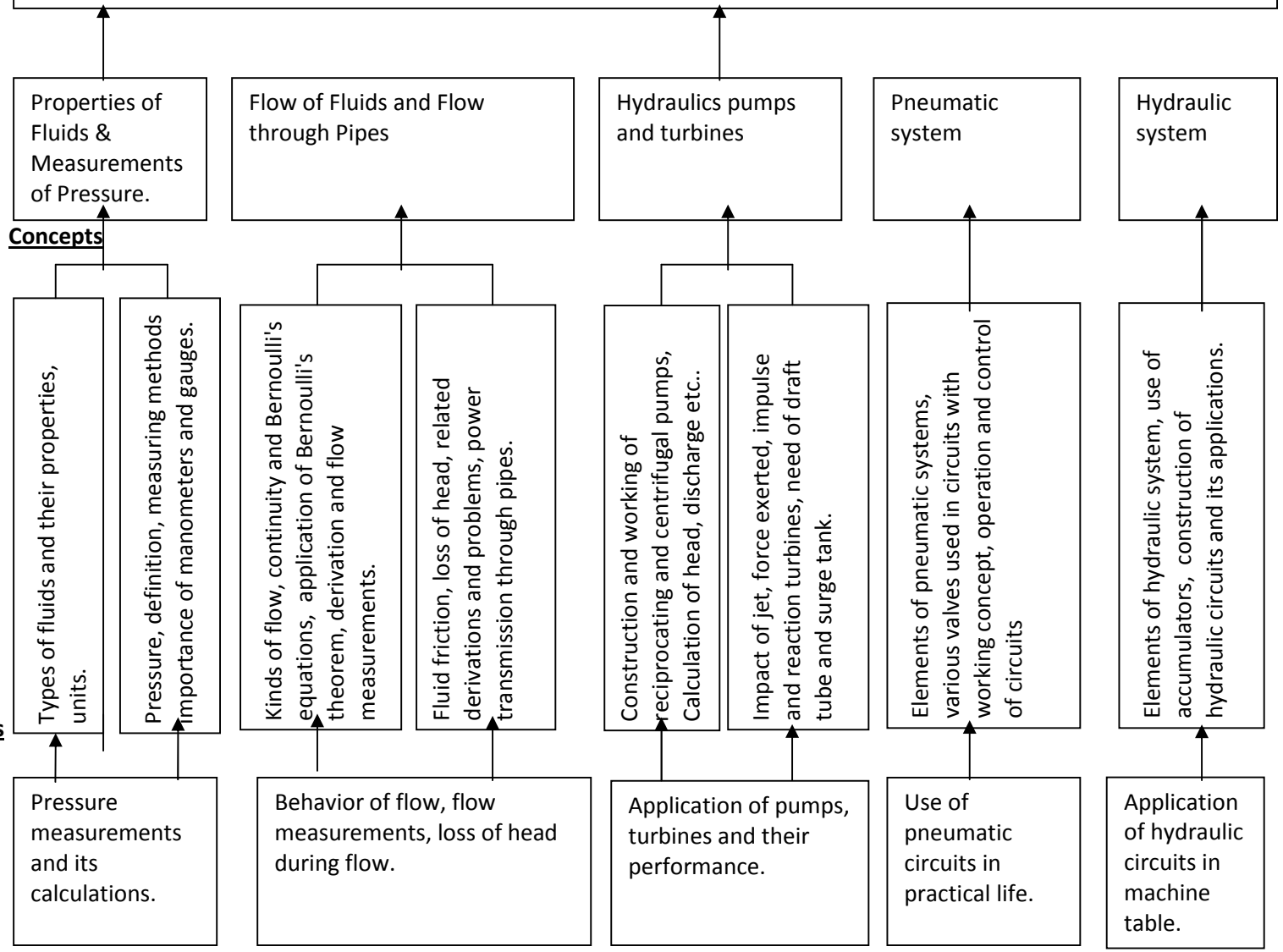
LEARNING STRUCTURE

22032 FLUID MECHANICS & FLUID POWER

Application

To understand the properties, principles, laws, derivation and determination of various co-efficients. To acquire knowledge about the construction and working of different kinds of pumps and hydraulic turbines , to identify the various components of Pneumatic and Hydraulic systems and constructing the required circuits using these components by studying this subject.



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22033 - RENEWABLE ENERGY SOURCES

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22033
Semester : III
Subject Title : **RENEWABLE ENERGY SOURCES**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Renewable Energy Sources	5	80	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	FUNDAMENTALS OF ENERGY	15
II	SOLAR ENERGY	15
III	WIND ENERGY	15
IV	BIO-ENERGY	15
V	OCEAN AND GEO-THERMAL ENERGY	15
	REVISION AND TEST	5
	TOTAL	**80**

RATIONALE: Electrical Energy requirement is the major crisis and hence any saving in Electrical energy is equivalent to production of Electrical Energy. Saving can be achieved by the utilization of Renewable Energy Sources.

RENEWABLE ENERGY SOURCES

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**FUNDAMENTALS OF ENERGY** Introduction to Energy-Energy consumption and standard of living-classification of energy resources-consumption trend of primary energy resources-importance of renewable energy sources-energy chain-common forms of energy-advantages and disadvantages of conventional energy sources-salient features of non-conventional energy sources-environmental aspects of energy-energy for sustainable development-energy density of various fuels-availability of resources and future trends. Energy scenario in India – Overall production and consumption-Availability of primary energy resources: Conventional, Non-Conventional-Estimated potential and achievement-Growth of energy sector and its planning in india – Energy conservation: Meaning and importance.	**15Hrs**
II	**SOLAR ENERGY** Introduction – Solar radiation at the earth's surface-Solar Radiation measurements-Estimation of average solar Radiation. Solar energy collectors- Classifications-Flat plate collectors-Concentrating collectors-Comparison. Solar water heaters-Solar industrial heating system – Solar Refrigeration and Air-Conditioning Systems-Solar cookers-Solar furnaces-Solar greenhouse-Solar Distillation-Solar pond Electric power plant-Distributed Collector- Solar thermal Electric power plant. Principles of photovoltaic conversion of solar energy – types of solar cells – solar Photo Voltaic applications.	**15Hrs**
III	**WIND ENERGY** Introduction-Basic principles of wind energy conversion: Nature of the wind, power in the wind, forces on the blades and wind energy conversion-wind data and energy estimation-site selection-classification of wind energy conversion systems-Advantages and Disadvantages-Types of wind machines-Horizontal axis machine-Vertical axis machine-Generating system-Energy Storage–Application of wind energy-Safety and environmental aspects.	**15Hrs**

IV	**BIO – ENERGY** Introduction – photo synthesis – usable forms of bio mass, their composition and fuel properties-Biomass resources – Biomass conversion technologies – Urban waste to energy conversion – Biomass gasification – biomass liquification – biomass to ethanol production – Biogas production from waste Biomass – types of bio gas plants - applications – Bio diesel production – Biomass energy programme in india.	**15Hrs**
V	**OCEAN AND GEOTHERMAL ENERGY** Ocean energy resources – principle's of ocean thermal energy conversion (OTEC) – Methods of Ocean thermal electric power generation – Energy utilisation – basic principle of tidal power – components and operations of tidal power plant – Energy and Power forms of waves – Wave energy conversion devices. Geothermal Energy – Geothermal Sources – Prime movers for Geothermal energy conversion – Advantages and Disadvantages – Applications – Material selection for geothermal power plants – Geo thermal exploration – Operational and Environmental problems – Prospects of geothermal energy in india.	**15Hrs**

Text Books:

1) Non Conventional Energy Sources - G.D. Rai – Khanna Publishers, New Delhi,1999.
2) Non Conventional Energy Sources and Utilisation - R.K. Rajput - S.Chand & Company Ltd., 2012.
3) Renewable Energy Sources - Twidell, J.W. and Weir, A. - EFN Spon Ltd., 1986.
4) "Non-Conventional Energy Resources - B.H.Khan - Tata Mc Graw Hill, 2nd Edn, 2009.

22033 RENEWABLE ENERGY SOURCES

MODEL QUESTION PAPER-1

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. List out any two conventional Energy Sources.
2. What are the common forms of energy?
3. State any two merits of non conventional energy sources.
4. What is meant by Energy conservation?
5. What is Solar Radiation?
6. Mention any two Instrument used for measurements of solar radiation.
7. What is the function of solar photo voltaic system?
8. List out any two types of Solar cells.
9. What is wind Energy?
10. What is Wind Data?
11. What are the types of wind energy conversion system?
12. State any two applications of Wind Energy.
13. What is Bio-Mass?
14. Define Photosynthesis.
15. What is meant by liquification?
16. State any two applications of Bio-Gas plant.
17. State any two limitations of tidal energy.
18. What is meant by Wave machines?
19. What is Ocean Thermal Energy?
20. State any two advantages of Geo thermal Energy.

PART-B

Marks 5 x 12=60

Answer all the questions

21. a). i) Explain the sources of renewable Energy? (6)
ii) List out Energy density of various fuels. (6)
(or)
b). i) Explain Availability of resources and future trends. (6)
ii) Describe the growth of energy sector and its planning in India. (6)

22. a) i) How do you estimate average solar radiation?. (6)
ii) Explain flat plate collectors. (6)
(or)
b) i) Explain box type solar cooker. (6)
ii) Describe the principle of solar photo voltaic energy conversion. (6)

23. a) i) Describe the major applications of wind power. (6)
ii) Explain Site selection consideration for wind power generation. (6)
(or)
b) i) Explain horizontal axis wind machine. (6)
ii) Describe about safety systems of wind turbine. (6)

24. a) i) Explain urban waste to energy conversion. (6)
ii) Describe Biomass to Ethanol production. (6)
(or)
b) i) Explain the process of gasification of solid Bio-fuels. (6)
ii) What is the present status of development of Biomass energy resources in India? (6)

25. a) i) Explain Ocean Thermal Electric conversion (OTEC). (6)
ii) Describe principles of Tidal power. (6)
(or)
b) i) Explain sources of Geothermal Energy. (6)
ii) State advantages and disadvantages of geothermal Energy. (6)

22033 RENEWABLE ENERGY SOURCES

MODEL QUESTION PAPER-II

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Define Energy.
2. What is primary Energy?.
3. State any two disadvantages of conventional energy.
4. What is meant by conventional energy?
5. What is solar radiation?
6. What is the function of solar energy collection?
7. What is meant by wind energy?.
8. State any two types of wind energy?
9. What is meant Wind Energy?
10. State any two application of wind energy.
11. List out any two advantages of wind energy.
12. State any two applications of wind energy.
13. What is meant by Photo Synthesis?
14. Define Bio-Mass
15. What is meant by Bio-Mass liquefaction.
16. What are the applications of Bio-Energy?
17. Define Ocean Energy.
18. List out wave energy conversion device.
19. Define Geo thermal Energy.
20. List out Geo-Thermal Sources.

PART-B

Marks 5 x 12=60

Answer all the questions

21. a). i) Explain in detail the importance of renewable Energy sources? (12)

(or)

b). i) Describe the growth of energy sector and its planning in India. (12)

22. a) i) Estimate average solar radiation (6)

ii) Explain the flat plate solar energy collectors. (6)

(or)

b) i) Describe the solar water heaters. (6)

ii) What are the applications of Solar photo voltaic cell? (6)

23. a) i) Describe the following Wind data energy estimation and site selection for wind energy. (12)

(or)

b) i) Explain with the sketch horizontal axis wind machine. (12)

24. a) i) Explain Urban waste to energy conversion. (12)

(or)

b) i) Describe the process of Bio-Mass Ethanol production. (12)

25. a) i) Explain the Ocean Thermal Electric Power Generation. (12)

(or)

b) i) Explain the prime movers for Geo-Thermal Energy Conversion. (12)

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22034 – MACHINE DRAWING

DIRCETORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22034
Semester : III
Subject Title : **MACHINE DRAWING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Machine Drawing	6	96	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Sectional Views	3
II	Limits, Fits and Tolerances	6
III	Surface Texture	3
IV	Keys, Screw threads and Threaded fasteners	6
V	Drawing practice of sleeve & Cotter joint, Spigot and cotter joint, Knuckle joint, Stuffing Box , Screw Jack, Foot step bearing, Universal Coupling, Plummer Block, Swivel Bearing, Simple Eccentric, Machine Vice, Protected type flanged coupling, Connecting Rod, Tail Stock – Manual Drawing Practice	75
	Revision and Test	3
	Total	96

RATIONALE:

Manufacturing of various machine parts and production of various equipments in small scale to big scale industries 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 supervisor cadre students to carry and complete the production and assembly process successfully.

The first three are theory units in which the students can comprehend the various types of sections used in drawing practice. Types of fits used, limits and tolerances of dimensions and surface finish methods which are to be used in industrial drawing will also be taught in these three units.

The fourth unit is also a theory unit in which the students can understand the types of fasteners and study of temporary fasteners like keys, screw threads and threaded fasteners which are commonly used in assembly process.

The final unit gives the practice of manual drawing of the commonly used components in industries to give a thorough knowledge of drawings.

The overall objective is to impart knowledge to the students so as to carry out the production and the assembly process without wastage of Man/Machine and Materials to have economical overall process.

OBJECTIVES:

- Appreciate the need for sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare hole basis system with shaft basis system.
- Select different types of fits and tolerance for various types of mating parts.
- Appreciate the importance of fits and tolerance.

MACHINE DRAWING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**SECTIONAL VIEWS** Review of sectioning – Conventions showing the section – symbolic representation of cutting plane- types of section – full section, half section, offset section, revolved section, broken section, removed section – section lining.	**3 Hrs**
II	**LIMITS, FITS AND TOLERANCES** Tolerances – Allowances – Unilateral and Bilateral tolerances. Limits – Methods of tolerances – Indication of tolerances on linear dimension of drawings – Geometrical tolerances – application – Fits – Classifications of fits – Selection of fits – examples	**6 Hrs**
III	**SURFACE TEXTURE** Surface texture – importance – controlled and uncontrolled surfaces – Roughness – Waviness – lay – Machining symbols	**3 Hrs**
IV	**KEYS, SCREW THREADS AND THREADED FASTENERS** Types of fasteners – temporary fasteners – keys – classification of keys – Heavy duty keys – light duty keys. Screw thread – Nomenclature – different types of thread profiles – threads in sections – threaded fasteners – bolts – nuts – through bolt – tap bolt, stud bolt – set screw – cap screws – machine screws – foundation bolts	**6 Hrs**
V	**MANUAL DRAWING PRACTICE** Detailed drawings of following machine parts are given to students to assemble and draw the sectional or plain elevations / plans / and side views with dimensioning and bill of materials 1. Sleeve & Cotter joint 2. Spigot & Cotter joint 3. Knuckle joint 4. Stuffing Box 5. Screw Jack 6. Foot step bearing 7. Universal Coupling 8. Plummer Block 9. Swivel Bearing 10. Simple Eccentric 11. Machine Vice 12. Protected type flanged coupling 13. Connecting Rod 14. Tail Stock	**75 Hrs**

Reference Books:

1) Machine Drawing, P.S. Gill, Katsan Publishing House, Ludiana
2) A Text book of Engineering Drawing, R.B. Gupta, Satya Prakasan, Technical India Publications, NewDelhi
3) Mechanical Draughtsmanship, G.L. Tamta, Dhanpat Rai & Sons, Delhi
4) Geometrical and Machine Drawing, N.D. Bhatt, Cheroter book stalls, Anand, West Railway
5) Engineering Drawing, D.N. Ghose, Dhanpat Rai & Sons, Delhi

22034 MACHINE DRAWING

MODEL QUESTION PAPER-1

Time: 3 Hrs **Max Marks : 75**

Part A & Part B to be answered in Drawing sheet

PART A

4 x 5= 20

Theory questions:

Answer any four questions

1. Name different types of section. Explain with example full section and half section.
2. Define Hole basis and shaft basis system. Explain with sketch.
3. Name different types of fits. Draw the tolerance zone for defining those fits.
4. Indicate roughness grade symbol for N10.
5. Illustrate the types of keys. Draw a gib headed key with its proportions.

PART B : 55 Marks

1. Assemble and Draw the following views of stuffing box (Detailed drawing given)

Right half sectional elevation	:	30
Plan	:	20
Bill of Material	:	5

22034 MACHINE DRAWING

MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 4 x 5 = 20

Answer any 5

1. What is the need for sectioning? Explain broken section and revolved section with neat sketch.
2. Why hole basis system is preferred over shaft basis system? Explain with suitable eg & sketch.
3. Define i) Lay
   ii) Waviness with suitable sketch. Draw conventional symbol for mentioning surface finish.
4. State the conventions followed in representing threads in drawings. Draw the representation for internal and external threads.
5. Draw 3 views of square nut of diameter 60 mm with proper formulae.

PART – B

II Assemble and draw the below mentioned views of SCREW JACK

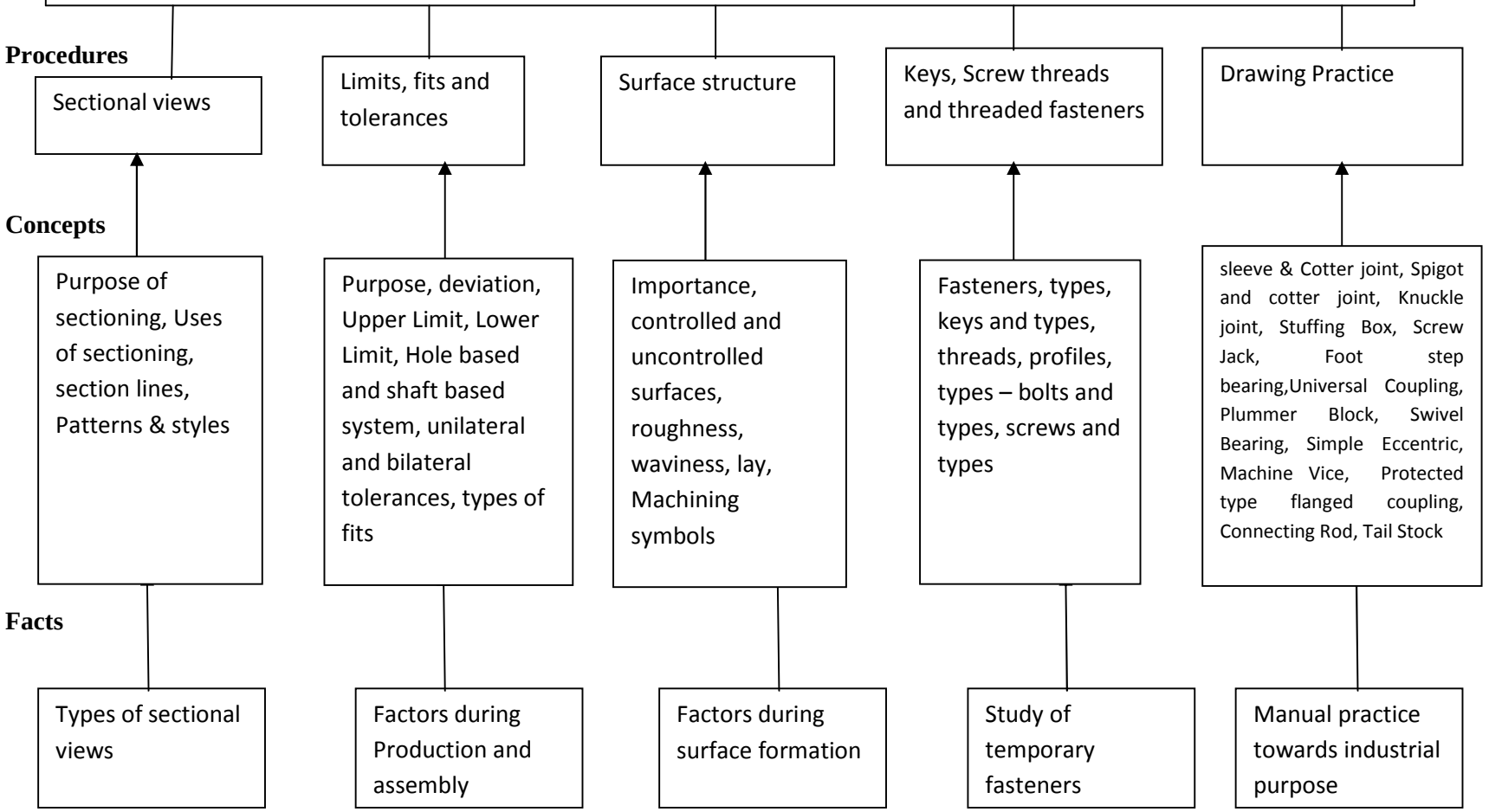
Right Half sectioned elevation	30
Plan	20
Bill of Materials	05
Total	75

LEARNING STRUCTURE

22034 MACHINE DRAWING

Applications

Enable to understand sectioning procedures, Tolerances in manufacturing, surface qualities, temporary fasteners and manual drawing methods of commonly used machine parts of industries by studying machine drawing and to apply the acquired knowledge and skill to draw industrial drawing which leads to manufacturing of parts and assembling with economical man / machine / material use.



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22035 - MECHANICAL TESTING & QUALITY CONTROL PRACTICAL

DIRCETORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22035
Semester	:	III
Subject Title	:	**MECHANICAL TESTING & QUALITY CONTROL PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
Mechanical Testing & Quality control Practical	4	64	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

- Acquire skills on different types of testing methods of metals.
- Conduct material testing on elasticity, hardness, bending, shear strength
- Acquire knowledge in microstructure of the metals.
- Prepare the metal for microscopic view.
- Conduct non-destructive testing methodology to find fine cracks and flaws etc.
- Determine modules of rigidity of open spring and closed coil springs.

Note:

The students should be given training in both sections. All the exercises should be completed. The students should maintain record notebook for the concerned subjects and submit during the Board Practical Examinations.

A. MECHANICAL TESTING

Determine stress strain relations for steel.
Determine hardness of materials.
Perform torsion, bending, impact and shear tests.

Exercises

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 aluminium.

3. Torsion test:

Torsion test on mild steel – relation between torque and angle of twist-determination of shear modulus and shear stress.

4. Bending and deflection tests:

Determination of Young's Modulus for steel by deflection test.

5. Impact test:

Finding the resistance of materials to impact loads by Izod test and Charpy test.

6. Tests on springs of circular section:

Determination of modulus of rigidity, strain energy, shear stress and stiffness by load deflection method (Open & Closed coil spring)

7. Shear test:

Single or double Shear test on M.S. bar to finding the resistance of material to shear load.

B. QUALITY CONTROL

To study the microscope structure of the metals

Determine the microscope structure of the ferrous and nonferrous metals

Conduct the liquid penetration test to find crack

Conduct magnetic particle test to find cracks

Exercise

1. Using the Metallurgical microscope and identify the grain structure of given specimen.
2. Preparation of specimen to examine the micro structure of metal samples (i)Ferrous and (ii) Non-Ferrous (Minimum two exercises on each category).
3. Detection of Cracks in casting using Visual Inspection and ring test&Die penetrant test
4. Detection of Cracks in casting using Magnetic particle test.

BOARD EXAMINATION

Note: All the exercises should be given in the Board Examination and students are allowed to select by a lot

Exercises	**Duration**	**Max. Marks**
A. Mechanical Testing	**2 Hrs**	**45**
Observation/tabulation		15
Reading/calculation		20
Result/Graph		10
B. Quality control	**1 Hrs**	**25**
Specimen preparation		10
View /Exercise		10
Result		5
Viva-voce		**5**
TOTAL		**75**

LIST OF EQUIPMENTS

S.No	LIST OF THE TOOLS &EQUIPMENTS	QUANTITY REQUIRED
1.	UTM	01
2.	Rockwell's Hardness Testing Machine	01
3.	Torsion testing machine	01
4.	Deflection testing arrangement	01
5.	Impact testing machine	01
6.	Tension testing arrangements	01
7.	Shear testing machine	01
8.	Vernier calliper	02
9.	Metallurgical Microscope	06
10.	Sample Specimen for ferrous & non- ferrous (Identification)	06 each
11.	For LPT	
	a. Die	02 no's
	b. Cleaner	04 no's
	c. Developer	04 no's
12.	Magnetic particle test equipment	02 no's
13.	Belt polishing machine	01
14.	Lapping machine	01
15.	Sample Specimen	10 no's

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22036- FLUID POWER PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22036
Semester : III
Subject Title : **FLUID POWER PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Fluid Power Practical	4	64	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

- Determine the co-efficient of discharge of venturimeter, orifice meter, mouth piece and orifice.
- Determine the co-efficient of friction in pipes.
- Conduct performance test on centrifugal and reciprocating pumps.
- Conduct performance test on impulse and reaction turbines.
- Design and operate pneumatic circuits.
- Design and operate fluid power circuits.

Exercises

I. Fluid Mechanics and Machines Lab:-

1. Verifying the Bernoulli's Theorem
2. Determination of co-efficient of discharge of a mouth piece and orifice by variable head method.
3. Determination of co-efficient of discharge of a venturimeter and orificemeter.
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 centrifugal pump and to draw the characteristics curves.
7. Performance test on impulse turbine and to find out the Efficiency.
8. Performance test on reaction turbine and to find out the Efficiency.

II. 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 and memory valve.
5. Automatic operation of double acting cylinder in multi cycle-using limit switch and memory valve.

III. 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.
4. Speed control of hydraulic motor using metering-in and metering-out control.

BOARD EXAMINATION

Part A: One question from fluid mechanics and machines lab (1½ Hrs) - 35 marks

Part B: One question from pneumatics/Hydraulics lab by lot (1½ Hrs) - 35 marks.

(Equal number of students in a Batch)

Viva-voce - 05 marks

Total - 75 marks

LIST OF EQUIPMENTS

1.The Bernoulli's Apparatus- 1 no.

2. An Open tank fitted with a samlla orifice (or) an external mouth piece and a collecting tank with Piezometer - 1no.
3. A Centrifugal pump having the discharge line with venturimeter or orifice meter arrangement – 1no.
4. An arrangement to find friction factor – 1no.
5. A reciprocating pump with an arrangement for collecting data to find out the efficiency and plot the characteristics curves. – 1 no.
6. A centrifugal pump with an arrangement for collecting tank to find out the efficiency and plot the characteristics curves. – 1 no.
7. A impulse turbine with an arrangement for calculating data to find out the efficiency – Francis or Kalpan - 1 no.
8. A reaction turbine with an arrangement for collecting data to find out the efficiency – 1no.
9. Pneumatic Trainer Kit – 2nos.
10. Hydraulics Trainer Kit – 1no.

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

20001- COMPUTER APPLICATIONS PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : COMMON TO ALL BRANCHES

Course Code : 1020
Subject Code : 20001
Semester : III
Subject Title : **COMPUTER APPLICATIONS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Computer Applications Practical	4	64	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

RATIONALE:

The application of Computer knowledge is essential to the students of all disciplines of Engineering in addition to their respective branch of study. The Computer Application Practical course facilitates the necessary knowledge and skills regarding creating, working and maintaining the documents, analyzing the data with charts manipulation of databases and presentation of documents with audio visual effects in a computer.

The learning of internet provides students with unprecedented opportunities to obtain information engage in discussion and liaise with individuals, organizations and groups world-wide. It provides the latest tools and technologies in helping the students to fetch better employment.

OBJECTIVES:

On completion of the following exercises, the students must be able to

- Understand the Windows operating systems
- Familiarize and customize the desktop
- Use the different facilities available in the word processor
- Analyze the data sheet
- Create and manipulate the database
- Prepare PowerPoint presentation
- Understand Internet concepts and usage of e-mail

GUIDELINES:

- All the eighteen experiments given in the list of experiments should be completed and all the experiments should included for the end semester practical examination.
- The end semester practical examination question paper contains two questions-the first question from section-I and the second question from section-II. Each question carries 35 marks and viva voce carries 5 marks.
- The computer systems should be 1:2 ratio for practical classes

ALLOCATION OF MARKS

1. Internal Assessment – 25 Marks

DESCRIPTION	MARKS ALLOTTED
Record with Printout	10
Assignment	5
Attendance	5
Model Examination	5
Total	**25 MARKS**

2. Board Examinations – 75 Marks

Content	Max. Marks	
	Section I	**Section II**
Writing steps	15	15
Execution of exercise	15	15
Result with Printout	5	5
Viva voce	5	
Total	**75 Marks**	

LAB EXERCISES

SECTION – I

WINDOWS

Introduction- History of Windows- screen saver and monitor resolution – Wallpaper setting- Folder manipulation – properties of a folder – Recycle bin – Short cuts – Sorting Folder – Switching between Application – Copying in CD/DVD settings – Recording Audio files.

Exercises

1. a. Installing screen saver and change the monitor resolution by 1280X960
   b. Setting wall papers
   c. Creating, moving, deleting and renaming a folder
   d. Copy, paste and cut a folder/file
   e. Displaying the properties for a file or folder
2. a. Restoring files and folders from Recycle bin
   b. Creating short cuts for folder/file
   c. Finding a file or folder by name
   d. Selecting and moving two or more files/folders using mouse
   e. Sorting folders/files.
3. a. Copying files into CD/DVD
   b. Switching between applications
   c. Making the taskbar wider and hiding the taskbar
   d. Recording and saving an audio file
   e. Set/Change the date and time.

WORD PROCESSING

Introduction – Menus – Tool bar – Create – Edit – Save – Alignment – Font Size – Formatting – Tables – Fill Colors – Mail Merge – Page Setup - Preview – Water marking – Header – Footer – Clip art.

Exercises

4. Create the following table and perform the operations given below

ABC PVT. LTD.

Chennai

Production Summary of various Units in every Quarter

Uunit	Product - ID	Jan-Mar	Apr-june	July-Sept.	Oct-Dec.
Unit - I	56	234.	50	74	125
Unit - II	142	236	126	175	251
Unit - III	213	541	216	60	43
Unit - IV	125	243	127	250	136
Unit - V	143	152	138	80	45

- Arrange Unit name as left align and other columns as right align.
- Use doubled Border to the Summary Title and fill with 15% gray colour.
- Implement merging and splitting two or more cells
- Give alternative fore colour for columns.
- Print the above table.

5. 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.

6. Create a news letter of three pages with two columns text. The first page contains some formatting bullets and numbers. Set the document background colour and add ‘confidential’ as the watermark. Give the document a title which should be displayed in the header. The header/ footer of the first page should be different from other two pages. Also, add author name and date/ time in the header. The footer should have the page number.

SPREADSHEET

Introduction – Menus – Tool bar – Create – Edit – Save – Formatting cells – Chart wizard – Fill Colors – Creating and using formulas – Sorting – Filtering.

Exercises

7. Create a result sheet containing Candidate's Register No., Name, Marks for six subjects. Calculate the total and result. The result must be calculated as below and failed candidates should be turned to red.

   Result is Distinction if Total >= 70 %

   First Class if Total > = 60 % and < 70 %

   Second Class if Total >= 50 % and < 60 %

   Pass if Total >= 35 % and < 50 %

   Fail otherwise

   Create a separate table based on class by using auto filter feature.

8. Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue colour and lowest donation with red colour. The table should have a heading.

9. Prepare line, bar and pie chart to illustrate the subject wise performance of the class for any one semester.

SECTION – II

DATABASE

Introduction – Menus – Tool bar – Create – Edit – Save – Data types – Insert – Delete – Update – View – Sorting and filtering – Queries – Report – Page setup – Print.

Exercises

10. Create Database to maintain at least 10 addresses of your class mates with the following constraints

    - Roll no. should be the primary key.
    - Name should be not null

11. Prepare a payroll for employee database of an organization with the following details:

    Employee Id, Employee name, Date of Birth, Department and

    Designation, Date of appointment, Basic pay, Dearness Allowance,

    House Rent Allowance and other deductions if any.

    Perform simple queries for different categories.

12. Design a pay slip for a particular employee from the above database.

PRESENTATION

Introduction – Menus – Tool bar – Create – Edit – Save – Slide transition – Insert image – Hyper link – Slide numbers – View slide show with sound – Photo album – Clip art.

Exercises

13. Make a marketing presentation of any consumer product with at least 10 slides. Use different customized animation effects on pictures and clip art on any four of the ten slides.
14. Create a Presentation on “Communication Skills” with three different slide transitions with sound effect.
15. Create a photo album in PowerPoint.

INTERNET

Introduction – Browsers – Open a website – Email: Send, receive and delete – Email with Attachments Google docs – Search Engines – Searching topics

Exercises

16. Create an e-mail id and perform the following

    - Write an e-mail inviting your friends to your Birthday Party.
    - Make your own signature and add it to the e-mail message.
    - Add a word attachment of the venue route
    - Send the e-mail to at least 5 of your friends.

17. Create a presentation on Google docs. Ask your friend to review it and comment on it. Use “Discussion” option for your discussions on the presentation.
18. Find out the direction and distance about road travel from Delhi to Agra using the Internet search. Also make a report of the Map and other details like place to stay and visit at Agra.

MODEL QUESTION PAPER

Year / Sem: **II / III**	Subject: **COMPUTER APPLICATIONS PRACTICAL**	Code: **20001**
Answer all the questions		**Max.Marks:75**

1	**Section - I** Prepare line, bar and pie chart to illustrate the subject wise performance of the class for any one semester.
2	**Section - II** Create an e-mail id and perform the following • Write an e-mail inviting your friends to your Birthday Party. • Make your own signature and add it to the e-mail message. • Add a word attachment of the venue route • Send the e-mail to at least 5 of your friends.

LIST OF EQUIPMENTS AND THE QUANTITY REQUIRED FOR A BATCH OF 30 STUDENTS

SOFTWARE REQUIREMENTS

Operating System	Windows XP or Windows Vista or Windows 7 / Linux
Office Package	Microsoft office 2000 or Office 2003 or Office 2007/Open Office

HARDWARE REQUIREMENTS

Desktop Computer System with latest configuration	30 Nos
Power Backup (UPS)	10 KVA
Laser Printer	3 Nos

SAFETY PRECAUTIONS TO BE FOLLOWED BY STUDENTS

- Do not touch, connect or disconnect any plug or cable without teacher's permission
- Don't attempt to touch any live wires
- Systems should be shutdown properly after completion of work

REFERENCES

TITLE	AUTHOR	PUBLISHER	Year of Publication
Computer Applications Practical Manual	Dr.V.Karthikeyan Mr.D.Arulselvan	Learning Resource Centre, Thiagarajar Polytechnic College, Salem- 636 005	2012
Windows 7 in easy steps	Harshad kotecha	Tata McGrawHill	2011
A First Course in Computer 2003	Sanjay Sasena	Vikas Publications	2009
MS Office – 2003	Ramesh Bangia	Kanna Book Publication	2005
Introduction to Computers with MS-Office 2000	Alexis Leon & Mathews Leon	Tata McGraw-Hill	2002
Mastering Microsoft Office 2000	Gini Courter & Annette Marquis	BPB Publications	1999

IV SEMESTER

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22041 - MANUFACTURING TECHNOLOGY - I

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22041
Semester : IV
Subject Title : **MANUFACTURING TECHNOLOGY - I**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Manufacturing Technology - I	5	80	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

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 LATHES	15
	REVISION AND TEST	5
	TOTAL	**80**

RATIONALE:

Manufacturing, the major and the most important aspect in industries needs utmost care and attention. Knowledge about casting processes and allied areas will be of great use to the personnel involved in production.

The areas like heat treatment, powder metallurgy and knowledge in centre lathe and special purpose lathes will provide the students an opportunity to train themselves with the skills needed for the present day industrial scenario.

OBJECTIVES:

- Acquire Knowledge about types of pattern, casting, moulding.
- Explain hot working and cold working processes.
- Describe the various casting processes.
- Appreciate the safety practices used in welding.
- Explain powder metallurgy process.
- Distinguish the different heat treatment processes.
- Explain the lathe and its working parts.
- Describe the functioning of semi automatic and automatic lathes.
- Explain bulk deformation processes.
- Explain the manufacturing of plastic components.

MANUFACTURING TECHNOLOGY – I

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**CASTING PROCESSES** **Patterns** – definition – pattern materials – factors for selecting pattern materials – single piece solid, split patterns – pattern allowances – core prints. **Moulding** – definition – moulding boxes, moulding sand – ingredients – silica – clay – moisture and miscellaneous materials – properties of moulding sand – sand additives – moulding sand preparation – 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 process core making – types of core – core boxes. **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 non ferrous 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	**15Hrs**
II	**JOINING PROCESSES** **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, 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 non destructive types of tests – magnetic particle test – radiographic and ultrasonic test defects in welding – causes and remedies – safety practices in welding .	**15Hrs**
III	**BULK DEFORMATION PROCESSES AND HEAT TREATMENT** 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	**15Hrs**

	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.	
IV	**MANUFACTURING OF PLASTIC COMPONENTS AND POWDER METALLURGY** **Plastic Components:** Types of plastics-Engineering plastics – thermosets – composite - structural foam, elastomers - polymer alloys and liquid crystal polymers **Factors Influencing The Selection Of Plastics:** Mechanical properties – degradation- wear resistance -frictional properties- special properties-processing – cost **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. **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.	**15Hrs**
V	**CENTRE LATHE AND SPECIAL PURPOSE LATHES** **Centre Lathe:** Theory of lathes – specifications – simple sketches – principal parts – head stock – back geared type – all geared type – tumbler gear mechanism – quick change gear box – apron mechanism – carriage cross slide – automatic, longitudinal and cross feed mechanism – tail stock and its functions – work holding device – face plate – three jaw chuck – four jaw chuck – catch plate and carrier – types of centres – machining operations done on lathe - straight turning – step turning-taper turning-knurling-Thread cutting-Facing-Boring-chamfering–-cutting speed-feed-depth of cut. **Semi Automatic Lathes:** Types of semi automatic lathes – capstan and turret lathes – difference between turret and capstan – tools and work holding devices – self opening die head – collapsible taps **Automatic Lathes:** Automatic lathe – classification of single spindle automatic lathe – principle of automatic lathes – automatic screw cutting machines – multi spindle automatic lathes	**15Hrs**

Text 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) A Text book of workshop Technology - R.S.Khurmi & J. K. Gupta - 2nd Edition, S.Chand & Co., Ram Nagar, New Delhi – 2002.

Reference Books:

1) Manufacturing process – Begeman - 5th Edition -McGraw Hill, New Delhi 1981.
2) Workshop Technology- WAJ Chapman - Volume I, II, & III – Vima Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
3) Workshop Technology – Raghuwanshi - Khanna Publishers. Jain & Gupta, Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi 110 006 - 2006
4) Production Technology - P. C. SHARMA - Edn. X - S.Chand & Co. Ltd., Ram Nagar, New Delhi 110 055 - 2006
5) Production Technology – HMT- Edn. 18 - published by Tata McGraw Hill publishing Co. Ltd., 7 West Patel nagar, New Delhi 110 008. – 2001.
6) Manufacturing Engineering & Technology - Kalpakjian,

22041 MANUFACTURING TECHNOLOGY - I

MODEL QUESTION PAPER-1

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. What is pattern?
2. What are the ingredients and its composition in the green sand.
3. What are advantages of pressure die casting.
4. Name the furnace used for melting gray cast iron.
5. Name the 3 types of flame used in gas welding.
6. What type of joints can be produced in spot and seam welding processes.
7. What an the principal joints used in welding processes.
8. What is plasma?
9. What is cold working.
10. What are the advantages of press forging.
11. What are the difference between case hardening and surface hardening.
12. What is process annealing?
13. What is composite?
14. How to improve the wear resistance in plastic components.
15. What is sizing in powder metallurgy.
16. What is compacting in powder metallurgy processes.
17. Write any two principal specification of a lathe.
18. Write any two functions of a tail stock in a centre lathe.
19. Write any two difference between torrent and capstan lathe.
20. What are the functions of a cam in a automatic lathe.

PART-B

Marks 5 x 12=60

Answer all the questions

21. a). i) What are difference pattern allowances provided while making patterns? Explain. **(6)**

ii) Explain with a neat sketch CO2 process of core making. **(6)**

(or)

	b) i)	What are the properties of good moulding sand processes? Explain.	**(6)**
	ii)	Explain with a neat sketch the hot chamber.	**(6)**
22.	a). i)	Explain with a neat sketch the submerged are welding processes.	**(6)**
	ii)	Explain with a neat sketch electron beam welding processes.	**(6)**
		(or)	
	b) i)	Explain with a neat sketch magnetic particle test in welded joints. Write its demerits.	**(6)**
	ii)	What are the safety practices used in gas welding.	**(6)**
23.	a.i)	Differentiate between hot working and cold working.	**(6)**
	ii)	What is isothermal annealing? Explain.	**(6)**
	b.i)	Draw the iron carbon equilibrium diagram. Indicate the Different phase transformation.	**(12)**
24.	a). i)	Differentiate between thermoplastic and thermo set plastic.	**(6)**
	ii)	What are methods of manufacturing metal powder in powder metallurgy processes. Explain with a neat sketch any one process.	**(6)**
	b) i)	Explain with a neat sketch any one injection moulding.	**(6)**
	ii)	What are the design rule in powder metallurgy processes? Explain with suitable example.	**(6)**
25.	a). i)	Name the work holding devices used in a lathe. Explain with neat sketch any one such devices.	**(6)**
	ii)	Explain with a neat sketch the self opening die.	**(6)**
	b) i)	Explain with a neat sketch the all geared head stock.	**(6)**
	ii)	Explain with a neat sketch single spindle automatic lathe.	**(6)**

22041 MANUFACTURING TECHNOLOGY- I
MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A
Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. What is negative allowance?
2. Composition of the ingredients use in synthetic green moulding sand.
3. Name the additives used in dry sound mould.
4. Name any two advantages of pressure die casting.
5. List out the gas welding equipments.
6. Name the basic welding joints.
7. What destructive test in welding joints?
8. What is hard facing?
9. What is cold working?
10. What are the quenching mediums used in heat treatment of steel?
11. Name any two tools used in smith forging.
12. What is tempering?
13. Write any two properties of a thermo set plaster.
14. What is composite?
15. What is sintering?
16. What is infiltration?
17. Write any two specification of a centre lathe.
18. Define feed in a lathe.
19. Name any two semi automatic lathe.
20. Classify simple spindle automatic lathe.

PART – B
Marks 5 x 12=60
Answer all the Questions

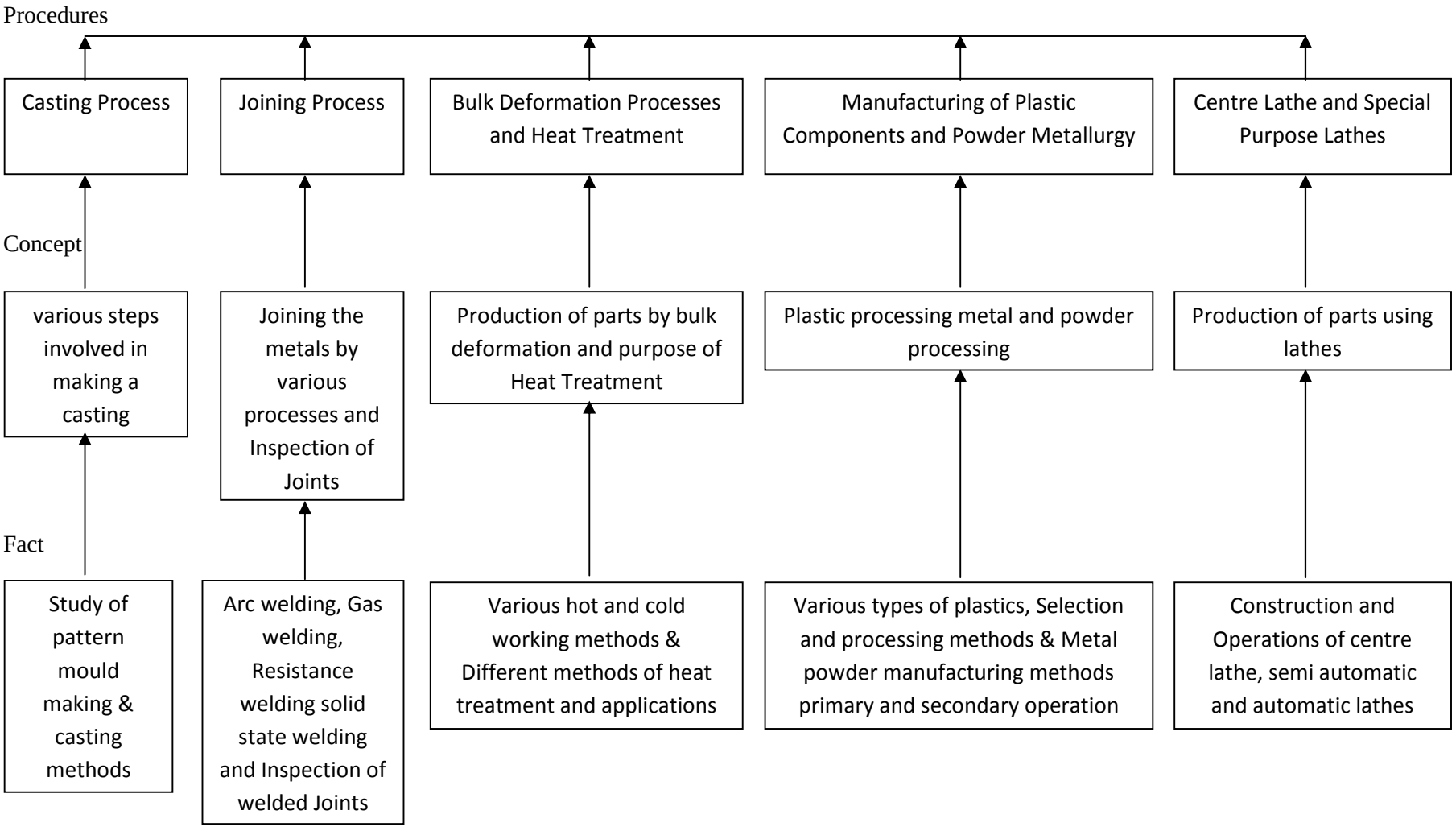
21	a. i)	List the types of pattern. Explain.	(6)
	ii)	Name any one melting furnace used for melting of aluminum. Explain with sketch.	(6)
		(or)	
	b.i)	Write the procedure for making green sand mould.	(6)
	ii)	Explain with a neat sketch pressure die casting in hot chamber process.	(6)
22.	a.i)	Explain with a neat sketch the three types of flame used in gas welding process.	(6)
	ii)	Explain with a neat sketch the ultrasonic testing in welded joints.	(6)
		(or)	
	b.i)	Explain with a neat sketch the Electro slag welding.	(6)
	ii)	Explain with a neat sketch spot welding.	(6)
23	a.i)	Differentiate between hot working and cold working.	(6)
	ii)	Explain the full annealing process. Write its purpose.	(6)
		(or)	
	b.	Draw the Iron-Carbon equilibrium diagram and indicate the phase transformations.	(12)
24	a.i)	Explain with a neat sketch injection moulding machine..	(6)
	ii)	Explain with a neat sketch any one method of manufacturing metal powder in powder metallurgy process.	(6)
		(or)	
	b.i)	What are the frictional properties of plastic components?	(6)
	ii)	What are the design rules for the powder metallurgy components?	(6)
25.	a)	Explain with the sketch any four operations in a lathe.	(12)
		(or)	
	b)i)	Differentiate between capstan and turret lathes.	(6)
	ii)	Explain with a neat sketch single spindle automatic lathe.	(6)

LEARNING STRUCTURE

22041 MANUFACTURING TECHNOLOGY - I

Applications

Acquiring knowledge about various manufacturing processes and machine tools to produce parts for various requirements.



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22042 - THERMAL ENGINEERING -I

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22042
Semester : IV
Subject Title : **THERMAL ENGINEERING -I**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Sem7ster	Marks			Duration
Thermal Engineering-I	6	96	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	BASICS OF THERMODYNAMICS AND THERMODYNAMIC PROCESSES OF PERFECT GASES	18
II	THERMODYNAMIC AIR CYCLES AND STEADY FLOW ENERGY EQUATION & APPLICATIONS	18
III	AIR COMPRESSORS AND GAS TURBINES	18
IV	FUELS & COMBUSTION OF FUELS AND I.C ENGINES	18
V	PERFORMANCE OF I.C ENGINES & HEAT TRANSFER	18
	REVISION AND TEST	6
	Total	96

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 thermodynamics and thermodynamic processes.
- Explain different Air Cycles.
- Apply steady flow energy equation for nozzles and condensers.
- Familiarize the parts, functions and types of Air compressors and determine their efficiency.
- Describe the working of the gas turbines.
- Explain different type of fuels and their combustion phenomenon.
- Explain the types and functions of IC engines.
- Explain the performance tests on IC engines.
- Compare the modes of heat transfer and evaluate the heat transfer by various modes.

THERMAL ENGINEERING –I

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**BASICS OF THERMODYNAMICS AND THERMODYNAMIC PROCESSES OF PERFECT GASES** Introduction – definitions and units of mass, weight, volume, density, 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 – work – power – energy – types - 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 - problems 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 - problems –Thermodynamic Processes-Change in Internal Energy- enthalpy – change in enthalpy – entropy – change in entropy – general equations for change in entropy. Constant volume, constant pressure , isothermal(hyperbolic) , isentropic (reversible adiabatic) , polytropic, – p-V and T-s diagrams, work done , change in internal energy , heat transfer , change in enthalpy , change in entropy for various processes – problems - Free expansion and throttling processes .	**18 Hrs**
II	**THERMODYNAMIC AIR CYCLES AND STEADY FLOW ENERGY EQUATION & APPLICATIONS** 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 - dual combustion cycle (description only). Steady flow system – control volume – steady flow energy equation – assumptions –Engineering applications – steam boiler – condenser – nozzles – steam and gas turbines – reciprocating and rotary compressors –Centrifugal pump – non flow energy equation – problems.	**18 Hrs**
III	**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)– problems – clearance volume and its effects – volumetric efficiency – power required to drive the compressor with clearance volume – problems – multi stage compression –merits and demerits –Two stage compressor with imperfect cooling- with perfect inter cooling - work input – condition for minimum work input in multi stage compressor with perfect inter cooling – ratio of cylinder diameters for minimum work input - problems – 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 – applications of rockets.	**18 Hrs**

IV	**FUELS** & **COMBUSTION OF FUELS AND INTERNAL COMBUSTION 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 – problems – analysis of exhaust gases- Orsat apparatus - calorific value of fuels – higher and lower calorific values – Dulong's formula – problems – determination of calorific value – Bomb and Junker's calorimeter – problems -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 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 - governing of I.C. engines - quantity and quality governing – cooling systems – air cooling – water cooling. Lubrication system – properties of lubricants –types of lubrication systems – Petroil and high pressure Lubrication system- oil pump (Gear & Rotor Pumps) and oil filters.	**18 Hrs**
V	**PERFORMANCE OF I.C ENGINES AND HEAT TRANSFER** 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 – procedure – problems – heat balance sheet – problems**.** Modes of heat transfer – heat transfer by conduction – Fourier's Law- Thermal conductivity – heat conduction through plane and composite walls – heat conduction through a cylinder – simple problems – heat transfer by convection – heat exchanger – Parallel flow and Counter flow – LMTD – forced convection – natural convection – heat transfer by radiation – Radioactive properties- definitions of black and white and opaque , transparent & grey bodies.	**18 Hrs**

Text 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,NewDelhi

Reference Books:

1) Thermal Engineering ,P.L Ballaney , 24th Edition ,Khanna Publishers, New Delhi.
2) Thermal Engineering ,B.K. Sarkar , 3rd Edition , Dhanpat Rai & Sons New Delhi .
3) Applied Thermodynamics, Domkundwar and C.PKothandaraman, 2nd Edition, Khanna publishers, New Delhi.

22042 THERMAL ENGINEERING-I

MODEL QUESTION PAPER-1

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Define ‘Absolute Zero ‘of temperature?
2. State First Law of thermodynamics?
3. What is universal gas constant?
4. Define pressure with unit?
5. Define ‘Air Standard Efficiency’.
6. What is meant by control volume?
7. Write the expression for thermal efficiency of diesel cycle?
8. Write down the steady flow energy equation?
9. Sketch the block diagram?
10. State the main classification of air compressor?
11. State the purpose of ‘inter cooling’?
12. How gas turbines are classified?
13. Define calorific value of a fuel’?
14. State any two advantages of super charging?
15. What is meant by’ scavenging’?
16. What are the different types of lubrication system?
17. Define mechanical efficiency?
18. Define ‘indicator power’?
19. Write the modes of heat transfer.
20. Define convection?

PART-B

Marks 5 x 12=60

Answer all the questions

21. a. 0.2 kg of air at a pressure of 1.1 bar 15°c is compressed isothermally to a pressure of 5 bar. Calculate 1) Final volume 2) Heat rejected 3) Change in entropy 4) change in internal energy. Assume R=0.292 KJ/kg k. (12)

(or)

b. Explain with sketches the open & closed system as applied to thermodynamics system. Give two examples each. (12)

22. a. Derive an expression for the air standard efficiency of Joule's cycle in terms of Pressure (12)

(or)

b. Air expands from 3 bar to 1 bar in a nozzle the initial velocity is 90m/s and the temperature 150°c. Calculate the final velocity of air, if c_p=1.005 KJ/kg k. (12)

23. a. A single stage single acting reciprocating air compressor has a bore of 200mm, a stroke of 300mm, It receives air at 1 bar 20°c deliver at 5.5 bar . If the compression follows pv1.3 clearance volume is 5% of stroke volume. Determine the power required to drive the compressor, if it runs at 500 rpm. (12)

(or)

b. Explain the working of a open cycle gas turbine with a neat sketch, compare open & closed gas turbines. (12)

24. a. Describe with neat sketch the method of determining the HCV & LCV of gaseous fuels using the Junker's gas calorimeter. (12)

b. Explain with sketches the working of A.C mechanical fuel pump (12)

25. a. Explain the morse test for finding out the indicated power of a multi cylinder engine. (12)

b. Discuss about the conduction heat transfer through a plane wall & composite wall. (12)

22042 THERMAL ENGINEERING – I

MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. State the law of conservation of energy.
2. Define Mass.
3. Define constant volume process.
4. Define Throttling process.
5. What is Air standard efficiency?
6. Define carnot cycle.
7. Write the steady flow energy equation.
8. What is condenser?
9. State any two merits of Air Compressor.
10. State the demerits of Gas turbine.
11. What is turbojet engines?
12. State any two application of Rockets.
13. What is calorific value of a fuel?
14. What is the difference between four stroke and two stroke engines?
15. What are the types of nozzels?
16. What are the properties of lubricants?
17. Define Brake Power.
18. What is specific fuel consumption?
19. What is convection?
20. State Fourie's law.

PART – B
Marks 5 x 12=60

Answer all the Questions

21 a. A gas whose pressure, volume and temperature are 5 bar, 0.23 m^3 and 185^0c respectively has its state changed at constant pressure until its temperature become 70^0c. Determine – (12)

i) the work done

ii) change in internal energy.

iii) the heat transferred during the process, R=290 J/kg K, Cp=1.005 KJ/kgk

(or)

b.i) Explain Boyle's law. (6)

ii) Explain I and II law of thermodynamics. (6)

22. a. The following data refers to a four cylinder petrol engine (12)

Total Swept volume – 2000cc

Clearance volume – 60 cc per cylinder.

Maximum cycle temperature – 1400^0c

At the beginning of compression, the pressure is 10^5 N/m^2 and the temperature is 24^0c. Calculate the air standard efficiency and the mean effective pressure.

(or)

b. Explain steady flow energy equation. (12)

23 a. Explain the classification of Air compressor. (12)

(or)

b. Explain open and closed cycle gas turbines. (12)

24 a.i) State the equipments of a good fuels. (6)

ii) Classification of IC engines. (6)

(or)

b. Explain four stroke cycle petrol engine. (6)

25. a) Explain Morse Test. (6)

(or)

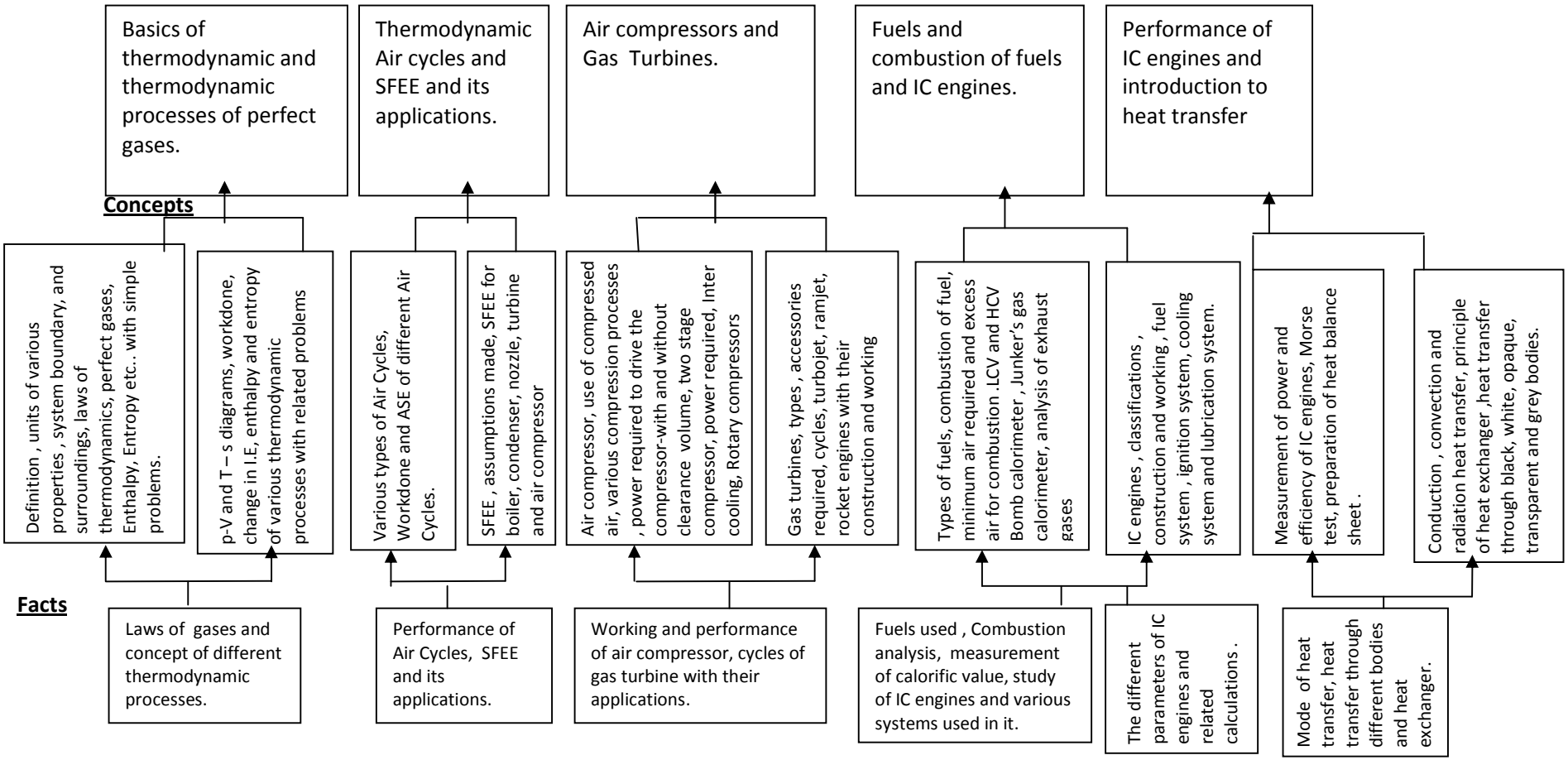
b) i) Explain the modes of heat transfer. (6)

ii) Explain heat transfer by conduction. (6)

LEARNING STRUCTURE

22042 THERMAL ENGINEERING-I

Application



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22043 - ELECTRICAL DRIVES & CONTROL

DIRECTORATE OF TECHNCIAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22043
Semester : IV
Subject Title : **ELECTRICAL DRIVES & CONTROL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Electrical Drives & Control	5	80	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	DC CIRCUITS AND DC MACHINES	15
II	AC CIRCUITS AND AC MACHINES	15
III	STEPPER AND SERVO MOTORS & DRIVES	15
IV	POWER SUPPLIES AND LOGIC GATES	15
V	CONTROL ELEMENTS AND PLC	15
	REVISION AND TEST	5
	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.
- Analyse 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.

ELECTRICAL DRIVES & CONTROL

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DC CIRCUITS AND DC MACHINES** Definition- Electric current, voltage and resistance -Ohm's law and Kirchoff's law- Resistance in series and parallel and series, parallel – simple problems- electromagnetism (definitions only) – magnetic flux, flux density magnetic field intensity, MMF, permeability, reluctance, Faraday's law of electromagnetic induction, electrical and mechanical units DC generators – construction, principle of operation, types and application. DC motors: - construction, principle of operation, types and application. Necessity of starters: Three point, four point starters.	**15Hrs**
II	**AC CIRCUITS AND AC MACHINES** Fundamentals of AC voltage, and current – peak, average, RMS value of sine wave, frequency, time period, amplitude, power and power factor (definition only) - star and delta connection relationship between phase, line voltage and current in star and delta connections. Transformer: Principle of operation and construction – EMF equation (no definition)- losses in Transformer – efficiency – application. Alternator construction – principle of operation – types and applications. AC machine: AC motors- Principle of operation of single phase capacitor start induction motor- applications- Three phase induction motors – Squirrel cage and slip ring Induction motors (construction and working principle only) - application – speed control of 3Φ Induction motor -Necessity of starters – DOL and star/delta transformer	**15Hrs**
III	**STEPPER AND SERVO MOTORS & DRIVES:** PMDC, Stepper motor- construction and working principle and applications - Servo motor – types: brushless servo motor, permanent magnet servo motor construction and applications. Industrial drives- types, group drive, individual drive, multi motor drive, block diagram of Variable frequency drive , stepper motor drive: single stepping and half stepping. Servo drives Electrical safety: - importance of earthing - electric shock: first aid, precautions - causes of accident and their preventive measures. Energy conservation	**15Hrs**

IV	**POWER SUPPLIES AND LOGIC GATES** Diode – terminals: anode and cathode, forward biasing and reverse biasing – use of diode in rectifiers – half wave and full wave – necessity of filters- Regulated power supplies: IC voltage regulators – SMPS, UPS and Inverters – General description and their applications Display devices – LED, 7 segment LED, LCD Logic gates: Positive and negative logic, definition, symbol truth table, Boolean expression for OR, AND, NOT, NOR, NAND, EXOR AND EXNOR gates – Universal logic Gates: NAND, and NOR.	**15Hrs**
V	**CONTROL ELEMENTS AND PLC** Fuses – selection of fuse – necessity of fuse- fuse switch units. Sensors: Photo electric sensor, Inductive proximity sensors, Temperature sensors. Switches: Push button switch, selector switch, limit switch, pressure switch, temperature switch, float switch and reed switch. Relays – NO, NC – usage- bimetallic thermal overload relays. Contactors- usage – necessity of contactor- Solenoid type contactor Circuit breakers – Miniature case Circuit breaker (MCCB) and Miniature Circuit breaker (MCB), Oil Circuit breakers (OCB), Earth leakage circuit breaker (ELCB) Features of PLC-PLC Block diagram- PLC scan - Fixed and modular PLC-Ladder logic-NO, NC contacts-Coils-AND, OR.	**15Hrs**

Text Books:

1) "A course in electrical engineering " - B.L.Theraja - Multi Colour Edition, S Chand & Co, Reprint 2006
2) Control of Machines - S.K Bhattacharya, Brijinder Singh – New Age Publishers, Second Edition- Reprint 2010
3) "Electronic Circuits & System- Analog and Digital" – Y.N.Bapat - Tata Mc Graw Hill .

Reference Books:

1) "Electrical Technology" – Hughes - 8th Edition, Pearson Education.
2) "Electronic Device and Circuits- An introduction" – Allen Mottershed - Prentice Hall of India.

22043 ELECTRICAL DRIVES AND CONTROL
MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

PART-A
Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. What in electrical current?
2. If R1=5Ω and R2=3Ω what is the effective resistance when they are connected in parallel.
3. What is magnetic flux?
4. Write any two application of DC motor?
5. Write the experiment for RMS value of sinusoidal wave in terns of peak value
6. Write the types of altimeter
7. What is time period?
8. What are the losses in a transformer?
9. What is group device?
10. Write what is half stepping?
11. Write any one from and for electrical stock
12. Write any one application of permanent magnet servo motor?
13. Draw the symbol for semiconductor display and identify the terminals?
14 Write any one application of UPS?
15. What are the semiconductors display divisions?
16. Write the Boolean expression for NAND and why it is called has universal logical gate?
17. What is the need of fuse
18. Draw the symbol for NO and NC of a conductor?
19. Mention any two types of switches.
20. Expand MCCB

PART-B
Marks 5 x 12=60

Answer all the questions

21.	a.i)	Find the value of current flowing through 8Ω in the following circuit?		(6)
	ii)	State the different types OR of DC motor with diagram		(6)
	b.	Explain the construction of DC generator with neat diagram?		(12)
22.	a.i)	Establish the relationship between line voltage and phase voltage, line current phase current of delta connection by pastor diagram		(6)
	ii)	Explain the principle of operation of 3D induction method?		(6)
	b.i)	Explain with neat diagram star delta starter		(6)

		ii)	Explain the principle of operation of one transformer	(6)
23.	a.i)		Explain the working principle of stepper motor and write any four applications.	(6)
		ii)	Write short notes on burblers servo motor	(6)
	b.i)		Write the importance of ear thing and write about causes of accident How will you prevent them?	(6)
		ii)	Draw the block diagram of variable frequency drive	(6)
24.	a.i)		Explain with neat diagram of forward biasing and reverse biasing of PN junc diode	(6)
		ii)	Draw a neat diagram how PN semiconductor diode is used as half wave rectifier	(6)
	b.i)		What is positive logic and negative logic	(6)
		ii)	Explain how NAND gate can be used as an universal gate for building other logics.	(6)
25.	a.		Draw the inductive proximity sensor and explain how it can be used as a metal detector?	(12)
	b.		Draw the neat diagram of oil circuit breaker and earth leakage circuit breaker and explain hoe they can be applied in electrical circuit.	(12)

22043 ELECTRICAL DRIVES AND CONTROL
MODEL QUESTION PAPER-II

Time: 3 Hrs **Max Marks : 75**

PART-A
Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. State Ohms law
2. If R1=10ohms and r2=12ohms r1 and r2 are connected in series find the effective resistance.
3. Give an application of dc motor
4. Why a starter to necessary of dc motor?
5. Define peak value
6. List any two losses of transformer?
7. What is meant by power factor?
8. State an application of alternator?
9. What is meant by energy conservation?
10. List any 2 types of servomotor?
11. State an application of stepper motor?
12. Write one precaution of ovoid electric shock?
13. Why do you need filter in rectifier?
14. Write the symbol and truth table of AND gate?
15. Draw the symbol of LED?
16. Expand SMPS?
17. What is meant by fuse?
18. List any two types of switches?
19. State the use of MCB?
20. Expand ELCB

PART-B
Marks 5 x 12=60

Answer all the questions

21.	a.	Draw the circuit of four point starter and explain its working?	(6)
	b.i)	State faraday law of electromagnetic induction?	(6)
	ii)	Explain the working of a DC motor with a neat diagram?	(12)
22.	a.i)	Explain the relation ship between phase and line voltage and current in star connection?	(6)
	ii)	Explain the principle of working of a 3b slipping induction motor?	(6)
	b.	Describe the construction, principles of operation application of transformer?	(12)

23.	a.	What is meant by an industrial drive list the types and explain any two in details?	(12)
	b.i)	State the importance of ear thing?	(6)
	ii)	List the causes of accident and their preventive measures?	(6)
24.	a.	Explain the working of full wave rectifier with a neat diagram. Also draw the input and output waveforms	(12)
	b.i)	Write a short note on 7segment LED	(6)
	ii)	Draw the symbol and write the truth table of OR, NOT, NAND and NOR gates	(6)
25.	a.i)	Explain the working of Full wave rectifier with a neat diagram also draw the input and output wave form?	(12)
	b.i)	What in meant by a contactor and explain	(6)
	ii)	State the necessity of a contactor and explain solenoid type contactor	(6)

LEARNING STRUCTURE

22043 ELECTRICAL DRIVES AND CONTROL

Application

Mechanical Engineers needs to manage fully automated or a manual production floor. He has to handle several switches, Circuit breakers, relays mounted on Control panels . The subject aims to provide knowledge on the DC and AC operated machines and its controlling elements

Procedure

- DC circuits and DC machines.
- AC Circuits and AC machines
- Stepper and servo motors and drives, safety
- Power supplies and Logic gates.
- Control elements and PLC

Concepts

- DC electrical Circuits - Ohms Law, Kirchoffs law DC Generators and DC motors, starter.
- AC electrical Circuits , Transformers and alternators
- AC machines - Single Phase iand three phase induction motors
- Steppers motors - Servo motor
- Drives –group drives - and safety
- Diodes - rectifiers – filters and regulated power supplies- Logic gates -
- Control elements and Fixed and Modular PLC

Facts

- Current, Voltage, Resistance relationship- Shunt and series motors and generators
- Frequency, flux, MMF, Power factor, active and reactive power, 1Φ & 3Φ transformers and speed control of induction motors
- Construction, principle of stepper and servo motors, Actuator applications and electrical safety.
- Diodes- linear and switched mode power supplies- Logic gates – Universal gates
- Switches, fuses, circuit breakers contactors. PLC digital I/p, o/p, Ladder logic

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22044 - COMPUTER AIDED MACHINE DRAWING PRACTICAL

DIRECTORATE OF TECHNCIAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22044
Semester	:	IV
Subject Title	:	**COMPUTER AIDED MACHINE DRAWING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
Computer Aided Machine Drawing Practical	5	80	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	**Topics**	**Hours**
I	INTRODUCTION TO CAD SOFTWARE	2
II	DRAWING AIDS AND EDITING COMMANDS	5
III	BASIC DIMENSIONING, HATCHING, BLOCKS AND VIEWS	5
IV	ISOMETRIC DRAWING, PRINTING AND PLOTTING	4
V	CAD DRAWING PRACTICE DETAILED DRAWINGS OF FOLLOWING MACHINE PARTS ARE GIVEN TO STUDENTS TO ASSEMBLE AND DRAW THE SECTIONAL OR PLAIN ELEVATIONS / PLANS / AND SIDE VIEWS WITH DIMENSIONING AND BILL OF MATERIALS USING CAD SOFTWARE – 12 EXERCISES: SLEEVE & COTTER JOINT, SPIGOT & COTTER JOINT, KNUCKLE JOINT, STUFFING BOX, SCREW JACK, FOOT STEP BEARING, UNIVERSAL COUPLING, PLUMMER BLOCK, SIMPLE ECCENTRIC, MACHINE VICE, CONNECTING ROD, PROTECTED TYPE FLANGED COUPLING.	64
	TOTAL	**80**

RATIONALE:

The contemporary progressing world is fast with the latest production systems. The advanced manufacturing of products is developed instantly using CAD Software. Even a small scale industry is now using a CAD software as it has become the heart of the Design department. So CAD has now become inevitable in industries.

Accuracy and Precision are the two important things that decide the quality of a product to survive its competitors in the market. Using CAD software design, the uniform accuracy, multiples of copies and storing in a small space for long time are assured.

The CAD software considerably improves the creativity and flexibility of a designer. The syllabus here enables a candidate to draw an industrial drawing within the optimum reach of a diploma cadre.

OBJECTIVES:

- Appreciate the need of sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare hole basis system with shaft basis system.
- Select different types of fits and tolerance for various types of mating parts.
- Practice on CAD commands in making 2D Drawings.
- Draw assembled drawings of different types of joints and couplings using CAD.
- Draw assembled drawings of various types of machine elements using CAD.

COMPUTER AIDED MACHINE DRAWING PRACTICAL

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**INTRODUCTION TO CAD SOFTWARE** Introduction – History of CAD – Applications – Advantages over manual drafting – Hardware requirements – Software requirements – Windows desktop – CAD screen interface – menus – Tool bars – How to start CAD – How to execute command – types of co-ordinate systems – Absolute – Relative – Polar.	2Hrs
II	**DRAWING AIDS AND EDITING COMMANDS** Creating objects (2D) – Using draw commands – Line, Arc, Circle, Ellipse, Donut, Polygon, Point, Pline, Sketch, Trace – Creating 2D Solid. Creating text – Dtext, Mtext, Text styles – Mline, spline – Drawing with precision – Osnap options – drafting settings –limits – Units – 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 – Pedit – Ddedit – Mledit.	5Hrs
III	**BASIC DIMENSIONING, HATCHING, BLOCKS AND VIEWS** Basic dimensioning – Editing dimensions – Dimension styles – Dimension system variables. Machine drawing with CAD. Creation of blocks – Wblock – inserting a block – Block attributes – Hatching –Pattern types – Boundary hatch – working with layers - Controlling the drawing display – Blipmode – View group commands – Zoom, redraw, regen, regenauto, pan, viewres – Real time zoom. Inquiry groups – calculating area – Distance – Time – Status of drawing – Using calculator.	5Hrs
IV	**ISOMETRIC DRAWING, PRINTING AND PLOTTING** Isometric drawing – Isometric projection – drawing isocircles – Dimensioning isometric objects. File commands – File Import and export – plotting drawing – external references – 3D fundamentals – 2D to 3D Conversion 3D Drawing : 3D Primitives-Extrude – Revolve-Slice-Section, Surface 3D Mesh-3D - Surface-3D Operation-Solid Editing	4Hrs

V	**CAD DRAWING PRACTICE** Detailed drawings of following machine parts are given to students to assemble and draw the sectional or plain elevations / plans / and side views with dimensioning and bill of materials using CAD Software		**64Hrs**
	1.Sleeve & Cotter joint 2.Spigot & Cotter joint 3.Knuckle joint 4.Stuffing Box 5.Screw Jack 6.Foot step bearing 7.Universal Coupling 8.Plummer Block 9.Simple Eccentric 10.Machine Vice 11.Connecting Rod 12.Protected type flanged coupling 13.Practice on Isometric Drawing	**3D Drawing** 1. Geneva Wheel 2. Bearing Block 3. Bushed bearing(Assembly) 4. Gib and Cotter(Assembly) 5. Screw Jack(Assembly) **Note:** Take the orthographic view and sectional view from the above assembled 3D drawing.	

Reference Books:

1) Inside AutoCAD - D. Raker and H. Rice - BPB Publications, NewDelhi
2) Engineering Drawing and Graphics + AutoCAD – K.Venugopal, - New Age International Publications
3) CAD/CAM/CIM - P. Radhakrishnan, S. Subramaniyan and V.Raju - New Age International Publications.
4) AutoCAD 2002 with Applications - Sham Tickoo - Tata Mcgraw Hill.
5) Computer Graphics, Prentice – Donald Hearn, M. Pauline Baker - Hall of India Pvt. Limited, NewDelhi.

LIST OF EQUIPMENT

1. Personal computer (With latest processor to suit Auto CAD) – 30 No's
2. MS Windows OS – 30 No's
3. AutoCAD software (release 2000 or above) – 30 Users

Board of Examination

Part A (I to IV units)

One Mark question contain	-	1 x 10 =	10 Marks

Part B – V Unit

1. Assembled view of a given drawing- (2 or 3 views)		45 Marks
2. 3D drawing using 3D commands	–	15 Marks
Viva voce	-	5 Mark
Total		75 Marks

Note to the examiner:

Part A

- Answer any 10 questions out of 15 questions.
- Fifteen questions should cover the complete syllabus (UNIT I to IV)

Part-B

- Answer should be evaluated from the print out for the Part-B questions.(1 & 2).
- Examiner should set the question paper to cover the complete syllabus of Unit-V. (Unit-V – 13 Drawings for Part-B 1st question).
- Examiner has to ask the student to answer any one question from the lot of 13 drawings.
- Examiner has to set the no. of questions minimum 13 even one batch of students contains less than 13.
- 3D Drawing creations the examiner should set the question paper to cover the complete syllabus of Unit-V. (Unit-V – 5 3D Drawings for Part-B 2nd question).

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22045 - MANUFACTURING TECHNOLOGY – I PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22045
Semester	:	IV
Subject Title	:	**MANUFACTURING TECHNOLOGY – I PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Manufacturing Technology – I Practical	6	96	25	75	100	3 Hrs

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 equipments used in welding
- Prepare sand moulds for different patterns.
- Perform welding operation to make different types of joints.
- Identify the different welding defects.
- Appreciate the safety practices used in welding.

Note: All dimensions in mm

Manufacture and estimate the cost of the job for following exercises by assuming the suitable raw material for the final size of the components.

Note to the faculty :-Last job of the raw material(MS Rod Ø32x77mm and MS Rod Ø25x77mm) to be retain in student wise or batch wise .This may be verifiable at the time of Board Practical Examination by the external examiner

All linear dimensions in ± 0.5mm tolerance.

All cylindrical dimensions in ± 0.2mm tolerance.

1. Lathe

1. Introduction of safety in operating machines.
2. Introduction to lathe and its parts.
3. Introduction to work holding devices and tool holding devices.
4. Types of tools used in lathe work.
5. Types of measuring instruments and their uses.
6. Setting of work and tools.
7. Operation of lathe.
8. Practice on a lathe.

Exercises :

1. Plain turning
2. Step turning
3. Taper turning
4. Knurling
5. Thread cutting
6. Bushing

2. Foundry

1. Introduction of tools and equipments
2. Types of patterns
3. Types of sand
4. Preparation of sand moulds
5. Furnaces – crucible furnace and tilting furnace
6. Melting if non ferrous metal
7. Core sands, preparation of cores

Exercises :

Preparation of sand mould :

1. Solid pattern
    a. Stepped pulley
    b. Bearing top
    c. Gear Wheel
    d. T-pipe
2. Split pattern
    a. Bent Pipe
    b. Dumbles
3. Loose Piece Pattern – Dowtail
4. Cylindrical core making
5. Melting and casting – (not for Examination, only for class exercises)

3. Welding

1. Introduction of Safety in welding shop
2. Introduction to hand tools and equipments
3. Arc and gas welding equipments
4. Types of joints

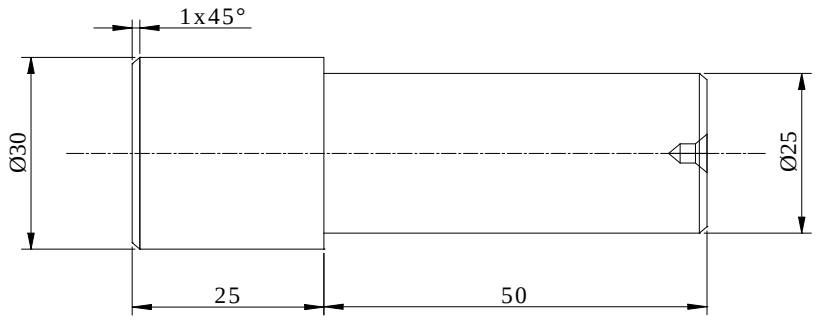
Exercises :

1. Arc welding
   - Lap joint (Material : 25 mm x 6mm MS flat)
   - Butt joint (Material : 25mm x 6mm MS flat)
   - T- joint (Material : 25mm x 6mm MS flat)
   - Corner joint (Material : 25mm x 6mm MS flat)
2. Gas Welding
   - Lap joint (Material : 25mm x 3mm Ms flat)
   - Butt joint (Material : 25mm x 3mm Ms flat)
   - T- joint (Material : 25mm x 3mm Ms flat)
   - Corner joint (Material : 25mm x 3mm Ms flat)
3. Gas cutting : Profile cutting
4. Spot welding – Lap joint (18/20swg)
5. Demonstration of Soldering and brazing

Lathe Exercises:

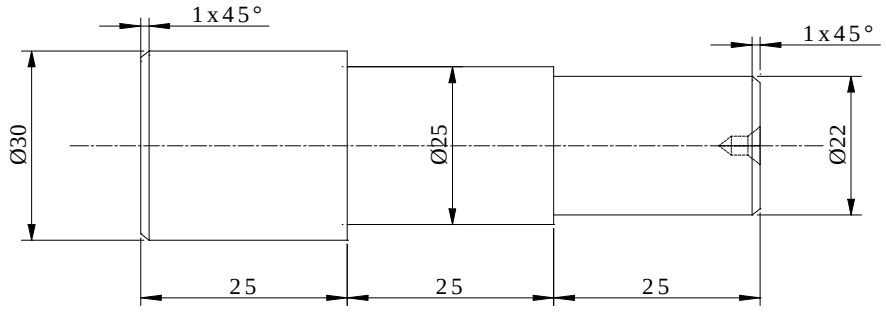
Exercise No:1 –Plain turning .

Raw Material: MS Rod Ø32x77mm



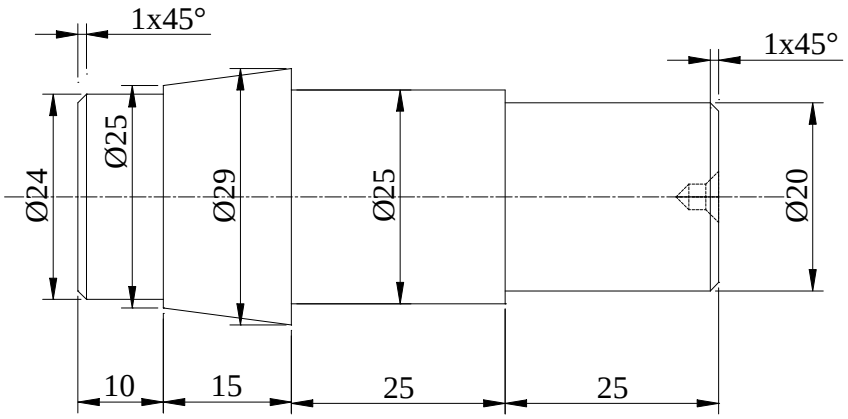
Exercise No:2-Step turning

Raw Material: Exercise No:1



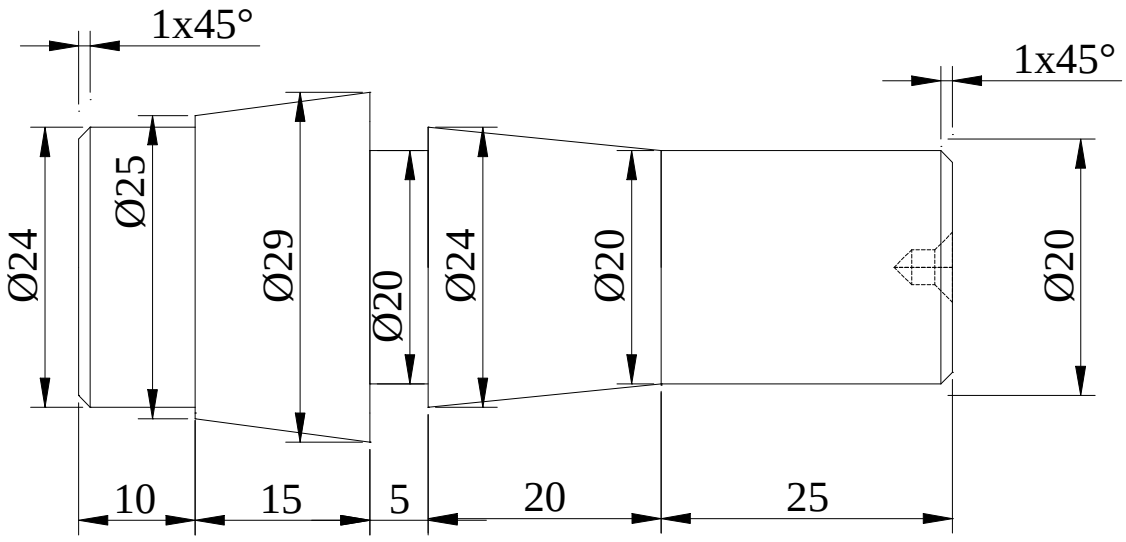
Exercise No:3-Step and taper turning

Raw Material: Exercise No:2



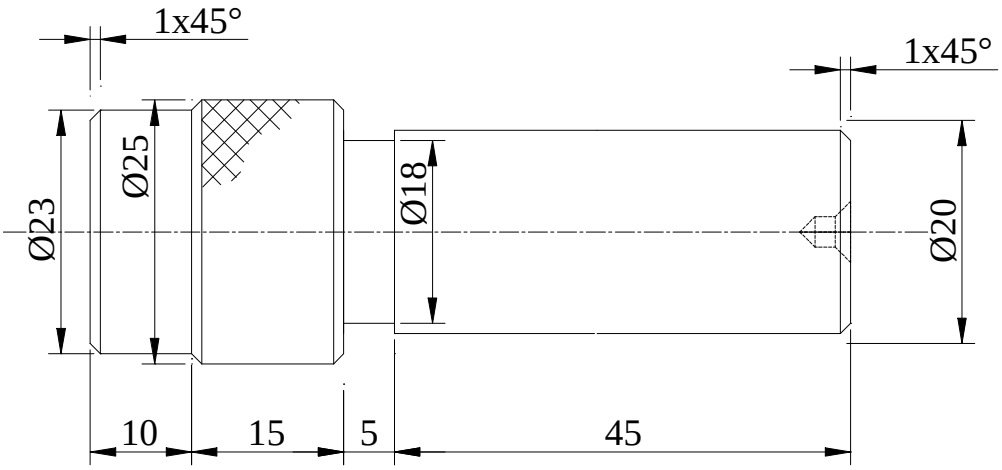
Exercise No: 4-Step and taper turning

Raw Material: Exercise No: 3



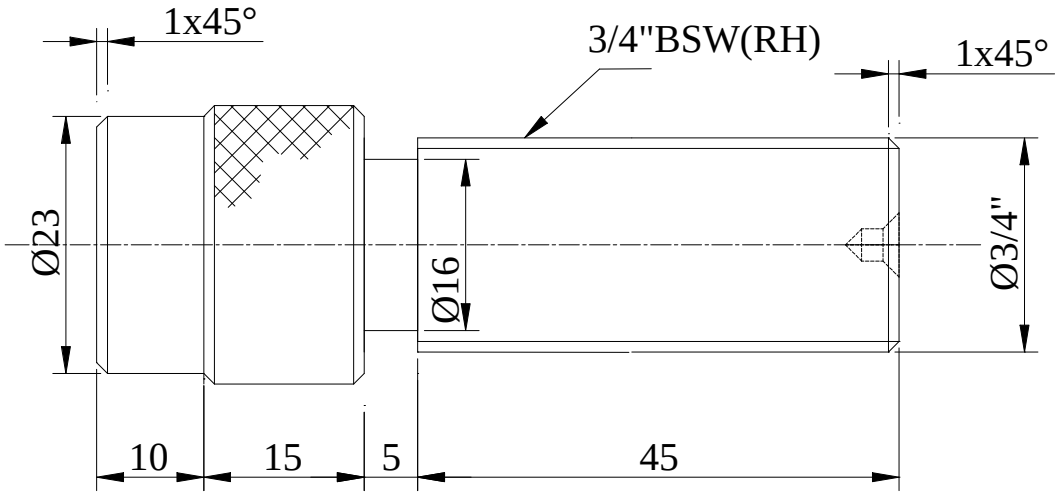
Exercise No: 5 Knurling and step turning

Raw Material: Exercise No:4



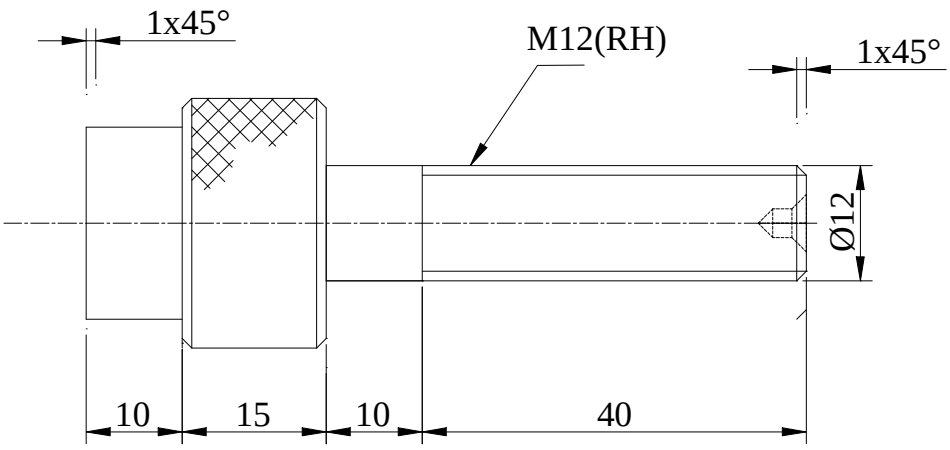
Exercise No:6 - BSW Thread cutting

Raw Material: Exercise No:5



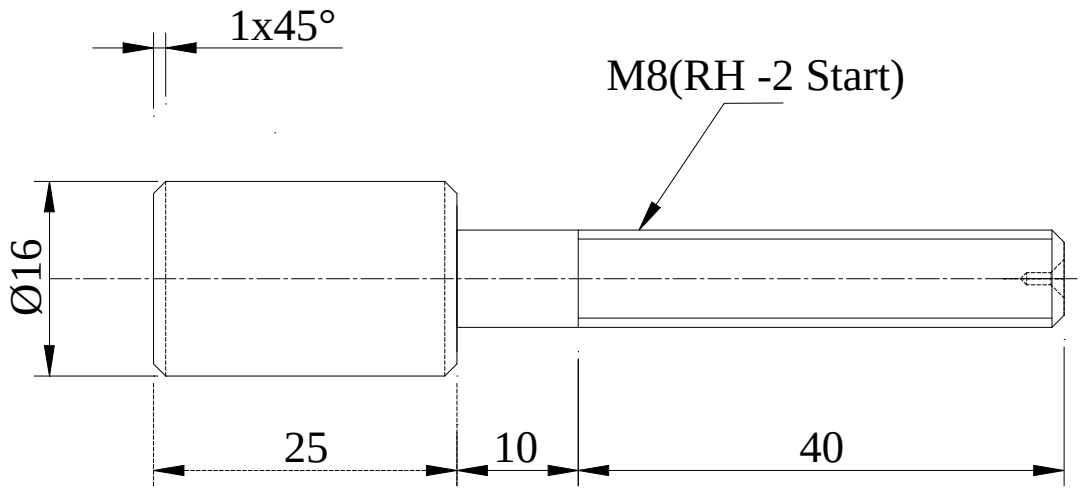
Exercise No:7 – Metric thread cutting

Raw Material: Exercise No:6



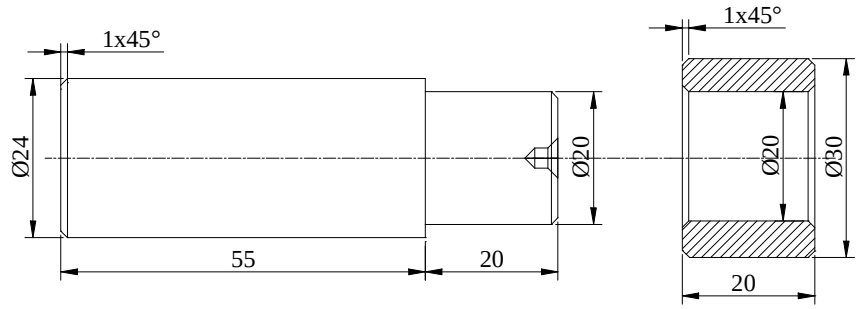
Exercise No:8- Metric thread cutting

Raw Material: Exercise No:7



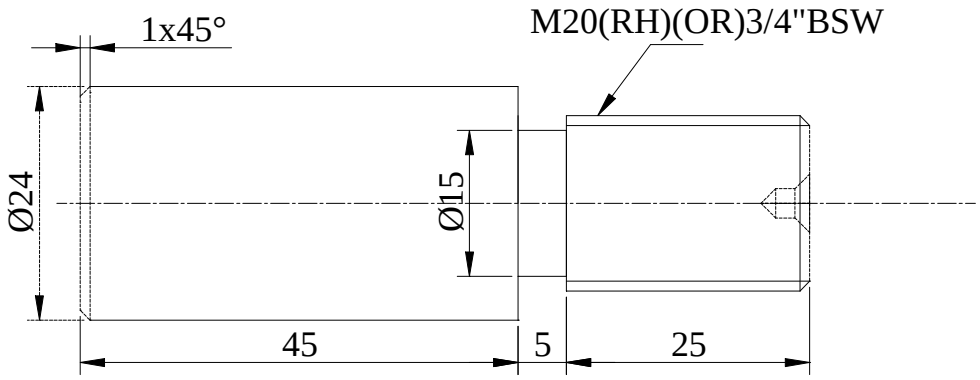
Exercise No: 9-Shaft and bush mating

Raw Material: MS Rod Ǿ25x77mm and Ǿ32x30mm



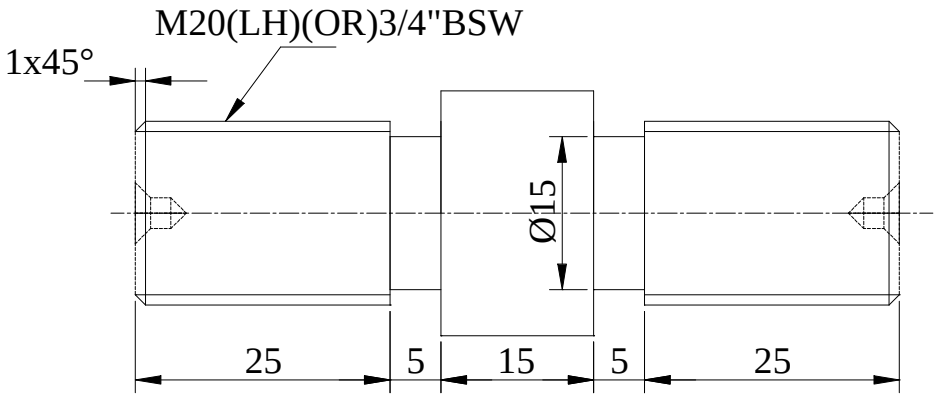
Exercise No: 10- Thread cutting

Raw Material: Exercise No:9



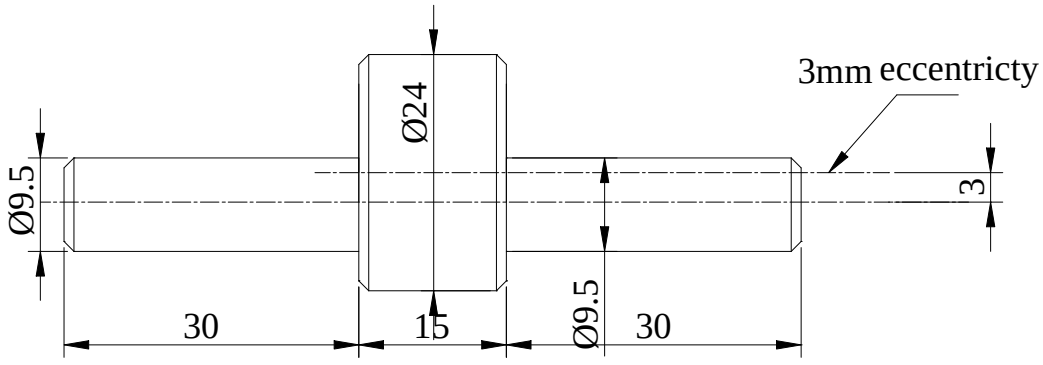
Exercise No:11- Thread cutting

Raw Material: Exercise No:10



Exercise No:12-Eccentric Turning

Raw Material: Exercise No:11



BOARD EXAMINATION

Lathe	: 45 marks (2hours)
Foundry (or) Welding	: 25 marks (1 hour) (By lot Equal distribution in a session)
Viva-voce	: 05 marks
Total	: 75 marks

Each Batch/Session the allocation of exercises (Lathe):

75% of the questions in the combination of step, knurling / taper and thread cutting.

Remaining 25% of the questions to be in the combination of taper, step, knurling and under cut.

LIST OF EQUIPMENT

Turning:

1. Center Lathe 4 ½ ‘ Bed length	–	15 No’s
2. 4 Jaw / 3 Jaw Chucks	–	required Numbers
3. Chuck key (10 mm x 10 mm size)	–	15 No’s
4. Box spanner	–	15 No’s
5. Cutting Tool H.S.S ¼ ‘’ X ¼ ‘’ X 4 ‘’ long	–	15 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)	–	15 Nos.
14. Outside and Inside Calipers	-	15 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	–	15 Nos.

Welding:

1. Arc welding booth	–	2 No's with oil /air cooled welding transformer with accessories
2. Gas welding unit (Oxygen and acetylene cylinder)	–	1 Set
3. Flux	–	500 grams
4. Electrode 10 SWG	–	200 No's
5. Face shield	–	3 No's
6. Gas welding goggles	–	2 No's
7. Leather Glows 18''	–	4 Set
8. Flux chipping hammer	–	4 No's
9. Spot welding machine	-	1 No

Foundry:

1. Crucible furnace	-	1 No
2. Tilting furnace	-	1 No
3. Shovel	-	20 Nos
4. Rammer set	-	30 Nos
5. Slick	-	30 Nos
6. Strike-off bar	-	30 Nos
7. Riddle	-	15 Nos
8. Trowl	-	30 Nos
9. Lifter	-	30 Nos
10. Sprue pin	-	60 Nos
11. Brush	-	20 Nos
12. Vent rod	-	30 Nos
13. Draw spike	-	30 Nos
14. Gate cutter	-	30 Nos
15. Cope box	-	30 Nos
16. Drag box	-	30 Nos
17. Core box	-	10 Nos
18. Runner & riser	-	60 Nos
19. Moulding board	-	30 Nos
20. Patterns	-	15 Nos each

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22046 - METROLOGY & MEASUREMENT AND MACHINE TOOL TESTING PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22046
Semester	:	IV
Subject Title	:	**METROLOGY & MEASUREMENT AND MACHINE TOOL TESTING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
Metrology & Measurement and Machine Tool Testing Practical	4	64	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

- Familiarize about measuring techniques of Metrology instruments.
- Select the range of measuring tools.
- Obtain Accurate measurements.
- Set up instrument for machine tool testing.
- Observe the machine tool alignment and results.
- Observe the manufacturing accuracy of machine tools.

Note:

- The students should be given training in both sections (Part-A & Part-B). All the exercises should be completed and the students should maintain record notebook for the concerned exercise and submit during the Board Practical Examinations.

METROLOGY & MEASUREMENT

Syllabus:

1. Introduction to linear measurement
2. Introduction to angular measurement
3. Introduction to geometric measurements
4. Linear Measuring Instruments
   Vernier Caliper, Micrometer, Inside Micrometer, Vernier Height gauge, Depth Gauge and Slip Gauge.

5. Angular Measuring Instruments – Universal Bevel Protractor, Sine Bar.
6. Geometric measurement - Gear toothVernier caliper, Thread micrometer

Exercises:

PART – A

METROLOGY & MEASUREMENT:

I. LINEAR MEASUREMENTS:

1. Determine the thickness of ground MS flat to an accuracy of 0.02mm using vernier caliper.
2. Determine the diameter and length of cylindrical objects to an accuracy of 0.02mm using vernier caliper.
3. Determine the inside diameter of a bush component to an accuracy of 0.02 using vernier caliper.
4. Determine the diameter of a cylindrical component to an accuracy of 0.01mm using micrometer and check the result with digital micrometer
5. Determine the height of gauge block or parallel bars to an accuracy of 0.02mm using vernier height gauge.
6. Determine the depth of a blind bore component to an accuracy of 0.02mm using vernier depth gauge.
7. Determine the thickness of ground MS plates using slip gauges

II. ANGULAR MEASUREMENTS:

8. Determine the angle of V-block, Taper Shank of Drill and Dovetails in mechanical components using universal bevel protractor.
9. Determine the angle of machined surfaces of components using sine bar with slip gauges.

III. GEOMETRIC MEASUREMENT

10. Measure the geometrical dimensions of V-Thread
11. Measure the geometrical dimensions of spur gear.

PART – B

MACHINE TOOL TESTING

Geometrical Test: Position of machine tool components and displacement of machine tool components relative to one another is checked.
The instruments required for Geometrical tests are Dial Gauge ,test mandrel, Straight edge, Squareness, sprit level.

- Test for level of installation of machine tool in Horizontal and Vertical Planes.
- test for Flatness of machine bed and for straightness and parallelism of bed ways on bearing surface.
- Test for perpendicular of guide ways to other guide ways or bearing surface.
- Test for true running of the main spindle and its axial movements.
- Test for parallelism of spindle axis to guide ways or bearing surfaces.

- Test for line of movements of various members like spindle and table cross slides.
- Practical test in which some test pieces are done and their accuracy and finish is checked.

1. Testing of Lathe machine alignments and prepare a test chart.
   a) Level of lathe.
   b) True running of spindle.
   c) Alignment of both centres.
   d) Parallelism of main spindle to saddle movements.
2. Testing of Shaping machine alignments and prepare a test chart.
   a) Level of machine.
   b) Table top parallel to its transverse movement.
   c) Ram movement parallel to table top.
3. Testing of Tool and Cutter grinder alignments and prepare a test chart.
   a) Level of Tool and Cutter.
   b) True running of spindle.
   c) Parallelism of Table top to its movement.
4. Testing of Pillar type drilling machine alignments and prepare a test chart.
   a) Level of the Drilling machine.
   b) True running of Spindle Taper.
   c) Squareness of Spindle axis with Table.
5. Testing of Surface Grinding machine alignments and prepare a test chart.
   a) Level of the Surface Grinding Machine.
   b) Parallelism of Table Top to its movement.
   c) Parallelism of Spindle axis to the Table Top.
   d) Squareness of Table with Vertical movement of Spindle.
6. Testing of Milling machine alignments and prepare a test chart.
   a) Level of the Machine
   b) Cutter Spindle Axial slip
   c) True running of internal Taper.
   d) Table surface parallel with Arbor.
   e) Test on Column.
7. Testing of Slotting machine alignments and prepare a test chart.
   a) Level of the Slotting machine.
   b) Ram movement perpendicular to the Table Top.
   c) Table Top parallel to its transverse movement.

BOARD EXAMINATION

Note: All the exercises should be given in the question paper and students are allowed to select by a lot

Exercises	Duration	Max. Marks
Part A	**1 Hr**	**25**
Metrology (Linear/Angular/Geometric)		
Least Count calculation/ Tabulation		10
Reading/ Calculation		10
Result		05
Part B	**2 Hrs**	**45**
Machine Tool Alignment / Mechanical measurement		
Drawing/Procedure		10
Alignment test /Calculation		25
Result & Test Chart		10
Viva-voce		**5**
TOTAL		**75**

LIST OF EQUIPMENTS

S.No	LIST OF THE TOOLS & EQUIPMENTS	QUANTITY REQUIRED
1.	Vernier caliper 0.02mm accuracy	06
2.	Micrometer 0.01mm accuracy	03
3.	Vernier Height gauge 0.02mm accuracy	01
4.	Sine Bar	02
5.	Slip Gauge	02
6.	Inside Micrometer 0.01mm accuracy	03
7.	Bevel protractor	02
8.	Gear Tooth Vernier caliper	02
9.	Thread Micrometer 0.01mm accuracy	02
10.	Pitch gauge mm & inch set	02 each
11.	Digital Micrometer 0.001mm accuracy	02
12.	Vernier Depth gauge	02
13.	Sample Specimen as required	
14.	Magnetic stand with dial indicator	06
15.	Straight edge	02
16.	Squares	02
17.	Split level	06
18.	Test Mandrels for each machines	

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22047 - ELECTRICAL DRIVES AND CONTROL PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22047
Semester : IV
Subject Title : **ELECTRICAL DRIVES AND CONTROL PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Electrical Drives and Control Practical	4	64	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

- Identify starters for different motors.
- 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.

LIST OF EXPERIMENTS:

Part A

1. Verification of Ohm's Law
2. Testing of DC starters – 3 point and 4 point starter
3. Load test on DC shunt motor
4. Load test on transformer
5. Testing of AC starters- DOL , star - Delta starter
6. Load test on single phase induction motor
7. Load test on three phase squirrel cage motor
8. Testing of relays, contactors ,push buttons and limit switch
9. Study of earthing, MCB, ELCB

Part B

10. Construction and testing of Half wave and Full wave rectifier.
11. Construction and testing of IC voltage regulator using IC 7805.
12. Study of SMPS, UPS, and inverters.
13. Verification of truth tables for logic gates.
14. Verification of universal gates.
15. Identification and testing of display devices- LED, 7 segment LED, Laser diode.
16. Construction and testing of Stepper motor drive.
17. Construction and testing of Servo motor drive.

Study Experiments should not be given in Board examination.

BOARD EXAMINATION

Sl.No.	**Detail**	**Mark Allotted**
1.	**Exercise 1 from Part A :**	
	Circuit diagram	05
	Connections & Readings	15
	Calculations & Graph	15
2.	**Exercise 2 from Part B:**	
	Circuit diagram	05
	Connections & Readings	15
	Execution	15
	Viva Voce	**5**
	Total	75

LIST OF EQUIPMENTS

Electrical Lab

1 .DC ammeter	0-5A	- 1no
2 .DC ammeter	0-25A	- 1no
3. DC voltmeter	0-30V	- 1no
4. DC voltmeter	0-300V	- 1no
5. Rheostat	10.8 ,8.5A	- 1no
6. AC ammeter	0-5A	- 1no
7. AC ammeter	0-10A	- 2nos
8. AC voltmeter	0-50V	- 3nos
9. AC wattmeter	5A-10A (0-750W,0-600V)	- 3nos
10. Loading rheostat	5A,230V	- 1no
11. Tachometer (Analog type)	0-1000rpm	- 1no
12 .Variac (Auto transformer)	20A,250V	- 2nos
13. 3 point starter	20A,220V	- 1no
14. Dol starter	16A,415V	- 1no
15 .Star /Delta starter	20a,600V	- 1no
16. Over load relay	1 to 2.5A	- 1no
17. Air break contactors	20A,220V	- 4no
18. push button	2A ,220V	-2 nos
19. limit switch	20A,220V	- 1no
20. MCB 20A single pole		- 1no
21 .MCB 20A double pole		- 1no

22. ELCB 2pole	20A,100mA	- 1no
23. ELCB 4POLE	20A,100mA	- 1no

Electronics Lab

1. Transformer	230 / 9-0-9V, 1A	- 4 Nos.
2. Resistor	1 KΩ/ ½ W	- 3 nos.
3. Capacitor	1000 μF/25V	- 4 nos.
4. IC 7805		- 1no.
5. Logic Gates IC 7400, 7408, 7432, 7404, 7402, 7486		- each 1 no.
6. Stepper Motor Drive kit		- 1no.
7. Servo Motor Drive Kit		- 1no
8. SMPS Trainer Kit		- 1no.
9. UPS Trainer Kit		- 1no.
10. Inverter Kit		- 1no.
11. Digital Multimeter		- 1no.
12. LED, 7Segment LED, Laser Diode		- 1 each

V SEMESTER

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22051 - THERMAL ENGINEERING – II

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22051
Semester : V
Subject Title : **THERMAL ENGINEERING - II**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Thermal Engineering - II	5	80	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Formation and properties of steam & Thermodynamic processes of vapour.	15
II	Steam Boilers and Performance of Boilers	15
III	Thermal Power Plants and Steam Turbines and Condensers	15
IV	Refrigeration and Air-Conditioning	15
V	Conventional Sources of Energy and Nuclear power plant.	15
	REVISION AND TEST	5
	Total	80

RATIONALE:

Power generation is the key factor for the development of industries and the nation as whole. Hence, to provide the knowledge resources in this specific area study of steam, boilers, steam turbines, Refrigeration and Air conditioning and Conventional sources of energy are essential.

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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.
- Appreciate the application of refrigeration and air-conditioning.
- Define various parameters used in the psychrometry.

THERMAL ENGINEERING – II

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Formation and properties of steam & Thermodynamic processes of vapour** 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 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 – problems. 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.	**15Hrs**
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 - Lamont and 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	**15Hrs**
III	**THERMAL POWER PLANT AND STEAM TURBINES AND CONDENSERS** **S**election 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 No_2 and SO_2.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.	**15 Hrs**

	Steam condensers – elements of condensing plant – classification of condensers – jet condenser -types – surface condensers - types – Comparison of jet and surface condensers – sources of air in condenser – condenser vacuum – vacuum efficiency – condenser efficiency-Dalton's Law – mass of cooling water required – mass of air present – number of tubes – problems-Cooling Towers.	
IV	**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 –Power Required –Mass of Ice Produced –Problems Bell-coleman cycle– problems – Vapour'compression refrigeration system - vapour absorption system –Comparision-refrigerants – desirable properties. Psychrometry-psychometric properties – dry air – moist air – water vapour – saturated air – dry bulb temperature – wet bulb temperature – wet bulb depression – dew point temperature – dew point depression – humidity – specific and relative humidity – psychrometric chart –psychrometric processes – sensible heating and cooling- By-Pass Factor-humidification – dehumidification –Mixing of Air Stream -simple problems using psychrometric chart – 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.	**15 Hrs**
V	**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 Hrs**

Text Book:

1) Thermal Engg, R.K . Rajput , 8th Edition, Laximi publications pvt Ltd , New Delhi.
2) Thermal Engineering, R.S. Khurmi and J.K. Gupta , 18th Ed, ,S.Chand &Co, NewDelhi
3) Power plant Engineering, G.R. Nagpal,Khanna Publishers, New Delhi.
4) Refrigeration and Air conditioning, P. L. Ballaney, , 4th edition, Khanna Publishers, Newdelhi.

Reference Book :

1) Thermal engineering, P.L Ballaney , 24th Edition ,Khanna Publishers, Newdelhi.
2) Thermal engineering, B.K. Sarkar , 3rd edition , Dhanpat Rai & Sons Newdelhi .
3) Power Plant Engineering Thermodynamics, Domkundwar and C.P Kothandaraman ., 2nd Edition , Khanna Publishers.
4) Refrigeration and Air conditioning, Manohar Prasad.,.
5) Power Plant Engineering, P.C. Sharma, S.K. Kataria & sons, New Delhi.

22051 THERMAL ENGINEERING -II
MODEL QUESTION PAPER-1

Time: 3 Hrs **Max Marks : 75**

PART-A
Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. What is wet steam?
2. Define dry steam?
3. Define the term dryness fraction?
4. Write the expression for entropy of wet steam?
5. State the functions of spring loaded safety value?
6. Give an example for high pressure boiler?
7. Write down the formula for mass of actual evaporation?
8. Define boiler efficiency?
9. Name any one pollutant of thermal power plant?
10. State the function of steam condenser?
11. State any two main elements of condensing plant
12. What is meant by a bleeder turbine?
13. Name any one fertile fuel?
14. Name any two nuclear fuels.
15. State any two main elements of nuclear power plant?
16. State any one material of control rod?
17. What is meant by refrigeration?
18. Define the term DBT?
19. Define cop of refrigerator?
20. What is humidification?

PART-B
Marks 5 x 12=60

Answer all the questions

21.a.1. Steam at a pressure of 8.5 bar absolute and dryness fraction of 0.98 in subjected to throttling expansion of 1 bar. Find the final condition of a steam. Assume cp for super heated steam as 2.25KJ/KGK. (8)

2. State the advantages of superheated steam. (4)

(OR)

b) In a test of wet steam made by a barrel calorimeter, the following observations were made. Calculate the dryness fraction of the steam. (12)

Mass of copper calorimeter = 0.99KG
Mass of copper calorimeter and water = 3.85KG
Mass of copper calorimeter, water and steam = 4.04KG

Initial temperature of water = 70 degree C
Final temperature of water = 44.5 degree C
Temperature of steam = 155 degree C

22.a) Describe with a neat sketch the working of Lamont boiler (12)

(OR)

b) The following observation refer to a boiler trial. Mean temperature of feed water 28 degree C, water evaporated per hour 48000KG, boiler pressure 14 bar absolute, quality of steam 90% dry, coal burnt per hour 4800KG per, calorific value of coal 34000KG/KGK (12)
Calculate a) equivalent evaporation in KG per KG of coal
b) boiler thermal efficiency

23. a) Explain the air and flue gas circuit with the aid of a line diagram (12)

(OR)

b) Explain the surface condenser with a neat sketch (12)

24. a) Describe the working of boiling water reactor with a neat sketch. (12)

(OR)

b) Explain CANDA type reactor with a neat sketch. (12)

25. a) Explain with a line diagram the vapour compression method of refrigeration. (12)

(OR)

b). Describe the working of window type air-conditioning system with a sketch. (12)

22051 THERMAL ENGINEERING – II

MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. Define Dryness fraction.
2. Define density of steam.
3. Define throttling process.
4. State the advantages of super heated steam.
5. Write any two safety precautions in Boiler operation.
6. State the function of Boiler accessories.
7. Define Boiler Efficiency.
8. Define Actual evaporation.
9. What are the pollutants of thermal power plant?
10. State the elements of condensing plant.
11. State Dalton's Law.
12. Define carnot cycle.
13. Define COP.
14. What is the unit of refrigeration?
15. Define psychometric process.
16. State any two applications of Air conditioning system.
17. Define Nuclear fission.
18. Name any two fuels used in Nuclear reactor.
19. State any two components of Nuclear reactor.
20. State any two methods of disposal of Nuclear wastes.

PART – B
Marks 5 x 12=60

Answer all the Questions

21	a.	Determine the specific volume and internal energy of 1 kg of steam at a pressure of 8 bar when steam is 90% dry, saturated and super heated the temperature of super heated steam being 200^{o} c. Assume C_p for superheated steam as 2.25 kJ/kgK.	(12)
		(or)	
	b.	A closed vessel of 0.65 m^3 capacity contains dry saturated steam at 4 bar. The vessel is cooled and the final pressure is 2 bar. Calculate 1. the mass steam in the vessel. 2. The final dryness fraction 3. the amount of heat transferred during the process.	(12)
22.	a.	Explain Lamont Boiler with a neat sketch.	(12)
		(or)	
	b.	Explain BHEL Boiler with a sketch.	(12)
23	a. i)	Sketch and explain any one Jet condenser.	(6)
	ii)	Sketch and explain electrostatic precipitator	(6)
		(or)	
	b.i)	Sketch and explain the elements of condensing plant.	(6)
	ii)	Sketch and explain the Cyclone Separator.	(6)
24	a.	Sketch and explain the Window Air conditioning.	(12)
		(or)	
	b.	Explain COP of Refrigerator and heat engines	(12)
25.	a) i)	Comparison of Nuclear and Thermal power plant.	(6)
	ii)	Define Moderator	(6)
		(or)	
	b) i)	Explain the CANDU type reactor.	(6)
	ii)	Explain the classification of reactor.	(6)

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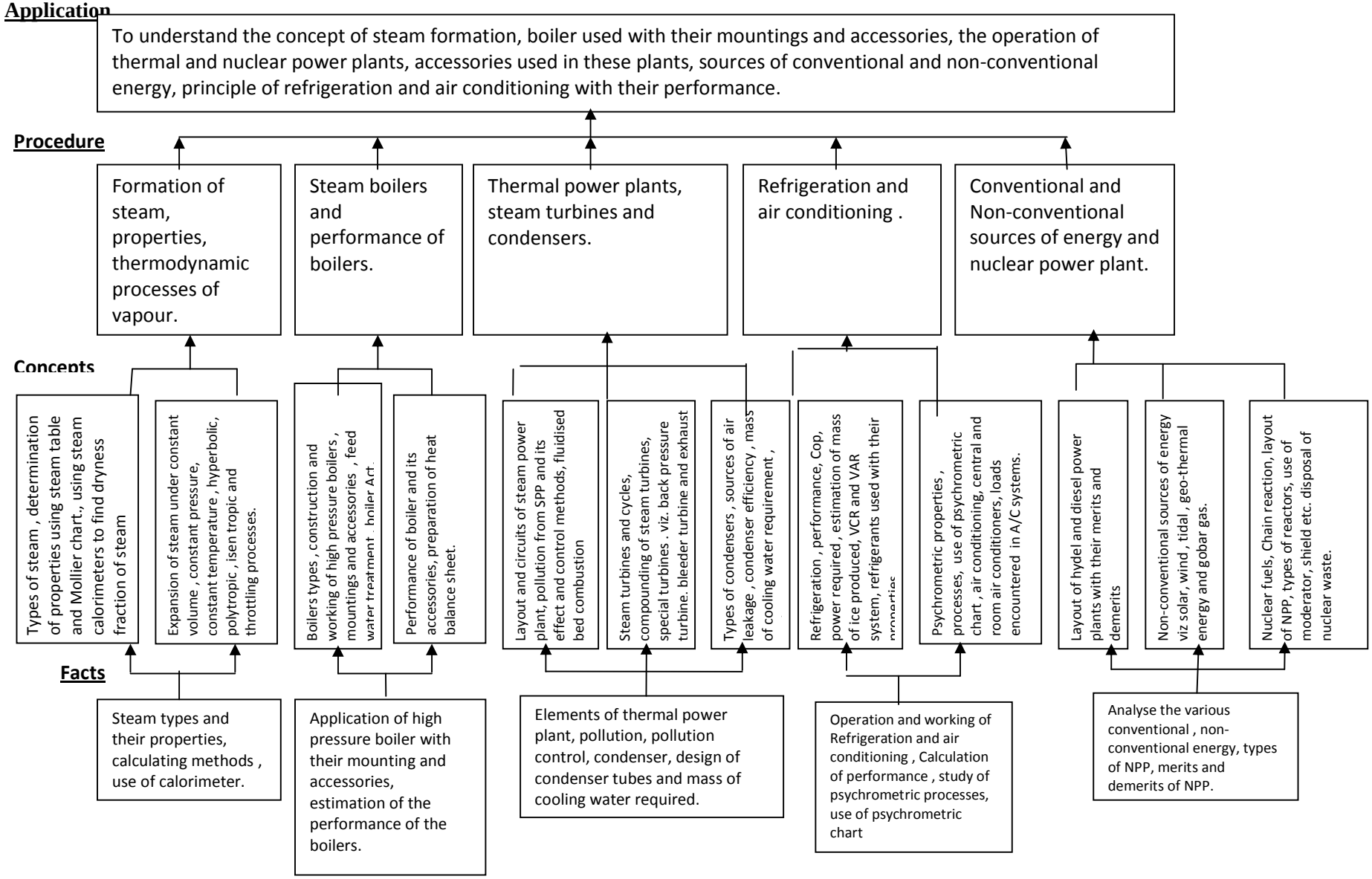
LEARNING STRUCTURE

22051 THERMAL ENGINEERING -II



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22052 - MANUFACTURING TECHNOLOGY - II

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22052
Semester : V
Subject Title : **MANUFACTURING TECHNOLOGY - II**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Manufacturing Technology - II	5	80	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Theory of Metal cutting, Drilling machines and Boring Machines	15
II	Reciprocating Machines	15
III	Milling machines and gear generating processes	15
IV	Abrasive Process and Broaching	15
V	Jigs & Fixtures, Press work & Non-Conventional Machining.	15
	Revision and Test	5
	Total	80

RATIONALE:

It is pertinent that those involved in the process of manufacturing should possess adequate and through knowledge about the working of conventional as well as non conventional machines to see that the process of manufacturing goes on without any hindrance. This will help the individuals to hasten and also troubleshoot the hiccups that may crop up in the process of manufacturing.

The topics included aim to inculcate in the students the skills of metal cutting, drilling, milling, grinding, generating and other machining processes which are very much essential for a technician to at promptly and with precision.

OBJECTIVES:

- Explain the working of machine tools planer, shaper and slotter.
- Compare various work holding devices
- Explain the working of machine tools drilling machine and milling machine.
- Distinguish various types of milling cutter.
- Classify the different types of grinders and grinding wheels.
- Explain the broaching operation and boring operation and their applications.
- Explain the milling procedure for spur, helical and bevel gears.
- Explain the various types of gear generating processes
- Compare the various types of jigs and fixtures.
- Explain the different types of press working operations.
- Appreciate the use of non-conventional machining processes.

MANUFACTURING TECHNOLOGY - II

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**THEORY OF METAL CUTTING, DRILLING MACHINES AND BORING MACHINES** **Theory of Metal Cutting:** Cutting tool material-High carbon Steel-High Speed Steel-Stellites-Cemented carbides-ceramics-Composition and applications for the above-Single point cutting tool-nomenclature-tool life-Chip Breakers. **Drilling Machines:** Drills-flat drills-twist drills-nomenclature-types of drilling machines-bench type-floor type-radial type-gang drill-multispindle type-principle of operation in drilling-speeds and feeds for various materials-drilling holes-methods of holding drill bit-drill chucks-socket and sleeve-drilling-operation-reaming-counter sinking-counter boring-spot facing-tapping-deep hole drilling. **Boring Machines:** Boring machines-horizontal and vertical types-fine boring machines-boring tools	**15Hrs**
II	**RECIPROCATING MACHINES** **Planer:** Types of planers-description of double housing planer-specifications-principles of operation-drives-quick return mechanism-feed mechanism- work holding devices and special fixtures-types of tools-various operation. **Shaper:** Types of shapers-specifications-standard-plain-universal-principles of operations-drives-quick return mechanism-crank and slotted link-feed mechanism-work holding devices-Special fixture-various operations. **Slotter:** Types of slotters-specifications-method of operation-Whitworth quick return mechanism-feed mechanism-work holding devices-types of tools.	**15Hrs**
III	**MILLING MACHINES AND GEAR GENERATING PROCESSES** **Milling Machines:** Types-column and knee type-plain-universal milling machine-vertical milling machine-specification of milling machines-principles of operation-work and tool holding devices-arbor-stub arbor-spring collet-adapter-milling cutters-cylindrical milling cutter-slitting cutter-	**15Hrs**

	side milling cutter-angle milling cutter-T-slot milling cutter-woodruff milling cutter-fly cutter-nomenclature of cylindrical milling cutter-milling process-conventional milling-climb milling-milling operations-straddle milling-gang milling-vertical milling attachment. **Generating Process:** gear shaper-gear hobbing-principle of operation only-gear finishing processes-burnishing-shaving-grinding and lapping-gear materials-cast iron, steel, alloy steels, brass, bronze, aluminum and nylon.	
IV	**ABRASIVE PROCESS AND BROACHING** **Abrasive Process:** Types and classification-specifications-rough grinding – pedestal grinders- portable grinders- belt grinders-precision grinding-cylindrical grinder- centerless grinders – surface grinder- tool and cutter grinder - planetory 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. **Broaching:** Types of broaching machine-horizontal, vertical and continuous broaching-principles of operation-types of broaches-classification-broach tool nomenclature-broaching operations-simple examples.	**15 Hrs**
V	**JIGS & FIXTURES, PRESS WORK & NON-CONVENTIONAL MACHINING** **Jigs And Fixtures:** Definitions and concept of Jig and fixture-Advantages of jigs and fixtures-elements of jigs and fixtures-locating devices-'V' locators-fixed stop locators-adjustable stop locators-clamping devices-strap clamp, screw clamp-cam action clamp-types of jigs-box drill jig-indexing drill jig-types of fixtures-keyway milling fixture-string milling fixture. **Press Working:** Types of presses-mechanical and hydraulic presses-press tools and accessories-press working operations-bending operations-angle bending-channel bending -curling-Drawing-shearing operations - blanking, piercing, trimming-notching-lancing-shaving-parting off. **Non-Conventional Machining Processes:** Construction, working and applications of Ultrasonic machining-chemical machining-electro chemical grinding-electrical discharge machining-plasma arc machining-LASER machining-Advantages – Disadvantages.	**15 Hrs**

Text 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.

Reference Book :

1) Production Technology, HMT, , Edn. 18, published by Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
2) Manufacturing process, Myro N Begman, , Edn. 5, Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
3) Workshop Tech Vol I,II, III, WAJ. Chapman, published by Viva Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
4) Production processes, NITTTR, published by 5, Tata McGraw Hill Publishing Co. Ltd., West Patel Nagar, New Delhi 110 008.

22052 MANUFACTURING TECHNOLOGY-II

MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Name the different chip breakers?
2. Define feed in a drilling operation?
3. Define deep hole drilling?
4. What are the principles movements of a horizontal boring machine?
5. Write any two specification of the shaper?
6. Name the type of planners?
7. Name the work holding devices used in a slotting machine?
8. What are the different table movements in universal shaper?
9. What is the function of a wood ruff milling cutter?
10. What is pressure angle in a gear drive?
11. What are the applications of cast iron as a gear material?
12. What are the principles of milling operations?
13. What is grit in grinding?
14. Name the different broaching operations?
15. What is truing?
16. Name the different feeds used in centre less grinder?
17. Define jigs?
18. Differentiate between blanking die and piercing die?
19. Expand EDM in non conventional machining processes?
20. What is lancing in a press operations?

PART-B

Marks 5 x 12=60

Answer all the questions

21 a) i) What are the properties of a good cutting tool material? Explain? (6)
ii) Explain with a neat sketch any three operations in a vertical boring machine? (6)

(or)

b) i) Explain with a neat sketch . any four operations in a drilling machine? (6)
ii) Nomenclature of a flat drill? (6)

22 a) i) Name the various operations in a planer. Explain any three operations? (6)
ii) Sketch and explain the automatic feed mechanism of a slotter? (6)

(or)

i) What is quick return mechanism? (6)
ii) Explain with a neat sketch the quick return mechanism used in a shaper? (6)

23 a) i) Sketch the milling processes? (6)
ii) Explain with a neat sketch the gear shaper? (6)

(or)

b) i) Explain with a neat sketch the gear hobbling processes. Write its merits and demerits of the process? (6)

24 a) i) Explain with a neat sketch the planetary grinder? (6)
ii) Nomenclature of a pull broach? (6)

(or)

b) i) BIS marking of grinding wheel. Explain? (6)
ii) Explain with a neat sketch the continuous broaching? (6)

25 a) i) Explain with a neat sketch the box drill figure? (6)
ii) Explain with a neat sketch the ultra sonic machining? (6)

(or)

b) i) Name the different binding operator. Explain with a neat sketch anyone binding operator? (6)
ii) Explain with a neat sketch LASER beam maturing. Writes adapter? (6)

22052 MANUFACTURING TECHNOLOGY - II
MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. What is 18-4-1 in H.SS?
2. What is Chip Breaker?
3. Name the tool holding devices used in drilling process,
4. Name the different types of planer.
5. Name the boring tools used in boring machine.
6. List out the any two work holding devices used in a shaper.
7. Write any two principal specification of a slotter.
8. Write the different operations in a planer.
9. Name any two types of Milling cutter.
10. What is the function of a land in the cylindrical milling cutter?
11. Write any two advance of gear hobbing.
12. Write any one application of cast iron as a gear material?
13. What is grit?
14. What is wheel balancing in the grinding process?
15. Write any one applications of pull broach.
16. What is truning?
17. What are elements of a jigs?
18. Name the material used in drill jig bushes.
19. What is bending in a press work?
20. What is Plasma?

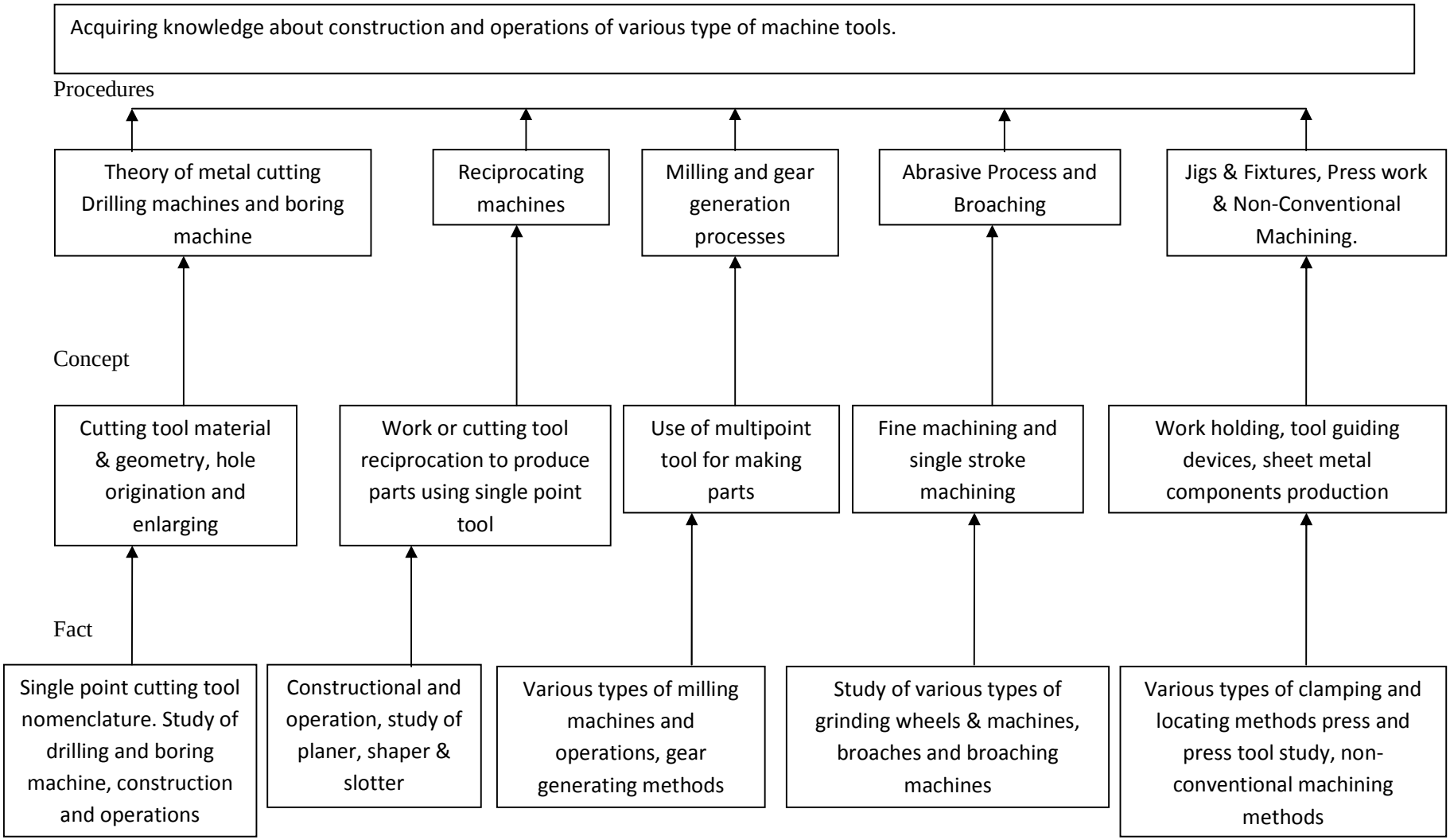
PART – B
Marks 5 x 12=60
Answer all the Questions

21	a. i)	What are compositions in a stellite tool. Write its application.	(6)
	ii)	Sketch the radial drilling machine and label the principal parts.	(6)
		(or)	
	b.i)	List the drilling operation. Sketch and explain any 2 operations.	(6)
	ii)	Explain with a neat sketch the horizontal boring machine.	(6)
		(or)	
22.	a.i)	Explain with a neat sketch the quick return mechanism in – Planer.	(6)
	ii)	Differentiate between plain Shaper and Universal Shaper. (or)	(6)
	b.i)	Explain with a neat sketch the quick return mechanism in shaper.	(6)
	ii)	Write the specification of a Slotter.	(6)
23	a.i)	Nomenclature of a cylindrical milling cutter.	(6)
	ii)	Explain with a a neat sketch the gear shaper. (or)	(6)
	b.i)	Explain with a neat sketch the milling processes.	(6)
	ii)	List out the gear finishing processes. Explain with a neat sketch any two gear finishing processes.	(6)
24	a.i)	Explain with neat sketch the cylindrical grinding machine.	(6)
	ii)	Explain the standard marking of a grinding wheel. (or)	(6)
	b.i)	Explain with neat sketch the mounting of grinding wheel in a machine spindle	(6)
	ii)	Explain with neat sketch any two boring operation in a vertical boring machine..	(6)
25.	a.i)	Explain with neat sketch the degrees of freedom of a object in a space.	(6)
	ii)	Explain with a neat sketch the Electrical discharge machining.	(6)
		(or)	
	b)i)	Explain with a neat sketch box type drill jig.	(6)
	ii)	Explain with a neat sketch curling operations.	(6)

LEARNING STRUCTURE:

22052 MANUFACTURING TECHNOLOGY-II

Applications



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22071 - TOTAL QUALITY MANAGEMENT

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22071
Semester : V
Subject Title : **TOTAL QUALITY MANAGEMENT**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Total Quality Management	5	80	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Basic Concepts of Total Quality Management	15
II	Continuous process improvement – Q-7 Tools	15
III	Statistical Fundamentals	15
IV	Controlcharts	15
V	Management Planning tools & Bench marking	15
	Revision and Test	05
	Total	80

RATIONALE:

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:

- 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.

TOTAL QUALITY MANAGEMENT

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**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 delight-ISO 9001:2008 Quality Management System requirements and implementation.	**15Hrs**
II	**CONTINUOUS PROCESS IMPROVEMENT – Q-7 TOOLS** Input / Output process model – Juran Trilogy – PDCA (Deming Wheel) cycle – 5S Concepts – SEIRI, SEITON, SEISO, SEIKETSU and SHITSUKE – needs and objectives – effective implementation of 5S concepts in an organisation - Housekeeping – Kaizen – Comparison between Kaizen and Kairyo. 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-Organisation of Quality circle and objectives of Quality circle.	**15Hrs**
III	**STATISTICAL FUNDAMENTALS** 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.	**15Hrs**
IV	**CONTROL CHARTS** Control chart – Types of control charts – Control chart for variables – Construction of X and R charts – control limits Vs specification limits –	**15 Hrs**

	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	**MANAGEMENT PLANNING TOOLS & BENCH MARKING** 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. Bench marking – Objectives of bench marking – Types – Bench marking process - Benefits of Bench marking – Pit falls of Bench marking-Just In Time(JIT) concepts and its objectives-Total Productive Maintenance(TPM)-Introduction, Objectives of TPM-steps in implementing TPM	**15 Hrs**

Text Book :

1) "Total Quality Management", Date H.Besterfiled, Pearson Education Asia. (Indian reprint 2002)
2) "Total Quality Management", V.Jayakumar, Lakshmi Publications. (reprint 2005)
3) "Training manual on ISO 9001 : 2000 & TQM", Girdhar J.Gyani, Raj Publishing House, Second Edition 2001
4) "Quality Management", Howard Cuitlow, Tata Mc Graw Hill, 1998

Reference Book:

1) "Total Quality Management", Oakiand.J.S. Butterworth Heinemann Ltd. Oxford 1989.
2) "Quality Management – Concepts and Tasks" Narayana.V and Sreenivasan.N.S., New Age International 1996.
3) "Total Quality Management for engineers", Zeiri. Wood Head Publishers. 1991.
4) "Quality Planning and Analysis", Juran J.M and Frank M.Gryna Jr., TMH. India. 1982
5) ISO 9001, Brain Rethry, Productivity and Quality Publishing Pvt. Ltd. 1993.
6) Quality Auditing D.Mills, Chapman and Hall, 1993.

22071 TOTAL QUALITY MANAGEMENT
(Elective Theory)
Model Question Paper – I

Time : 3 Hrs. **Max. Marks:75**

Note : Answer any 15 Questions – All Questions carry equal marks

PART – A
Marks 15 X 1=15

1. Define TQM?
2. What are the pillars of TQM?
3. List out any two barriers to TQM implementation.
4. What is vision statement?
5. List various techniques to sustain continuous improvement.
6. What are the three elements of Juran trilogy?
7. What is Kaizen?
8. What is 5S practice?
9. What is check sheet?
10. What is Histogram?
11. Define data and information?
12. What are control charts?
13. Give the types of variations?
14. Define fraction defective
15. Differentiate defect and defective?
16. When u-chart is used?
17. When do you use the affinity diagram?
18. What is relationship diagram?
19. Why arrow diagrams are called PERT diagrams?
20. What is bench marking?

PART – B
Marks 5X12=60

Answer all Questions

21.a. Explain the seven steps of Strategic planning with a block diagram. (12)

(OR)

b. Describing the Deming philosophy fourteen points on route to quality. (12)

22. a. Explain the various aspects of Kaizen. (12)

(OR)

b. What is 5S? Explain all the elements of 5S principle in detail? (12)

23. a. The following are scores of two batsmen Sachin and Dravid in a series of innings

Sachin	12	115	6	73	7	19	119	36	84
Dravid	47	12	16	42	4	51	37	48	13

Who is the better score getter and who is more consistent? (12)

(OR)

b. Discuss why standard deviation is considered to be the 'best' measure of dispersion. (12)

24. a. Compare $\bar{X}$ and R charts. Discuss the circumstances in which either of the two or a combination of these will be used for the purpose of control.(12)

(OR)

b. For the following sample of data draw $\bar{X}$ and R chart (12)

Subgroup Number	**Observation**				
	X1	**X2**	**X3**	**X4**	**X5**
1	6.0	5.8	6.1	6.1	6.9
2	5.2	6.4	6.9	6.2	5.2
3	5.5	5.8	5.2	4.9	6.6
4	5.0	5.7	6.5	7.0	6.4
5	6.7	6.5	5.5	5.4	6.5
6	5.8	5.2	5.0	6.6	7.0
7	5.6	5.1	5.2	4.7	6.2
8	6.0	5.8	6.0	6.7	5.4
9	5.5	4.9	5.7	6.8	6.5
10	4.3	6.4	6.3	5.9	6.4

25. a. Explain briefly the method of drawing matrix diagram.

(OR)

b. Describe the steps in Benchmarking process.

--x--

22071 TOTAL QUALITY MANAGEMENT
(Elective Theory)
Model Question Paper – II

Time : 3 Hrs. **Max. Marks:75**

Note : Answer any 15 Questions – All Questions carry equal marks

PART – A
Marks 15 X 1=15

1. Define quality.
2. Write any two characteristics of TQM.
3. State any four benefits of TQM.
4. What is a Quality council?
5. What is Seiton?
6. Define Kairyo?
7. When do you use the check sheets?
8. What are the types of check sheets?
9. When do you us the scatter diagram?
10. What is the purpose of pareto diagram?
11. What do you mean by frequency distribution?
12. What do you mean by central tendency?
13. Define coefficient of variation?
14. Explain mode.
15. What is 'six sigma'?
16. Why do we need six sigma state?
17. When do we use tree diagram?
18. Compare variable chart with attribute charts?
19. Contrast a p-chart and a c-chart?
20. Write 3σ limits for a control chart for p.

PART – B
Marks 5X12=60

Answer all Questions

21. a. List the various stumbling blocks while implementing a TQM programme.

(OR)

b. Explain the functions of quality council.

22. a 1.Explain continuous process improvement.

2. Explain the concept of six sigma with an example.

(OR)

b. Explain Juran's ten steps to quality improvement.

23. a. A machine shop produces steel pins. The width of 100 pins was checked after machining and data was recorded as follows:

Width in mm	Frequency
9.50 – 9.51	6
9.52-9.53	2
9.54-9.55	20
9.56-9.57	32
9.58-9.59	22
9.60-9.61	8
9.62-9.63	6
9.64-9.65	4

Find the arithmetic mean, standard deviation and variance.

(OR)

b. Calculate the mean and standard deviation for the following:

Size of item	6	7	8	9	10	11	12
Frequency	3	6	9	13	8	5	4

24. a. Describe the steps to be followed for construction of $\bar{X}$ and R charts with an example.

(OR)

b. In the manufacture of connecting rod assembly, the number of defectives found in the inspection of 14 samples of 50 items in each sample are given in the following table.

Sample No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
No. of defectives	8	7	5	4	8	7	9	21	12	10	9	8	16	15

Determine the trial control limits, construct the np chart and state whether the process is in control.

25. a. Describe about relationship diagram with an example?

(OR)

b. Explain in detail the bench marking process.

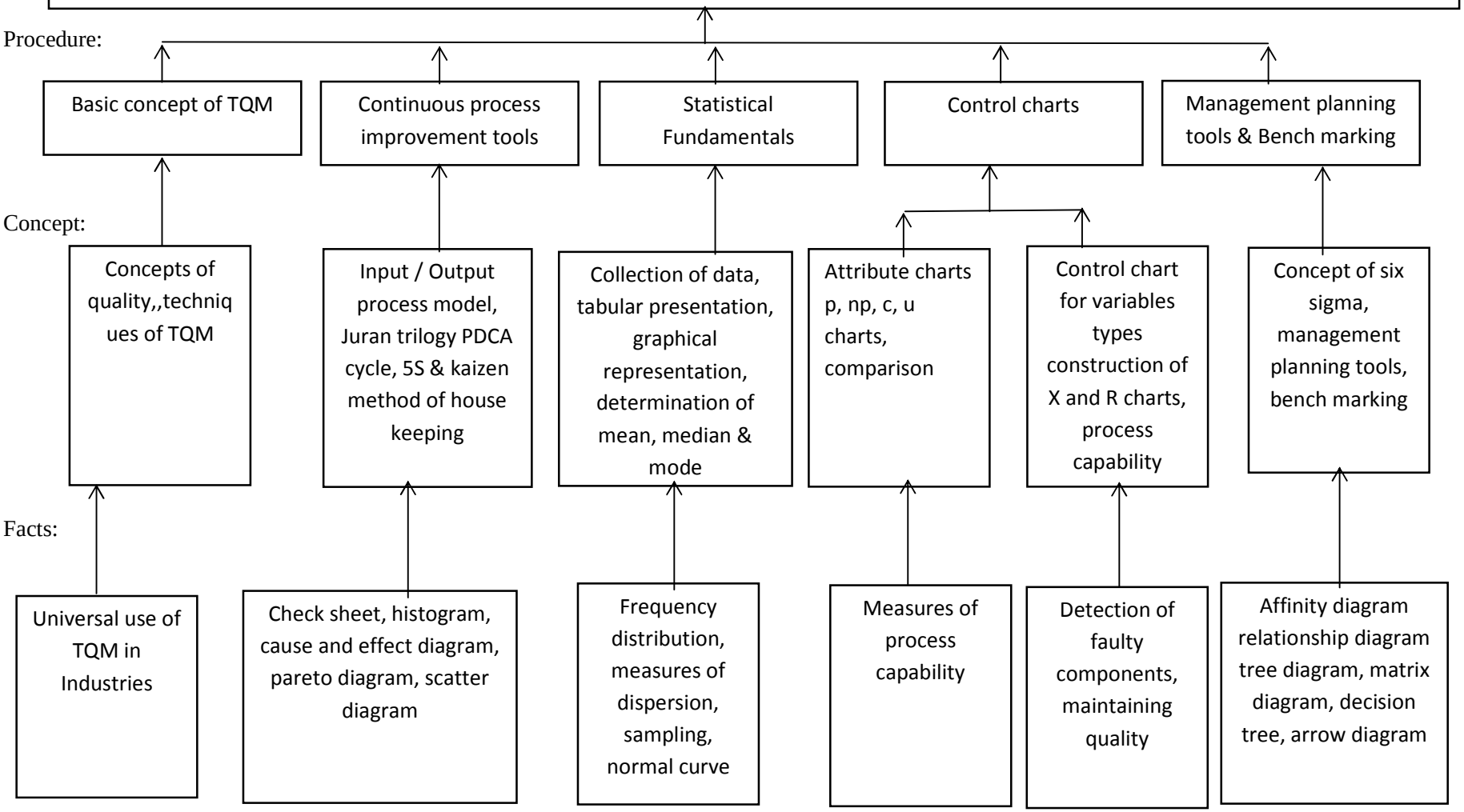
--x--

LEARNING STRUCTURE

22071 TOTAL QUALITY MANAGEMENT

Applications

Understand the need for quality, improvement of process continuously using tools statistical fundamentals required for SPC, use of charts, identify the new seven management tool, adopting bench marking practice in the industrial environment



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22072 - MODERN MACHINING PROCESSES

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22072
Semester : V
Subject Title : **MODERN MACHINING PROCESSES**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Modern Machining Processes	5	80	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Automatic Lathes and Gear Manufacturing	15
II	Mechanical Energy Based Processes	15
III	Electrical Energy Based Processes	15
IV	Chemicals and Electro Chemical Energy Based Processes	15
V	Thermal Energy Based Processes	15
	Revision and Test	5
	Total	80

RATIONALE:

The Trend of globalization has put forth on industries the need and compulsion to adopt not only new and innovative methodologies but also unconventional processes to lay emphasis on accuracy, cost effectiveness and promptness.

The areas like special purpose machines , various energy based processes will go long way in giving the students an insight into the areas of material removal by using various kinds of energy and the need to preserve accuracy and cost effectiveness essential in industries.

OBJECTIVES:

- Explain the working of automatic lathe.
- Compare different types of gear manufacturing methods.
- Explain the construction and working of ultrasonic machines.
- Explain the working of Electrical energy based machining processes.
- Compare different Electrochemical machining processes.
- Explain the working of LBM and Plasma arc machinery.
- Explain the applications and limitations of modern machining process.

MODERN MACHINING PROCESSES

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**AUTOMATIC LATHES AND GEAR MANUFACTURING** **Automatic Lathes:** Automatic lathe – classification of single spindle automatic lathe – principle of automatic lathes – automatic screw cutting machines – multi spindle automatic lathes Transfer Machines – In-line & Rotary types, advantages & disadvantages. **Gear Manufacturing Processes –** Gear Broaching **:** Gear shaper-gear hobbing-principle of operation only-gear finishing processes-burnishing-shaving-grinding and lapping-gear materials-cast iron, steel, alloy steels, brass, bronze, aluminum, nylon.	**15Hrs**
II	**MECHANICAL ENERGY BASED PROCESSES** **Ultrasonic Machining :** Principle- Transducer types – Concentrators - Abrasive Slurry - Advantages and Limitations – Applications. Abrasive Jet Machining: Process- Principle - Advantages and Limitations – Applications. Water Jet Machining: Principle –Advantages and Limitations – Practical Applications	**15Hrs**
III	**ELECTRICAL ENERGY BASED PROCESSES** **Electrical Discharge Machining (EDM),** Mechanism of metal removal – Dielectric Fluid – Electrode Materials - Spark Erosion Generators – Electrode Feed System – Tool Electrode Design – Characteristics of Spark Eroded Surfaces - Advantages and Limitations – Practical Applications EDM Wire Cut and Grinding: Principle – Wire Feed System - Advantages and Limitations – Practical Applications	**15Hrs**
IV	**CHEMICALS AND ELECTRO CHEMICAL ENERGY BASED PROCESSES** **Chemical Machining :** fundamentals, Principle –classification and selection of Etchant -chemical milling, Engraving, Blanking, Drilling and Trepanning-Advantages and limitations –Applications. Electro Chemical Machining: Electro-chemistry of the process-Electrolytes-Electrolyte and their Properties – Advantages and Limitations – Applications -Electro Chemical Grinding: Honing, cutting off, Deburring and turning.	**15 Hrs**

V	**THERMAL ENERGY BASED PROCESSES** **Electron Beam Machining:** Principle –Generation and control of electron beam-Advantages and Limitations – Applications. Laser Beam Machining: Principle –Solid and Gas Laser Application – Thermal Features of LBM - Advantages and Limitations – Applications. Ion Beam Machining: Equipment – Advantages and Limitations – Applications. Plasma Arc Machining: Principle –Gas mixture– Types of Torches –Advantages and Limitations – Applications.	**15 Hrs**

Text Book :

1) "Modern Machining Process", P.C Pandey And H.S. Shan, Tata Mc Graw – Hill Publishing Company Limited, New Delhi, 2007
2) " Advanced Machining Process", V.K. Jain, Allied Publishers PVT Limited 2007

Reference Book:

1) "New Technology", Amitadha Bhattacharyya, The Institution Of Engineers , (India).2."Production Technology", HMT Banglore, Tata Mc Graw–Hill Publishing Company Limited,New Delhi, 2006.
2) ,"Text Book of Production Engineering", P.C. SharmaS. Chand & Company Ltd., Ramnagar,New Delhi.
3) "Elements of workshop Technology", S.K. Hajra Choudhury, S.K. Bose, A.K. Hajra Choudhury,Nirjhar roy.

22072 MODERN MACHINING PROCESSES

MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Write one uses of cam in automatic lathe?
2. Write the main advantages of automatic lathe?
3. What are the methods available for manufacturing gears?
4. What are the advantages of aluminium as gear materials?
5. List the common materials used for tool in USM
6. Name the abrasive and carrier gases used in AJM
7. Write the application WJM
8. Give the leading advantages of USM
9. What is the main function of dielectric fluid in EDM?
10. What are the requirements of tool material for EDM?
11. What is the function of servo mechanism in EDM?
12. Write any two advantages of wire cut EDM
13. List out the common electrolytes used in ECM
14. What is the function of electrolyte?
15. List out the advantages of ECG over conventional grinding
16. Write any two limitations in electro chemical mechanisms
17. List the product application of EBM?
18. What is laser?
19. Write any two disadvantages of EBM
20. Write any two applications of plasma arc machinery.

PART-B

Marks 5 x 12=60

Answer all the questions

21 a) With a simple sketch explain the screw cutting machine and name the operations that can be performed on the machine. (12)

(or)

b) Explain the constructional arrangement of a single spindle automatic lathe with a sketch. (12)

22. a) Explain the working principles of ultrasonic machining with neat sketch and state their advantages and disadvantages. (12)

(or)

b) Explain abrasive jet machinery with neat sketch and state their applications (12)

23 .a) Explain wire cut EOM with neat sketch and state them advantages. (12)

(or)

b)Explain EDM with neat sketch and write their limitations and applications. (12)

24. a) Explain ECM with neat sketch and state their advantages. (12)

(Or)

b)Explain ECG with neat sketch and state their disadvantages. (12)

25. a) Explain EBM with neat sketch and state their advantages. (12)

(Or)

b) Explain IBM with neat sketch and state their applications. (12)

22072 MODERN MACHINING PROCESS

MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. List out the various types of automatic lathe.
2. List out the various types of transfer machines.
3. Write any two advantages of transfer machines.
4. List out the various types of gear finishing process.
5. Write any two limitations of ultrasonic machining.
6. Write any two practical applications of water jet machining.
7. Write the application WJM
8. Write any two advantages of abrasive jet machining.
9. Write any two di-electric fluid used in EDM.
10. Define Metal removal rate in EDM.
11. Write any two electrode materials in EDM.
12. List out various types of flushing system in EDM.
13. What is deburring in electro chemical grinding?
14. Write any two properties of electrolyte used in electro chemical machining.
15. What is trepanning in chemical machining?
16. Write any two limitations of Electro chemical machining.
17. List out various types of torches used in plasma arc machining.
18. Write any two advantages of laser beam machining.
19. Write any two advantages of electron beam machining.
20. List out the parts of ion beam machining.

PART – B
Marks 5 x 12=60

Answer all the Questions

21	a. i)	Draw and explain the working of multiple spindle of automatic lathe.	(6)
	ii)	Draw and explain the working of gear shaper .	(6)
		(or)	
	b. i)	Draw and explain the working principle of transfer machine.	(6)
	ii)	Write a short notes on gear material.	(6)
22.	a. i)	Draw and explain the working of ultrasonic machining.	(6)
	ii)	Draw and explain the working of water jet machine.	(6)
		(or)	
	b. i)	Draw and explain the working of abrasive jet machining.	(6)
	ii)	Write the advantages and limitations of water jet machining	
23	a. i)	Explain the various types of spark erosion generators used in EDM.	(12)
	ii)	Explain wire feed system in wire cut EDM machine.	(12)
		(or)	
	b. i)	Draw and explain the working of EDM wire cut machine.	
	ii)	Write a short notes on di-electric fluid and electrode materials used in EDM.	
24	a. i)	Draw and explain the chemical machining process.	(6)
	ii)	Draw and explain the electro chemical machining process.	(6)
		(or)	
	b. i)	Write short notes on selection of Etchant in chemical machining process.	(6)
	ii)	Draw and explain the electro chemical grinding machining process	(6)

25. a. i) Draw and explain the electron beam machining. (6)

ii) Draw and explain the plasma arc machining. (6)

(or)

b. i) What are the advantages and limitations of plasma arc machining? (6)

ii) Draw and explain the laser beam machining. (6)

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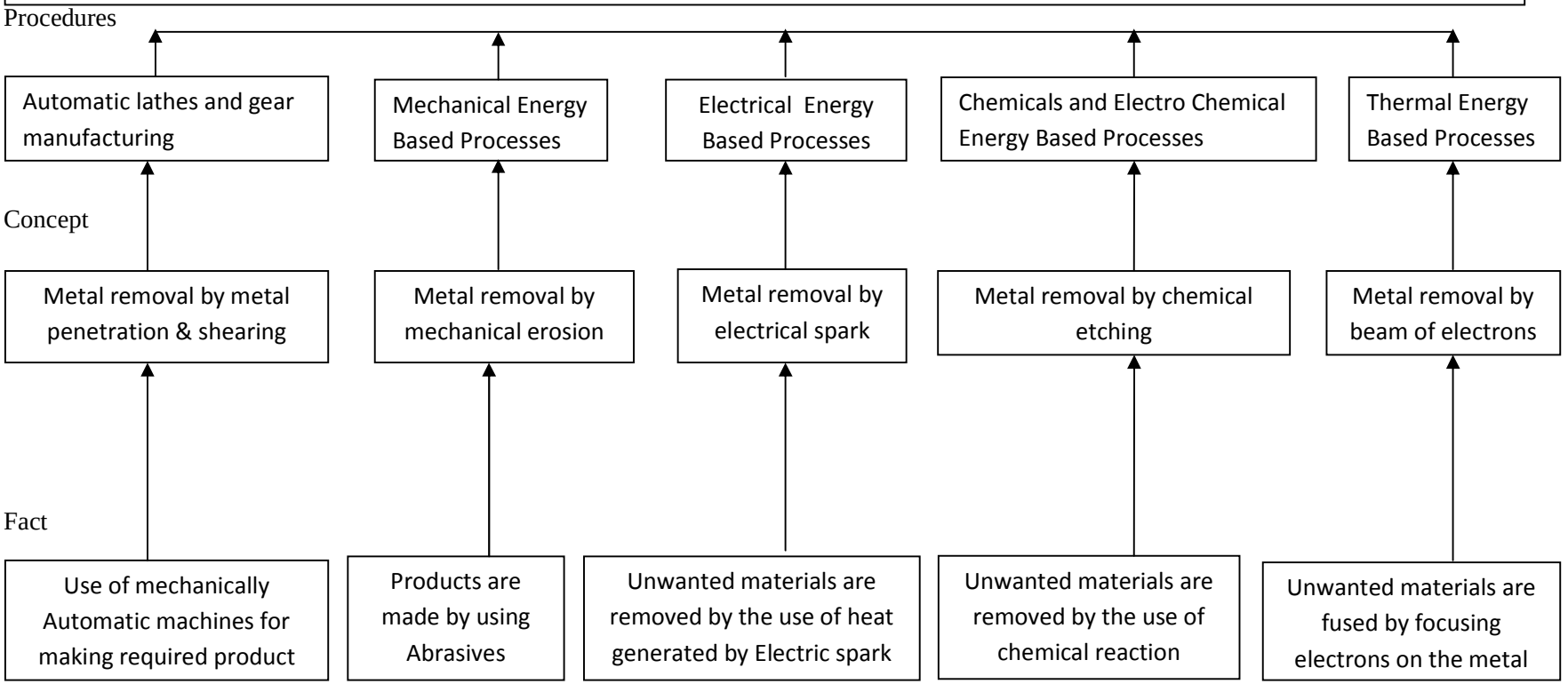
LEARNING STRUCTURE:

22072 MODERN MACHINING PROCESSES

Applications

Enable to understand principles, methods and applications of modern machining processes and to improve the knowledge and skill to identify and select the suitable process of machining based on the material properties, availability of energy sources and working conditions in the field of mechanical engineering



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22073 - POWER PLANT ENGINEERING

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22073
Semester	:	V
Subject Title	:	**POWER PLANT ENGINEERING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
Power Plant Engineering	5	80	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	**Topics**	**Hours**
I	Sources of energy and economics of power plant	15
II	Steam power plant	15
III	Hydro Electric power plant	15
IV	Diesel engine and gas turbine power plants	15
V	Nuclear and other power plants	15
	Revision and Test	5
	Total	80

RATIONALE:

Globalization made tremendous growth in industrial activities, which in turn needs power. If power requirement has not been met industrial growth cannot be sustained. Hence knowledge in exploration of various sources of energy, efficient running of various existing power plants and construction of new power plants required for the development of nation and its people.

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OBJECTIVES:

- Identify various sources of natural energy.
- Convert natural energy into electrical energy.
- Compare various types of power plants like thermal, Hydel, Diesel power plants.
- Explain the working of Hydro electric power plant and its merits.
- Explain the Power production in a Nuclear Power Plant.
- Identify the various parts of a Power plant and its utility.

POWER PLANT ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**SOURCES OF ENERGY AND ECONOMICS OF POWER PLANT** Power – Sources of energy – Fuels – Types of fuels – Solid fuels, Liquid fuels, Gaseous fuels – Calorific value of fuels – Types of coal – Coal selection – Requirements of fuel – Hydel Potential energy – Nuclear energy – Comparison of Sources of power – Non conventional sources of energy – Solar energy, Wind energy, Tidal power and Bio gas. Types of loads – Economic load sharing – Economics in plant selection – Economic of power generation – Choice of power station – Energy rates – Types of tariff.	**15Hrs**
II	**STEAM POWER PLANT** Layout of steam power plant – Fuel and Ash handling – Combustion for burning coal, Mechanical stackers, Pulverizes, Electrostatic Precipitators, Draughts-Different types, Surface condensers - Types of cooling towers – Steam turbines – Steam engines – Advantages of steam turbines over steam engines – Boilers – Types of boilers – Principles of steam power plant design – Factors affecting steam plant design – Thermal power plants environmental control.	**15Hrs**
III	**HYDRO ELECTRIC POWER PLANT** Water power – Application of hydro power plant – Lay out of Hydro electric power plant – Elements of Hydro electric power plant – Classification of Hydro electric power plant – Advantages of Hydro electric power plant – Mini and Micro hydro power plants – Types of Dams – Pen stock – Draft tube – Surge tank – Hydraulic turbines – Classifications – Turbine governing – Cavitations – Safety measures in Hydro power stations – Control room functions – Switch gear – Site selection – Comparison of Hydro electric power plant and steam power plant.	**15Hrs**
IV	**DIESEL ENGINE AND GAS TURBINE POWER PLANTS** Types of diesel engine power plants – Layout and components – Diesel engine power plant auxiliaries – Engine starting methods – Advantages of Diesel engine power plant – Application of Diesel engine power plant - Site selection. Gas turbine power plant – Classification – Elements of simple gas turbine power plant – Layout – Open and Closed cycles – Reheating,	**15 Hrs**

	Regeneration and Inter cooling – Combined cycles - Applications and advantages of Gas turbine plant.	
V	**NUCLEAR AND OTHER POWER PLANTS** Nuclear energy – Fission, Fusion reaction – Nuclear power plant layout – Elements of Nuclear power plant – Types of reactors – Pressurized water reactor – Boiling water reactor – Waste disposal and safety – Advantages of Nuclear power plant – Comparison of Nuclear power plant and steam power plant – Site selection and Commissioning procedures. Solar thermal power generation plants – Geo thermal power generation-Tidal power generation-Tidal power generation – Wind mills – Bio gas plants.	**15 Hrs**

Text Book:

1) Arora S.C and Domkundwar ,"A Course in Power plant Engineering",S, Dhanpat Rai, 2001
2) Nag P.K, "Power Plant Engineering", Third Edition, Tata McGraw – Hill, 2007

Reference Book:

1) El-Wakil M.M, "Power Plant Technology", Tata McGraw-Hill, 1984
2) Ramalingam K.K, "Power Plant Engineering", Scitech Publications, 2002
3) Nagpal G.R,"Power Plant Engineering", Khanna Publishers, 1998
4) Rai G.D, "Introduction to Power Plant Technology", Khanna Publishers, 1995

22073 POWER PLANT ENGINEERING

MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Define power
2. List out any two types of solid fuels.
3. Define calorific value of fuels.
4. What is meant by economical load sharing.
5. State the functions of pulverizer.
6. List out any two types of surface condenser.
7. State any two factors affecting steam plant Design.
8. What is the function of Steam engine.
9. State any two applications of Hydro Power Plant.
10. List any two types of dams.
11. What is cavitations?
12. What is the function of Switch Gear?
13. State any two advantages of diesel engine power plant.
14. What is the functions of gas turbine.
15. What is reheating?
16. List out any two applications of gas turbine plant.
17. Define FISSION.
18. State any two types of reactors.
19. What is Geo thermal Energy?
20. What is meant by Bio-gas?

PART-B

Marks 5 x 12=60

Answer all the questions

21.	a.i)	Describe various types of coal.	(6)
	ii)	Explain about economical of power generation.	(6)
		(or)	
	b.i)	Explain gaseous fuel.	(6)
	ii)	Describe non-conversional energy sources.	(6)
22.	a.	Sketch the layout of steam power plant and explain working of steam power plant.	(12)
		(or)	
	b.i)	Explain any one type of cooling tower.	(6)
	ii)	What are the advantages of steam turbine over steam engines?(	(6)
23.	a.i)	Explain the construction and working of Hydel Power plant with a Layout	(12)
		(or)	
	b.i)	What is Surge tank and state its purpose.	(6)
	ii)	State Site selection procedure for Hydro electric power plant.	(6)
24.	a.i)	Describe construction and working of diesel engine power plant with layout	(6)
	ii)	State the applications of Diesel engine power plant.	(6)
		(or)	
	b.i)	Explain the construction and working of gas turbine power plant with the layout	(12)
25.	a.i)	What is chain reaction? How it is controlled.	(6)
	ii)	Describe boiling water reactor?	(6)
		(or)	
	b.i)	What are the advantages of nuclear power plant.	(6)
	ii)	Explain solar thermal power generation plant	(6)

22073 POWER PLANT ENGINEERING

MODEL QUESTION PAPER-II

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Define power
2. What is meant by calorific value.
3. What is meant by Hydel potential energy.
4. List out any two types of coal.
5. What is the function of Mechanical Stackers?
6. What are the types of cooling towers?
7. List out any two types of boilers.
8. What are the functions of steam engine?
9. State any two applications of Hydro Power Plant.
10. What is meant by Pen stock?
11. What is the function of Surge tank?
12. What is cavitation?
13. What are the types of Diesel Engine Power Plant?
14. State any two advantages of Diesel Energy power Plant?
15. What is meant by Reheating?
16. What is the function of inter cooling?
17. Define Fusion.
18. State any two types of Reactors?
19. What is meant by tidal power?
20. What is meant by Geothermal Energy?

PART-B

Marks 5 x 12=60

Answer all the questions

21.	a.i)	Explain about Solid fuels, liquid fuels and gaseous fuels.		(12)
		(or)		
	b.i)	Compare various sources of power.		(12)
22.	a.i)	Explain Pulverizes used in steam power plant.		(8)
	ii)	What are the advantages of Steam turbine over steam engine		(4)
		(or)		
	b.i)	With a neat sketch explain working of a steam power plant.		(12)
23.	a.i)	Sketch layout of Hydro Electric power plant and explain its working.		(12)
		(or)		
	b.i)	What are the functions of controller room?		(6)
	ii)	Explain about switch gear.		(6)
24.	a.i)	Explain with neat diagram layout and componenets of diesel engine power plant		(12)
		(or)		
	b.i)	Explain the sketch elements of simple gas turbine power plant.		(12)
25.	a.i)	Sketch nuclear power plant layout and explain its working		(12)
		(or)		
	b.i)	Compare nuclear power plant with steam power plant.		(6)
	ii)	Explain tidal power generation		(6)

LEARNING STRUCTURE

22073 POWER PLANT ENGINEERING

Applications

Acquire knowledge on various sources of natural energy and its conversion to electrical energy by starting constructing works of various power plants to meet power requirement of our country

Procedures

Sources of Energy and Economics of Power Plant	Steam power plant	Hydro electric power plant	Diesel engine and gas turbine power plants	Nuclear and other power plants
Power – Sources of energy – Fuels - Hydel – Nuclear – Comparison of Sources of power – Non-conventional sources.Loads – Economics-Load sharing – Plant selection – Power generation – Power station – Energy rates – tariff.	Layout – Combustion - Condensers - Cooling towers – Turbines – Steam engines – Boilers – Steam power plant design – Environmental control.	hydro power plant Lay out – Advantages – Mini and Micro hydro power plants – Dams – Pen stock – Draft tube – Surge tank – Hydraulic turbines – Governing – Cavitations – Safety measures – Control room functions – Site selection .	Diesel engine power plants Layout – Auxiliaries – Engine starting – Advantages – Application - Site selection. Gas turbine power plant – Layout – Reheating, Regeneration and Inter cooling – Combined cycles - Applications and advantages	Nuclear energy – Nuclear power plant layout – Types of reactors – Waste disposal and safety – Advantages – Comparison – Site selection and Commissioning. Solar thermal power generation plants – Tidal power generation – Wind mills – Bio gas plants.

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22054 - DESIGN OF MACHINE ELEMENTS

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22054
Semester : V
Subject Title : **DESIGN OF MACHINE ELEMENTS**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Design of Machine Elements	6	96	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	Design of Joints And Fasteners	18
II	Design of shafts, couplings and keys	18
III	Design of friction drives (flat belt and v-belt)	18
IV	Design of bearings	18
V	Design of levers and spur gears	18
	Revision and Test	6
	Total	96

RATIONALE:

The main objective of Machine Design is to create new and better machines and improving the existing one. The process of design involves the study of existing ideas and new ideas to be conceived. A mechanical engineer should have thorough knowledge of machine design to avoid the failure of machines or components.

OBJECTIVES:

- Design riveted joints, welded joints, sleeve and cotter joint and knuckle joint.
- Design eye bolts, cylinder cover studs.
- 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 used for power transmission.
- Design hand lever, foot lever and cranked lever.

DESIGN OF MACHINE ELEMENTS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DESIGN OF JOINTS AND FASTENERS** Names of engineering materials - Factors affecting selection of material – BIS designation of Ferrous materials – Preferred number-Factor of safety and allowable stress - Procedure for designing machine elements – Types of failures – Problems on tension, compression, shear and bearing. **Joints**: Design of- sleeve and cotter joint - knuckle joint-welded joint. Fasteners: Design of bolted joints - eye bolts - cylinder cover with bolts, studs - pins.	**18Hrs**
II	**DESIGN OF SHAFTS, COUPLINGS AND KEYS** **Shafts:** Design of shafts subjected to – twisting moment – bending moment – combined twisting and bending moments – fluctuating loads – design of shafts based on rigidity. **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).	**18Hrs**
III	**DESIGN OF FRICTION DRIVES (Flat belts and V-belts)** **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. **V-Belts:** V-belt drive - comparison with flat belt drive - designation of V-belts – length of belt - power transmitted – Design of V-belt using manufacturer's data only – Problem.	**18Hrs**
IV	**DESIGN OF BEARINGS** **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.	**18 Hrs**

V	**DESIGN OF LEVERS AND SPUR GEARS** **Levers:** Types of levers – applications - mechanical advantage – leverage - displacement ratio - design of-hand lever-foot lever-cranked lever - problems. **Spur gears:** Gear drives - merits and demerits over belt drive – Classification of gears - gear materials - spur gear terminology - design of spur gears based on Lewis & Buckingham equation - Problems – speed reducer – types –(Approved data books only).	**18 Hrs**

Text Book :

1) Machine Design, Pandya & Shah, Edn. 1995, Charotar Publishing House.
2) Machine Design, T. V. Sundararajamoorthy & N. Shanmugam, Revised Edition June-2003–Anuradha Publications, Kumbakonam.
3) Design Data Book – by PSG College of Technology, DPV Printers, Coimbatore.
4) Design Data Book – Approved by DOTE.

Reference Book:

1) A text book of Machine Design, R.S. Khurmi & J.K.Gupta, Edn. 18,Eurosia Publishing House Pvt. Limited, New Delhi-110 055.
2) Machine Design Bandari,
3) Theory and Problems of Machine Design, Holowenko, Laughlin, Schaum's outline Series.

22054 DESIGN OF MACHINE ELEMENTS
MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

[N.B: (1) Answer all the questions, choosing either (a) or (b) of each question
(2) All questions carries 15 marks.
(3) Any approved data book, P.S.G. data book may be permitted.]

1.a) i) Name the type of steel with its composition designated as given below: (5)
XT72WI8Cr4V1

ii) Design a sleeve and cotter joint to connect two rods for transmitting a maximum tensile load of 100KN. The rods sleeve and cotters are made of same material and the permissible stresses in the material are 65N/mm^2 in tension, 130N/mm^2 in compression and 50N/mm^2 in shear. (10)

(or)

b)i) An eye bolt is used for lifting a load of 50KN. Find the nominal diameter of the bolt, if the tensile stress is not to exceed 100 N/mm^2. Assume coarse threads, if the bolt extends 50mm into the component. What will be the shear stress in the threaded portion of the bolt? (5)

ii) A stream engine cylinder has an effective diameter of 350mm and the maximum stream pressure acting on the cylinder cover is 1.2N/mm^2. Calculate the number and the size of studs required to the secure cylinder cover. Assume permissible stress in the studs as 335N/mm^2. (10)

2.a) A shaft is supported on bearings A& B 800mmbetween centers A 20˚ straight both spur gear with 600mm pitch diameter is located 200 mm to the right of left hand bearing A and a 700mm diameter pulley is mounted 250mm towards the left of bearing B. The gear is driven by a pinion with a downward tangential force while the pulley drives the horizontal belt having 180 angle of wrap. The pulley also serves a flywheel and weighs 2000N. The maximum belt tension is 3:1. Determine the maximum bending moment & the necessary shaft diameter, if the allowable shear stress of the material is 40N/mm^2. (15)

(or)

b) Design a protected type cast iron flange coupling for a steel shaft transmitting 15KN at 200 rpm and having an allowable shear stress of 40 MPa. The working stress in the bolt should not exceed 30MPa. Assume that the same material is used for shaft and key and the crushing stress is twice the value of its shear stress. The maximum torque is 20% greater than the full load torque. The shear stress for cast iron is 14MPa. (5)

3.a)i) List the types of belts and material used for it. (5)

ii) A leather belt drive transmits 15KNW power. The center distance between the pulleys is twice the diameter of the big pulleys. The speed of the big and small pulleys are 480rpm and 1440rpm respectively. The belt should operate at velocity of 20m/s approximately and stresses in the belt should not exceed 2.25 N/mm^2. The density of the leather is 0.95gm/cc and the coefficient of the fiction is 0.35. The thickness of the belt is 5mm. Calculate (a) the diameter of the pulleys (b) the length and width of the belt and (c) the belt tensions. (10)

(or)

b) Design a V-belt drive and calculate the actual belt tension and average stress from the following data: (15)

Diameter of the driven pulley = 500mm, diameter of the driving pulley = 150mm, center distance between pulley= 925mm, speed of driven pulley= 300rpm, speed of driving pulley= 1000rpm, power transmitted = 7.5KW.

4.a)i) How bearings are classified. (5)

ii) A 75 mm journal bearing 100mm long is subjected to 2.5KN at 600rpm. If the room temperature is 24˚C, determine the viscosity of oil to be used to limit the bearing surface temperature at 50˚C. Take D/C=100 and K=0.484˚C/m^2/W. (10)

(or)

b) Design a suitable journal bearing for a centrifugal pump from the following data: (15)

Load on bearing	14KN
Diameter of a journal	80mm
Speed	1440rpm
Bearing characteristic number	30 X 10^{-6}
Permissible bearing pressure	0.7 X 1.4N
Average atmospheric pressure	30˚C

Calculate the cooling requirement using hasche's equation. Use Mckee's equation for calculating the friction co- efficient. Assume L/D=2.

5.a)i) Explain the applications of levers. (5)

ii) Design a hand lever of rectangular section subjected to a maximum load of 250 N at the end of moment arms of 1.2m. The thickness of the lever is constant and is equal to 0.375 times the width of the lever near to the boss. Permissible shear stress for the shaft material is 40N/mm^2 and the permissible bending stress for the lever material is 1N/mm^2. (10)

(or)

b) Design a spur gear drive to connect an electric motor to a reciprocating pump, both string mounted on the same bed. Speed of the motor is 1440rpm, speed reduction desired is 10:1. Motor power is 36.8KW. The gears are to have 20˚ pressure angle. The maximum number of teeth on pinion is 24. (15)

22054 DESIGN OF MACHINE ELEMENTS
MODEL QUESTION PAPER-II

Time: 3 Hours **Max. Marks: 75**

NOTE: - 1. *Answer all questions by choosing either* (a) or (b) of each question.
2. Each question carries 15 marks.
3. Approved Design data book is permitted.

1 a. i) Write the procedure for design of machine elements. **(05)**

ii) Design a sleeve and cotter joint to withstand a tensile load of 60 kN. All parts of the joint are made of the same material and the permissible stresses in tensile, crushing and shear are 60 N/mm^2, 125 N/mm^2 and 70 N/mm^2 respectively. **(10)**

or

b. i) An eye bolt is used for lifting a load of 50 kN. Find the nominal diameter of bolt, if the tensile stress is not to exceed 100 N/mm^2. If the bolt extends 50mm in to the component, what will be the shear stress in the threaded portion of the bolt? **(08)**

ii) A tangential force of 5 kN is applied to the taper pin which fits on 40 mm diameter of the shaft. Determine the diameter of the taper pin assuming the permissible shear stress as 275 N/mm^2 for pin. **(07)**

2 a. Design a shaft to transmit power from an electric motor to a lathe headstock through a pulley by means of a belt drive. The pulley weighs 300 N and is located at 200 mm from the centre of the bearing. Diameter of the pulley is 200 mm. Maximum power transmitted is 1500 W at 120 rpm. Angle of lap of the belt is 180° and μ=0.3. Shock factor in bending and twisting is 1.5 and 2.0 respectively. Allowable shear stress in the shaft material is 35 N/mm$^{2.}$ **(15)**

or

b. Design a C.I. rigid flange coupling to transmit 15 kW at 90 rpm from an electric motor to a compressor. The service factor is 1.35. The following permissible stresses may be used.
Shear stress for shaft, bolt and key material = 40N/mm^2;
Crushing stress for bolt and key = 80N/mm^2;
Shear stress for C.I. = 8 N/mm^2. **(15)**

3. a. i. Sketch and name the different types of belts used in engineering field. **(03)**

ii. Design a fabric belt to transmit 12 kW at 420 rpm of an engine to a line shaft at 1200rpm. Engine pulley diameter is 550mm and centre distance is 2m. **(12)**

or

b. Design a V-belt drive and calculate the actual belt tensions and average stress from the following data: Diameter of driven pulley = 500mm; Diameter of driving pulley = 150 mm;
Centre distance = 925 mm; Speed of driven pulley = 300 rpm; Speed of driving Pulley = 1000 rpm; Power transmitted = 7.5 kW. **(15)**

4. a. i. Explain how a ball bearing is designated with an example. **(05)**

ii. A 80 mm long bearing supports a load of 2800 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05 mm and the viscosity of oil is 21 cp at the operating temperature. If the bearing is capable of dissipating 80 W, determine the maximum safe speed. **(10)**

or

b. Design a journal bearing for a centrifugal pump from the following data: Load on the journal is 12.5 kN; Speed of the journal is 1440 rpm; Diameter of the journal = 75 mm; Bearing characteristics number = 30×10^{-6}; Permissible bearing pressure 0.7 to 1.4 N/mm^2; Ambient temperature = 30° C; L/D = 2; Temperature of oil = 70° C; Assume the bearing heavily constructed and temperature rise as 6° C. **(15)**

5. a. A cranked lever has the following dimensions:-

Length of the handle is 320 mm;
Length of the lever arm is 450 mm;
Overhang of the journal is 120 mm.

The lever is operated by a single person exerting a Maximum force of 400 N at a distance 1/3rd the length of the handle from its free end. The permissible bending stress for the lever is 50 N/ mm^2 and shear stress for the shaft material is 40 N/mm^2. **(15)**

or

b. A pair of straight teeth spur gear having 20° involute full depth teeth is to transmit 15 kW at 250 rpm of the pinion. The speed ratio is 3:1. The allowable static stresses for gear of C.I. and pinion of steel are 56 MPa and 105 MPa respectively. Number of teeth on pinion = 16. Face width = 14 times module. Design spur gear drive and check for wear.

Assume the following:-

(i) Type of load and service: steady load 8-10 hours per day.
(ii) Velocity factor $C_V = 4.5/(4.5+V)$, where V – velocity in m/sec.
(iii) Surface endurance limit σ_{es}= 630N/mm^2.
(iv) E for steel = 2×10^5 N/mm^2.
(v) E for Cast Iron = 1×10^5 N/mm^2.
(vi) Assume deformation factor, C = 320kN/m. **(15)**

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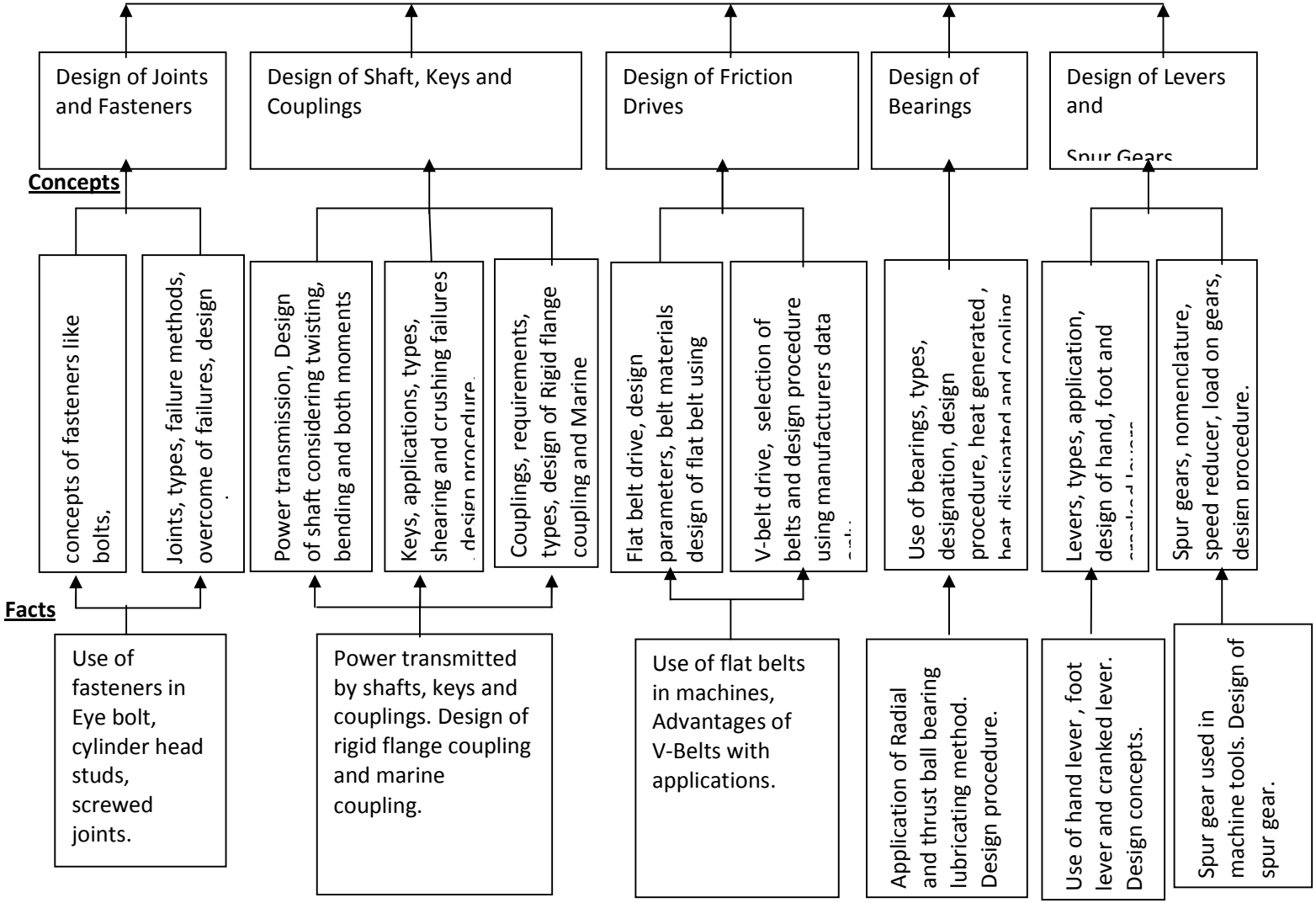
LEARNING STRUCTURE:

22054 DESIGN OF MACHINE ELEMENTS

Application



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22055 - THERMAL ENGINEERING PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22055
Semester : V
Subject Title : **THERMAL ENGINEERING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Thermal Engineering Practical	4	64	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

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.
- Identify the parts of a high pressure boiler and their applications.
- Identify the boiler mountings and accessories and their functions
- Conduct of C.O.P of Refrigerators.

Study Exercise: (Not for examinations)

1. Study of high pressure boiler. (With model)
2. Study of boiler mountings and Accessories.(With model)

List of Experiments:

PART-A

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

PART-B

8. Load test (Performance test) on Four Stroke Petrol Engine.
9. Load test (Performance test) on Four Stroke diesel Engine.
10. Morse test on Multi-cylinder petrol engine.
11. Heat balance test on Four Stroke Petrol engine.
12. Heat balance test on Four Stroke Diesel engine.
13. Volumetric efficiency of Air Compressor.
14. Thermal Conductivity measurement using guarded plate apparatus
15. Determination of COP of Refrigeration System

BOARD EXAMINATION

One Question from part A	:	25Marks
One Question from part –B	:	45Marks
Viva-Voice	:	05Marks
Total	:	75Marks

LIST OF EQUIPMENTS

1. Open cup apparatus – 2 No
2. Close cup apparatus – 2 No
3. Redwood viscometer – 2 No
4. Say bolt viscometer – 2 No
5. 4 stroke petrol engine Model – 2 No
6. 4 stroke diesel engine Model – 2 No
7. 2 stroke petrol engine Model – 2 No
8. Petrol engine of any make with following arrangements – 1 No
    - Load test arrangement
    - Heat balance test arrangement
9. Diesel engine of any make of any make with following arrangements – 1 No
    - Load test arrangement
    - Heat balance test arrangement
10. Multi -cylinder petrol engine of any make with Morse test setup – 1 No
11. Air compressor with set up for conducting volumetric efficiency test – 1 No
12. Refrigeration Testing Kit – 1 No
13. Guarded Plate Apparatus - 1 No

-

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22056 – MANUFACTURING TECHNOLOGY - II PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22056
Semester	:	V
Subject Title	:	**MANUFACTURING TECHNOLOGY –II PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
Manufacturing Technology –II Practical	6	96	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

- Identify a milling machine and its parts
- Identify a cylindrical grinder, surface grinder and tool and cutter grinder
- Identify the tools and instruments used in milling.
- 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.

SYLLABUS

1. Introduction to milling machine and its parts.
2. Introduction to grinding machine and its parts
3. Introduction to work holding devices.
4. Types of cutter used in milling machine
5. Types of grinding wheels used in grinding machines
6. Setting of work, tools and cutters in milling and grinding machines
7. Operation performed in milling and grinding machines
8. Operation of milling and grinding machines.

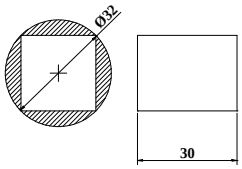
EXERCISES:

1. Prepare a square block from round rod using Milling machine
2. Prepare a 'V' Block using Milling machine
3. Prepare a Groove cut using Milling machine
4. Prepare a Spur Gear using milling machine by Simple Indexing
5. Prepare a Spur Gear using milling machine by Differential Indexing
6. Prepare a Hexagon by straddle milling process using milling machine
7. Prepare a Helical Gear using milling machine
8. Prepare a Plug Gauge using Cylindrical Grinding machine
9. Prepare Progressive type Plug gauge Progressive type Plug gauge using Cylindrical Grinding machine
10. Prepare a Facing Tool using Tool and Cutter Grinder
11. Prepare a plain surface using surface Grinder
12. Prepare a Parting Tool using Tool and Cutter Grinder

Note: Sketches enclosed
Note: All dimensions in mm
Note to the faculty :-Last job of the raw material (MS Rod Ø32x33mm, MS Rod Ø25x98mm and 13x13x75 mm MS square rod) to be retained in student wise or batch wise .This may be verifiable at the time of Board Practical Examination by the external examiner
All Linear dimensions are in ± 0.5 mm tolerance and all cylindrical dimensions ± 0.2 mm tolerance except grinding operation.

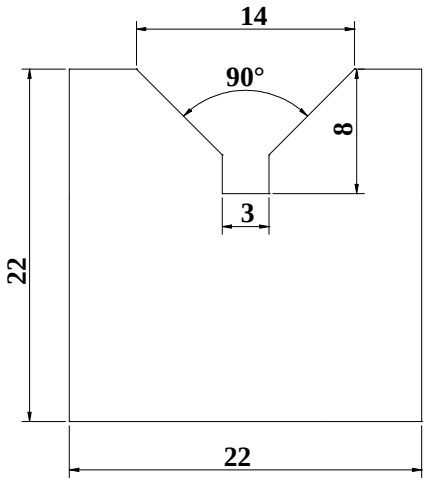
I MILLING

Exercise No:1
Raw Material: Ø 32x33mm MS rod
Milling a maximum size of square block from a 32 mm diameter round rod



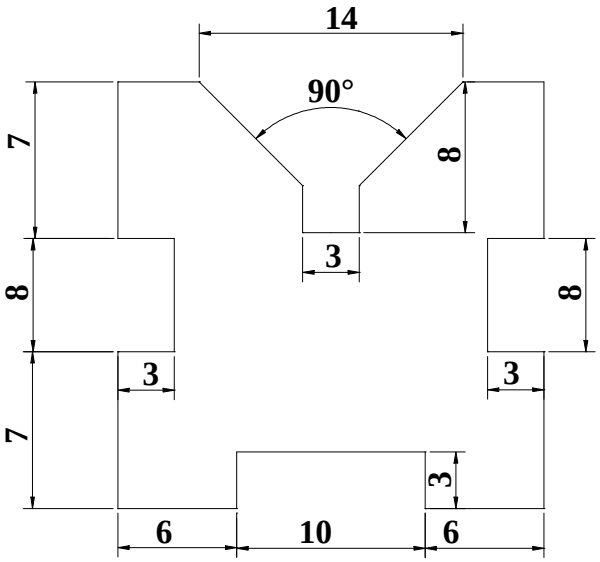
Exercise No:2-‘V’ Block Milling

Raw Material: Exercise No:1



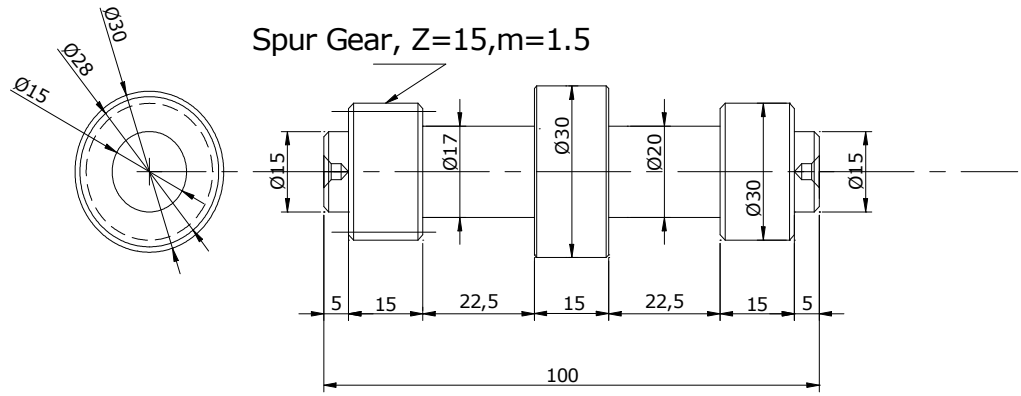
Exercise No:3- Groove Milling

Raw Material: Exercise No.2



Exercise No: 4- Spur Gear milling (Simple Indexing)

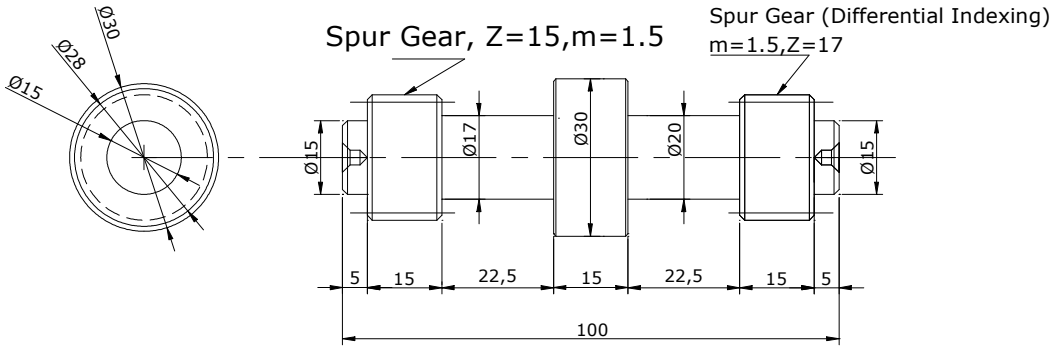
Raw Material: Ø 32x105 mm MS rod



E

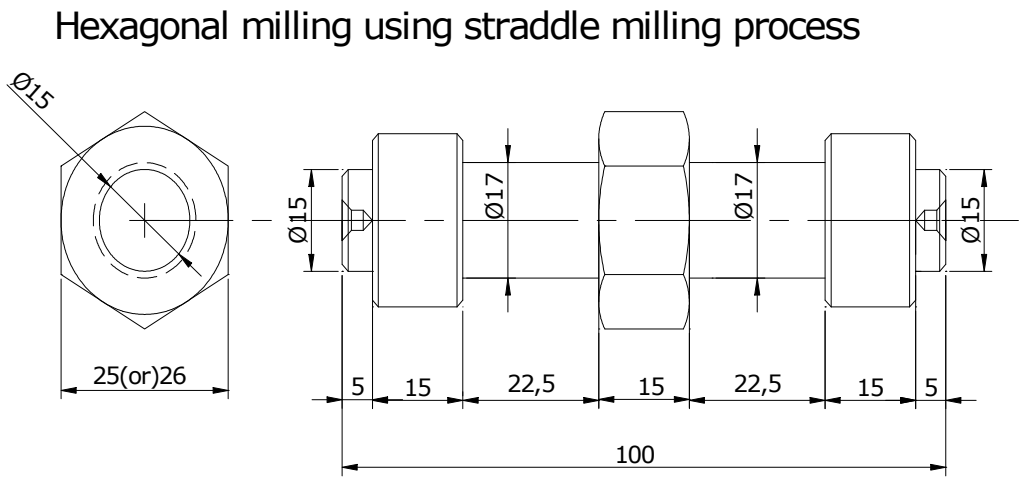
xercise No:5- Spur Gear milling (Differential Indexing)

Raw Material: Exercise No: 4



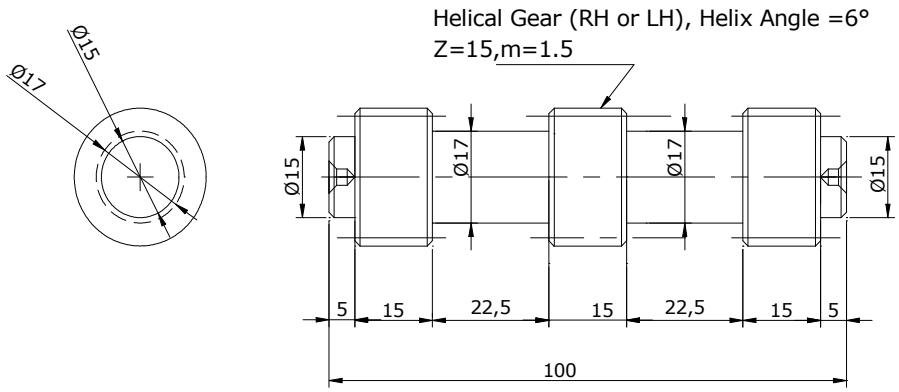
Exercise No:6- Hexagon by straddle milling process

Raw Material: Exercise No: 5



Exercise No:7- Helical Gear Milling

Raw Material: Exercise No: 6

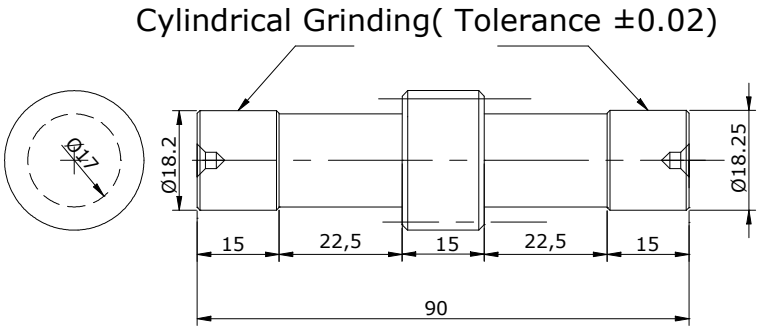


GRINDING

CYLINDRICAL GRINDING

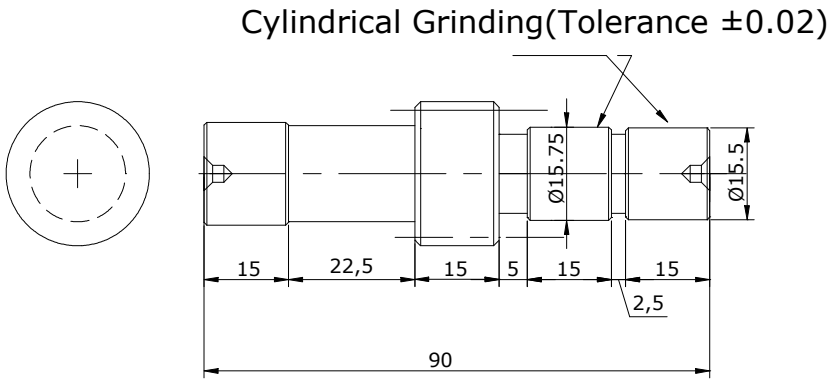
Exercise No:8- Plug Gauge (Cylindrical Grinding)

Raw Material: Exercise No:7



Exercise No: 9- Progressive type Plug gauge (Cylindrical Grinding)

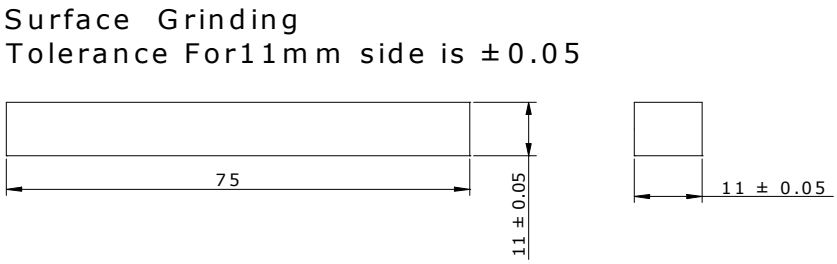
Raw Material: Exercise No: 8



Surface Grinding

Exercise No:10- Surface Grinding

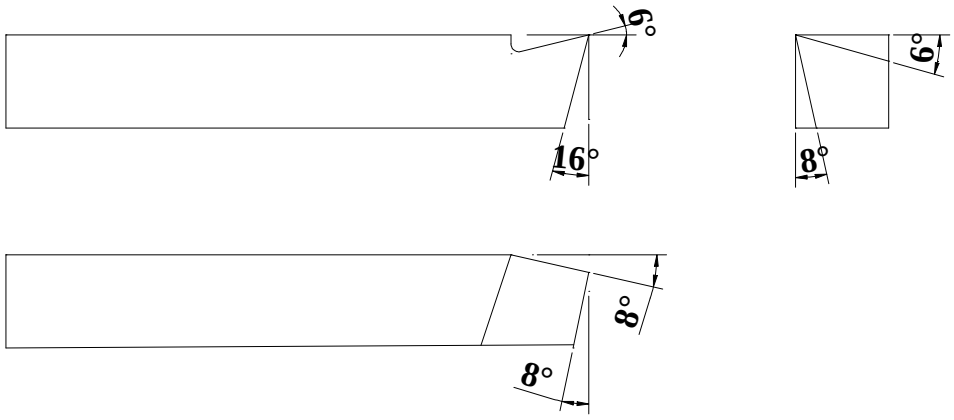
Raw Material: 13x13x75 mm MS square rod



TOOL AND CUTTER GRINDING

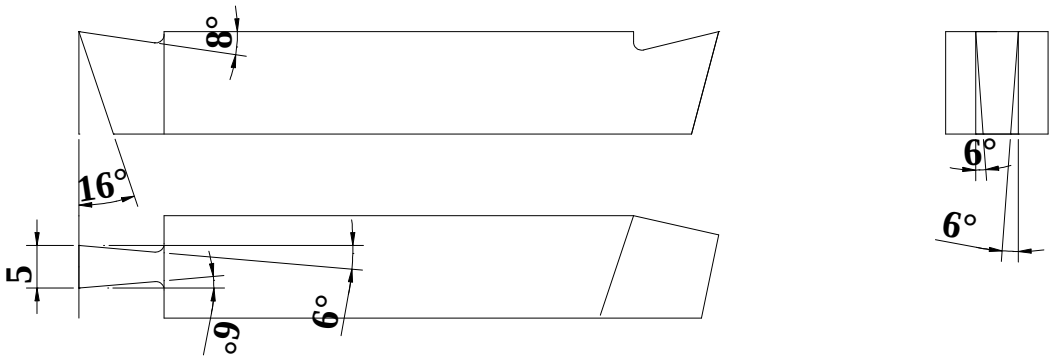
Exercise No:11- Facing Tool (Tool and Cutter Grinder)

Raw Material: Exercise No: 10



Exercise No: 12- Parting Tool (Tool and Cutter Grinder)

Raw Material: Exercise No: 11



BOARD EXAMINATION

Exercise should be given either in milling or grinding in the Board Examination for 75Marks.

A. Milling Exercise

- Milling a V- block from the given round rod
- Milling a V- block & groove as in the Ex no3
- Milling a spur gear by simple indexing at the centre of the rod
- Milling a spur gear by differential indexing at the centre of the rod
- Milling a helical gear at the centre of the rod

B. Grinding Exercise

- Grinding a plug gauge
- a. Grinding a rectangular/ square using surface grinding machine and
  b. Grinding a facing tool using tool and cutter grinder
- a. Grinding a rectangular/ square using surface grinding machine and
  b. Grinding a parting tool using tool and cutter grinder

Board Examination : 75 Marks

LIST OF EQUIPMENTS

MACHINES:

1. Vertical milling machine/ vertical milling attachment in Universal Milling Machine – 2 No’s
2. Universal Milling Machine with indexing head- 2 Nos
3. Surface Grinding Machine (Horizontal) – 1 No
4. Cylindrical Grinding machine – 1 No
5. Tool and Cutter grinder – 1 No

Equipments & Tools:

1. Milling Cutter (2 Module cutter) & accessories – complete sets
2. Milling Machine Handle and required accessories – 2 sets
3. Grinding wheel OD 150 mm , ID 1’’(AA-65, K5, V8) – 2 No’s
4. Grinding wheel OD 300 mm , ID 150mm(AA-56, K5, V8) – 1 No

DIPLOMA IN ENGINEERING/TECHNOLOGY

L - SCHEME

2011 - 2012

20002 COMMUNICATION AND LIFE SKILLS PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME

(Implemented from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN ENGINEERING/TECHNOLOGY
Subject Code : 20002
Semester : V SEMESTER
Subject Title : **COMMUNICATION AND LIFE SKILLS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATION:

No. of Weeks per Semester: 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
COMMUNICATION AND LIFE SKILLS PRACTICAL	4	64	25	75	100	3 Hrs

Topics and Allocation of Hours:

Sl. No.	Section	No. of Hours
1	Part-A:Monodic Communication	16
2	Part-B:Dyadic Communication	16
3	Part-C:Professional Communication	16
4	Part-D:Life Skills	16
Total		64

RATIONALE

Nowadays, effective and errorfree communication is a basic need. Communication through English is the order of the day for entry and survival in any corporate. Training in Monodic communication (one man communication) Dyadic communication (a pair communication) and Professional communication (may be Monodic, Dyadic or Group communication) is attempted through these practical modules. One can improve one's communication skills by enriching one's vocabulary ,particularly active vocabulary and standard everyday expressions and using them in various contexts. Practice alone, both on the campus and outside the campus, can help a learner to grow proficient in the art of Communication.

Language is the most commonly used and effective medium of self-expression in all spheres of human life - personal, social and professional. A student must have a fair knowledge of English language use and various communicative functions. He/she must be able to pursue the present course of study and handle the future jobs in industry. The objective of the course is to assist the diploma holders to acquire proficiency in monodic, dyadic and professional communication skills and selective but most important life skills. At the end of the course, the student will be able to communicate his ideas fearfree and errorfree, in social and professional spheres of life and imbibe life skills.

SPECIFIC INSTRUCTIONAL OBJECTIVES

Communication is crucial as it influences every aspect of one's personal development. Having a sound grounding in reading and writing techniques allows a student to progress on to higher level literacy skills. Many students struggle because their basic decoding is so inaccurate that advanced comprehension is difficult for them. Because of their poor exposure and poor use of English language in various spheres of life they suffer proper communication. They also tend to be 'afraid' of words and in turn they are not able to develop their personal vocabulary. In otherwords, without solid literacy skills, the student's prospects and life chances are limited. It is a fact that Communication skills and Life Skills shapes one's personality.

MONODIC COMMUNICATION

The student is able to:

1. Practise using departmental words and terminology in sentences.
2. Prepare and perform oral presentations.
3. Introduce oneself and others.
4. Deliver welcome address and vote of thanks.
5. Compere a program.
6. Describe the visuals.
7. Take notes, answer very short questions.
8. Comprehend an auditory/oral passage.

DYADIC COMMUNICATION

The student is able to:

1. Adopt various communicative functions.
2. Prepare and perform a dialogue.
3. Adopt the basics of telephone etiquette.

PROFESSIONAL COMMUNICAITON

The student is able to:

1. Prepare a resume.
2. Take part in a group discussion.
3. Communicate through body language.
4. Adopt the interview skills with professional presence.
5. Perform mock interview.

LIFE SKILLS

The student is able to:

1. Prepare for and deal with change.
2. Adopt motivation, goal-setting and self-esteem.
3. Adopt Teamwork skills.
4. Adopt Time management.
5. Adopt Emotional intelligence skills.
6. Assert Positively.
7. Adopt Interview etiquette.

8. Plan career.
9. Understand Strength, weakness (long term, short term).

LEARNING STRUCTURE

To enable the students to practise monodic communication, dyadic communication professional communication and imbibe life skills through various modes of practical learning and assignments.

PROCEDURE	MONODIC COMMUNICATION	DYADIC COMMUNICATION	PROFESSIONAL COMMUNICATION	LIFE SKILLS
PRINCIPLES	Identifying various platforms	Exposure to dialogue situations, exposure to telephone etiquette.	Exposure to resume writing, group discussion, interviews.	Exposure to selective life skills/problem solving skills.
CONCEPTS	Sharing opinions, feeling, with or without audience.	Understanding the basic communicative functions. Conversing with a neighbour	Writing resume, performing group discussion, facing interviews.	Imbibe and practise the selective life skills.
FACTS	Oral presentation, art of introduction, enhancing the list of active vocabulary, listening skills, note taking skills, describing skills.	Audio tapes, compact disk, mikes, various contexts.	FAQ, Resume models, Audio tapes, compact disk, mikes.	Stories, anecdotes, incidences, case studies and assignments.

COMMUNICATION AND LIFE SKILLS PRACTICAL

SYLLABUS

PART A: MONODIC COMMUNICATION (16 hours/ periods)

a) **Vocabulary enrichment**: recording important words and terminology alphabetically connected to the concerned department – playing antakshari.
b) **Introducing oneself**: using greeting phrases – opening and closing with courteous notes – supplying personal information.
c) **Introducing others**: using greeting phrases – opening and closing with courteous notes – with information.
d) **Welcome address, vote of thanks and compering a program:** keeping notes – and personal information of the dignitaries – concerned.
e) **Making an Oral Presentation**: Preparing the presentation - Talking about people, animals and places – Keywords technique and the rehearsal – Presentation outline – Performing the presentation – answering the questions.
f) **Oral description**: a picture from an English magazine – a visual ad – a natural scene.
g) **Auditory/Oral comprehension** – small passage – small dialogue -very short story – note - taking skill.
h) **News Caption**: giving caption for a news item from an English daily.

PART B: DYADIC COMMUNICATION: COMMUNICATIVE FUNCTIONS

(16 hours/ periods)

a) **Dialogue**: preparing and performing - Meeting people, exchanging greetings and taking leave – Giving instructions and seeking clarifications – Thanking someone and responding to thanks - minimum seven exchanges including the courteous openings and closings – ten common contexts.
b) **Telephonic dialogue**: telephonic etiquette - Answering the telephone and asking for someone – Dealing with a wrong number – Taking and leaving messages – Making enquiries on the phone-ordering for supply-bookings and arrangements-handling the complaints – calling for appointment.

PART C: PROFESSIONAL COMMUNICATION (16 hours/ periods)

a) Group Discussion - Taking part in a Group Discussion – focus on team spirit.
b) Interview - Frequently asked questions in an interview – Mock interview - Body language.
c) Resume Writing – components.

PART D: LIFE SKILLS (16 hours/ periods)

a) Preparing for and dealing with change.
b) Motivation, goal-setting and self-esteem.
c) Teamwork skills.
d) Time management

e) Emotional intelligence skills
f) Career planning.
g) Assertive Skills.
h) Interview skills.

References :-

1) Malcolm Goodale, Professional Presentations with VCD, Cambridge University Press
2) B.Jean Naterop and Rod Revell, Telephoning in English with 2 Audio CDs Cambridge University Press
3) Priyadarshi Patnaik, Group Discussion and Interview Skills with VCD, Cambridge University Press
4) Kamalesh Sadanand and Susheela Punitha, Spoken English: A Foundation Course for Speakers of Tamil, Orient BlackSwan.
5) S. P. Dhanavel, English and Soft Skills, Orient BlackSwan
6) Robert Sherfield and et al, Developing Soft Skills, Pearson Education.
7) Poly Skills: A course in communication skills and Life skills, Cambridge University Press.
8) English and Communication Skills for Students of science and Engineering by S.P.Dhanavel , Orient BlackSwan.
9) Speak Well, edited by Kandula Nirupa Rani, Jayashree and Indira,OrientBlackSwan.
10) Fifty ways to improve your telephoning and teleconferencing Skills by Ken Taylor -

COMMUNICATION AND LIFE SKILLS PRACTICAL

Model Question Paper - 1

Time: 3 hrs **Max Marks: 75**

PART –A (35 Marks)

Monodic Communication:

1. Introduce one self (5)
2. Use the mentioned words orally in sentence (2x2 ½ =5)
3. Prepare and present a welcome address for your college annual day programme. (5)
4. Listen to the passage read out from the English daily of the week of the examination. Please note: No prerecorded passage (10)
5. Write a news caption for the passage given from the English daily. (5)
6. a) Describe orally the visual or the picture found in the English daily of the week of the examination. (5)

   (or)

   b) Make an oral presentation about an animal.

PART – B (15 Marks)

Dyadic Communication:

1. Play antakshari of five pairs of departmental words with your partner. (5)
2. Prepare and perform a dialogue with your partner on the given situation (10)

   (minimum seven exchanges)

   Or

   Prepare and perform a telephonic dialogue on a flight booking.

   (minimum seven exchanges)

PART-C (25 Marks)

Professional Communication:

1. Form a group of six members and perform a discussion on the given theme. (10)

2.Imagine you are V.Gokulraj ,a diploma holder. Prepare a resume for the post of supervisor in Oberoi computers Ltd.Chennai. (10)

Professional appearance: Interview etiquette-dress code- Body language (5)

COMMUNICATION AND LIFE SKILLS PRACTICAL

Model Question Paper - 2

Time: 3 hrs Max Marks: 75

PART –A (35 Marks)

Monodic Communication:

1. Introduce your friend S.Mohan an a excutive engineer to a group of audience. (5)
2. Use the mentioned words in sentence orally. (2x2 ½ =5)
3. Prepare and present a Vote of thanks in your college sports day programme. (5)
4. Listen to the passage read out from the English daily of the week of the examination.
   Please note: No prerecorded passage (10)
5. Write a news caption for the passage given from the English daily. (5)
6. a) Describe the visual or the picture found in the English daily of the week of the conduct of the examination. (5)
   (Or)
   b) Make an oral presentation about your polytechnic college.

PART – B (15 Marks)

Dyadic Communication:

1. Play antakshari of five pairs of your departmental words with your partner. (5)
2. Prepare and perform a dialogue with your partner on the given situation (10)
   (minimum seven exchanges)
   (Or)
   Prepare and perform a telephonic dialogue on ordering the supply of a computer
   (minimum seven exchanges)

PART-C (25 Marks)

Professional Communication:

1. Form a group of six members and perform a discussion on the given theme. (10)
2. Imagine you are M.Kishore a diploma holder. Prepare a resume for the post of operating engineer in REC Electricals Ltd.Madurai. (10)
   Professional appearance: Interview etiquette-dress code- Body language (5)

NOTES OF GUIDANCE

Role of the media:

To equip a learner with vocabulary, particularly active vocabulary and standard everyday expressions ,using English dailies and watching selective English T.V. channels both in the classroom and outside the classroom is focused. Such a provision is recommended for the students to establish familiarity with the English dailies and selective English T.V. channels.

Minimum two copies of two English dailies in the laboratory room (students can bring their own copies also).Minimum two systems with net connection for information collection in the laboratory itself.

Synopsis of the news item:

During every lab work day, students must choose a news item from the English daily or weekly or monthly, and write a synopsis of the chosen news item, in not more than five lines. The news item should be pasted on the left page and synopsis on the right page (the chosen news item should not be politically, socially or communally controversial). Students should exercise care in choosing the news items. Teachers have to advise them on this aspect. This can be done outside the class hours also but every record exercise should begin with the synopsis of news item of the date of the lab session.

For example, first lab exercise namely departmental vocabulary and antakshari is performed on 15/12/2011. The student should choose a news item from any English daily of 15/10/2011 and record the synopsis on the right page (in not more than 5 lines) under the caption **Synopsis of the news item of the day/date 15/10/2011.**There is no harm in repeating or copying the lines form the passage. The essence of the passage should be there. The cutout news item for presenting the synopsis should be pasted on the left page of the record notebook.

This is to be done with interest for developing one's personality. This work **does not carry any marks** but without which the record exercise should not be valued. This is the precondition for valuing the record exercise. Each record exercise follows the synopsis of the chosen news item.

At the bottom of the synopsis, the student should record the **dictionary meaning** of atleast **one strange word** found in the chosen news item. At the end of every month, a minimum of 10 Headlines of 10 different days i.e. one Headline a day from anyone English daily should be pasted on the right or left page of the Record Note Book. (This work does not carry marks but this is the precondition for marking the record exercises)

External examiner**,** before signing the record notebook, should verify whether the Newspaper works were recorded/pasted in the record notebook.

Verbal communication in any language begins with sounds in isolation, union and word formation. Learning everyday words and expressions is the primary factor. Grammar comes next. One can enrich one's every day vocabulary by reading English magazines and listening to or watching an English channel on television. So an English laboratory should be equipped with a minimum of two copies of two English dailies and English weeklies or monthlies.

Watching English channels helps the students improve their vocabulary and expressions. If there is a provision, students may be permitted to watch selective, mind corruption free English channels (sports, education, news, animal channels and so on) for at least 15 min. during the English lab sessions. This will serve as motivation for the students and help them shed their inhibition.

What is antakshari? (Polar word game)

This game can be played on the stage by two or three students using the departmental words. Suppose Mr. A belongs to Dept.of Electrical and Electronics and he says his departmental word ' **ampere** 'Mr. B has to supply a word beginning with the ending letter of Mr. A's word. The word **ampere** ends with the letter **' e'** so Mr. B says **' electrical** '.Mr. A has to continue with the letter **' l '.** Like that five pairs of words are to be spoken.(**Letter ending only, not sound ending.)** Suppose departmental words are not available in some English letters like
' x ' ' y ' ' z ' the students may be permitted to use common words.

ANTAKASHARI (Five Exchanges)

(Dept. of Mechanical Engineering.)

EXAMPLE:

Mr. A	Mr. B
1. Governo**r**	**R**eservoi**r**
2. **R**ac**k**	**K**elvi**n**
3. Nu**t**	**T**oo**l**
4. **L**athe	**E**missio**n**
5. Naphth**a**	**A**nvil

Introducing oneself:

One is not expected to introduce one's family. One or two sentences on his family will do. Care must be taken to include general proficiency, titles and merits, awards possessing or secured in academic activities like paper presentation, participation in inter polytechnic or intra polytechnic competitions, sports activity, forums like NCC,NSS, hobby, ambition, strengths and weaknesses.

Introducing others – merits – credentials—one or two points on his family.

Vote of thanks / Welcome address.No doubt it should be all-covering but Focus should be on the important persons/invitees/chief guest and the message of the speaker.

Description (pictures from English weekly/daily) Pictures may be displayed through projector or Magazine cuttings may be used. Just five lines on the picture will do.

Auditory/oral comprehension: A Passage from any English daily of the week of the examination is to be read out for two to three minutes in the end examination. Display of recorded passages can be used as an addition in the class room. The use of pre-recorded passage discouraged in the end examination.

Oral presentation: Students must be encouraged to use English magazines and internet for collecting information on the topic, noting keywords and use them in their presentation in his own language. One must be able to talk extempore for 2 min on any topic, given a time of two minutes for organizing his/her thoughts. The topics can be kept simple and general (current events of interest like sporting event for headline of the day). It must be totally an oral activity without the aid of any other media.

News Caption: A news item ,without heading,of not more than ten lines from an English daily of the week of the conduct of Examination is to be given. The caption may be a passive construction or a catchy phrase on the given news item.

Face to face dialogue: Selective nine situations / topics are to be performed in the class room. (Minimum seven exchanges with courteous openings and closings).

Telephonic dialogue: Selective seven situations to be given. (Minimum seven exchanges).

Resume writing: cover letter—the components of a resume like sender's address, recipient's address, career objective to be explained.

Group Discussion: Topics of common interest, avoiding controversial ones, are to be given for discussion. A group may consist of six members.

Students should be exposed to 44 phonemes (sounds) in English language and their symbols.

There shall be no question on this end examination.

COMMUNICATION SKILLS EXERCISES:-

1. Departmental Vocabulary alphabetically (using it in sentence, antakshari).Using the words orally in sentences
2. Introducing oneself and others
3. Vote of thanks / Welcome address
4. Description (pictures from English weekly/daily)
5. Auditory/oral comprehension
6. Oral presentation
7. Face to face dialogue
8. Telephonic dialogue
9. Resume writing
10. Group Discussion

Communication Skills:

Ten Marks for each exercise leading to a maximum of hundred marks in total.

The total marks to be reduced to an average of ten marks.

Texts of the performed activities to be recorded in the Record Note book. Synopsis of the news item of the day/date is mandatory at the beginning of every record exercise.

Life Skills:

i) Preparing for and dealing with change.
j) Motivation, goal-setting and self-esteem.
k) Teamwork skills.
l) Time management
m) Emotional intelligence skills
n) Career planning.
o) Assertive Skills.
p) Interview skills.

Life skills are to be intensely inculcated through lectures, quotes, anecdotes and case studies. An excellent awareness of the eight essential life skills is to be created through continuous internal assessment. Five assignments in these topics are to be recorded in the record note book.

- A minimum of five assignments on five different topics.
- Each assignment to be assessed for twenty marks.
- The total marks to be reduced to an average of ten marks.
- All the topics to be covered in the lab.

TIME MANAGEMENT IN THE END EXAM.

For written part 30 min

- Written part of the examination should be the first / beginning of the examination, monadic oral exam to start during the written exam.
  Written Part exercises:
- auditory / oral comprehension.
- Resume writing.
- Giving news caption for the passage.
- During the written examination time of 30 minutes, monodic communication examination may also take place simultaneously.

MONODIC COMMUNICATION (ONE MAN COMMUNICATION)

Oral part – 75 min.

Both internal and external examiners (simultaneously) are to examine the students.

Five minutes for each student. 15 students for external & 15 students for internal and within 75 minutes both internal and external examiners complete the monadic communication exam.

DYADIC COMMUNICATION (ONE PAIR COMMUNICATION)

- 5 min for each pair.
- 15 pairs in total. 8 pairs for external and 7 pairs for internal examiner. (8x5=40 min) within **40 min** both internal and external examiners completes the dyadic communication exam.
- The students examined by the external for monadic exam are to be examined by the internal for dyadic and vice versa.

PROFESSIONAL COMMUNICATION

- 30 min for group discussion.
- 6 members in each group.
- 5 min for discussion for each group.
- Both internal and external examiners to supervise / examine simultaneously one group each.
- Within fifteen minutes all the six groups to be examined.

LABORATORY REQUIREMENT

1. An echo-free room for housing a minimum of sixty students.
2. Necessary furniture and comfortable chairs
3. Public Address System.
4. A minimum of two Computers with internet access, with Audio for Listening Skill and related software packages.
5. A minimum of Two different English dailies.
6. A minimum of one standard Tamil daily.
7. Headphone units – 30 Nos. with one control unit with a facility to play and record in Computer.
8. A minimum of Three Mikes with and without cords.
9. Colour Television (minimum size – 29").
10. DVD/VCD Player with Home Theatre speakers.
11. Clip Chart, white board ,smart board.
12. Projector.
13. video camera.
14. Printer,Xerox,scanner machines **desirable.**
15. English Weeklies/monthlies/journals like ELTOI **desirable.**
16. Frozen thoughts –monthly journal for Lifeskills by Mr.Rangarajan / www.frozenthoughts.com

Mark Pattern

End Examination –	**75 Marks**
Monodic Communication –	35 Marks
Dyadic Communication –	15 Marks
Profession Communication –	20 Marks
Professional Appearance –	5 Marks

Internal Assessment	**25 Marks**
Communication skills Record Notebook	10 Marks
Life skills assignments	10 Marks
Attendance	5 Marks

COMMUNICATION AND LIFE SKILLS PRACTICAL

Allocation & Statement of Marks

Duration:3Hrs.

Name of the Candidate Reg. No.

A. Monodic communication : 35 Marks

Introduction (5 mks)	Use in sentence (5 mks)	Vote of thanks / welcome address (5 mks)	Auditory/Oral comprehension (10 mks)	Description/ Oral presentation (5 mks)	News caption (5 mks)	Total (35 mks)

B. Dyadic communication: 15 Marks

Antakshari (5 mks)	Dialogue (10 mks)	Total (15 mks)

C. Professional communication: 20 Marks

Group Discussion (10 mks)	Resume (10 mks)	Total (20 mks)

D. Internal Assessment: 25 Marks

Record Notebook Commn.skills (10 mks)	Assignments Life Skills (10 mks)	Attendance (5 mks)	Total (25 mks)

E. Professional Appearance: /5 Marks

Total : **/100 Marks**

Internal examiner **External examiner**

FACE TO FACE DIALOGUE TOPICS

1. Between Friends (On any acceptable topic).
2. Between a conductor and a passenger.
3. Between a doctor and a patient.
4. Between a Shopkeeper and a Buyer.
5. Between a Teacher and a Student.
6. Between a tourist and a guide.
7. In a Bank.

8 At a railway enquiry counter.

9. Lodging a complaint.

Note: A resourceful teacher may add a few more topics of common interest.

TELEPHONIC DIALOGUE TOPICS

1. Placing an order.
2. Making Enquiries.
3. Fixing appointments
4. Making a hotel reservation.
5. Dealing with a wrong number.
6. Travel arrangements.
7. Handling complaints.

MECHANICAL DEPARTMENTAL VOCABULARY FOR ANTAKASHARI AND USING IN SENTENCES

EXAMPLE:

A:

1. Anvil – made of cast Iron used in foundry shop.
2. Axle – A metal rod that connects two wheels.
3. Alloy – alloy is a mixture of two or more metals.
4. Addendum – distance between top of gear teeth and pitch circle.
5. Annealing – It is a heat treatment process for softening the metals.

B:

1. Bearing – it is which supports the shaft.
2. Bolt – it is a type of fastener. Combined with screw.
3. Brake – it is used to halt an auto mobile vehicle.
4. Beed – steel wiring used in tyres to withstand stress.
5. Baffles – it is used to reduce noise, filter dust particles in auto mobile.

C:

1. Cam – it is a lobe like structure, which actuates the valve.
2. Crown – the slope like structure in the piston.
3. Calipers' – they are measuring instruments.
4. Clutch – it is used to disengage and engage the fly wheel and main shaft.
5. Chamber – it is the distance between vertical line and tyre center line.

D:

1. Damper – it is a type of shock absorber, reduces the vibration.
2. Differential – it controls the speed of rotating wheel in the rear axis.
3. Diaphram – it is used to separate two layers.
4. Detonation – it is the continuous knocking with serious effect on cylinder head.

E:

1. Evaporator – it absorbs heat to vapourise liquid into air
2. Engine-the place where fuel is burnt and heat energy is converted. mechanical energy
3. Electrolyte-it is a liquid substance which is used to transfer current or any metal particle.

4. Emission-the release of burnt gas from automobile.
5. Elongation-the increase of dimension due to application of load.

F:

1. Filter-which is used to remove dust particles.
2. Friction-the resistance on wear occur due to rubbing of two metals.
3. Fly wheel-the wheel like structure used to balance the uneven weight in engine.
4. Fuel – it is a substance that burns with oxygen in the air.
5. Factor of safety - it is the safety limit after which the material will break down.

G:

1. Governor – it is used to control the flow of fuel according to load.
2. Gear – it is used to transmit power from one place to another.
3. Generator – it is used to generate power.
4. Gasket – it prevents the leakage and to provide sealing effect.
5. Goggle – the protective device used to guard the eyes.

H:

1. Hub – it is the center part of wheel.
2. Hammer – it is used to beat sheet metals.
3. Hydraulics – it deals with fluid for various function.
4. Hatching – it is used to highlight the parts in drawings.
5. Head stock – it is the main function unit of lathe.

I:

1. Ignition – it is the function by which fuel is burnt.
2. Injection – it is the process of spraying fuel into engine block.
3. Impeller – it is which converts kinetic energy into pressure energy.
4. Inventory – it is the place where raw materials are stored.
5. Idling – it is the condition at which the automobile engine at stationary state.

J:

1. Jig – it guides the tool and hold the job.
2. Jaw – it is teeth like structure used to hold work pieces.
3. Jog mode – Jog mode is used to give manual feed for each axis continuously.
4. Junk – it is known as waste material in industry.
5. Journal – It is a type of bearing.

K:

1. Keyway – it is a specific path made in shaft to joint parts.
2. Knocking – the sound produced due to Burning of uncompleted burnt fuel.
3. Kelvin – it is the degree of hotness.
4. Knurling – it is the process of lathe done to work piece to improve the gripness.
5. Knuckle joint – It is a type of joint used to connect two work pieces.

L:

1. Lubrication – process of reducing heat by applying cooling substances.
2. Layering – it is used to draw parts of a machine separately and combine together.
3. Lever – it is a supported arm used to engage gears.
4. Lathe – it is the father of machines used in turning operations.
5. Lead screw - it is the screw through which the carriage travels.

M:

1. Manometer – it is used to measure the pressure of fluids.
2. Milling – process of removing metal from work piece by rotating cutting tool.
3. Manifold – it is a passage made for flow of fuel in automobile.
4. Moulding – it is the process of passing hot liquid metal into mould made through sand.
5. Module – it is a metric standard used to identify or specify pitch.

N:

1. Nozzle – it is used to reduce the pressure and increases the velocity.
2. Nut – it is a type of fastener used to couple with screw.
3. Nomenclature – Dimensional property of specific part on component is notified by nomenclature.
4. Neck – Distance between drills body and shank.
5. Naphtha – kind of inflammable oil.

O:

1. Orthography – it is the three dimensional view of an object.
2. Ovality – Elliptical shape of piston.
3. Over haul – it is the complete checking and servicing of a machine or vehicle.

4. Optimum temperature – suitable temperature condition for certain process on working.
5. Offset – it is by which the axis of certain job is defined.

P:

1. Pinion – a small gear is called pinion.
2. Pulley – A cylindrical object used to connect belt for transmitting power.
3. Pump – it is which transfers fluid from one place to another.
4. Piston – it is which transfer power from combustion chamber to connecting rod.
5. Port – it is the opening in two stroke engine for movement of fuel and exhaust.

Q:

1. Quilt – it is used to give automatic feed in machines.
2. Quality control – it is an inspection processl.

R:

1. Reaming – it is the operation used to finish inner surface of a hole.
2. Reservoir – it is used to store fuel or any liquid.
3. Rack – it is a spur gear with infinite radius.
4. Retainer – it is used to bring back to the original position.
5. Radiator – it is the part used in automobile for cooling water.

S:

1. Shackle – it is a rod connected to leaf spring.
2. Spring – it is a circular rod which compresses on load and retracts when released.
3. Strainer – it is used to remove micro particles.
4. Shock absorber - it is used to reduce vibration and give cushioning effect.
5. Suspension- it is used to absorb shocks and give cushioning effect.

T:

1. Tail stock – it is used in lathe to support the job.
2. Tool – it is a metal.removal device.
3. Torque – it is the twisting load given on a work piece.
4. Trimming – it s the process of removing excess metal .
5. Turning – it is a metal cutting process used to reduce diameter.

U:

1. Universal joint-it is used to connect propeller shaft and differential unit.
2. Universal divider head- it is used to index various components.

V:

1. Valve – valve is the part used in automobile for flow of fuel and exhaust to cylinder head.
2. Vent hole – it is the hole made in casting for ventilation purpose.
3. Vulcanizing – it is the process of adding carbon to rubber.
4. Vibration – it is caused due to the movement in an uneven surface.
5. Velocity-rate of change of displacement.

W:

1. Wheel-it is a circular object which rotates and moves the vehicle.
2. Wiper-it is used in wind shield to remove water droplets.
3. Work piece-it is the material in which various processes are done to make a component.
4. Wage-it is the amount paid to a worker for his work.
5. Washer-washer is a component used in fasteners to reduce gap.

Y:

1. Yawing-the turning of wind mill towards direction of air is called yawing.
2. Yoke-it is which holds the other end of spindle in milling machine.
3. Yield stress-It is the stress above which it will attain the breaking stress.
4. Young's modulus-it is the ratio between stress and strain.

Pl.note: Suppose departmental words are not available in some English letters like

' x ' ' y ' ' z ' the students may be permitted to use common words. This is only an example. Another student of Mechanical Engineering can have different sets of words under each letter of the English alphabet.Like that there may be variety of sets. The most important point is that One is not supposed to murmur but speak the words intelligibly in an audible manner. Swallowing the words will deprive a student of winning a selection in an interview. In the same way, students of other Departments can have different sets of words of their departments under each letter of the English alphabet.

TELEPHONE LANGUAGE AND PHRASES IN ENGLISH

Answering the phone

" Good morning/afternoon/evening, Madras Enterprises, Premila speaking."

" Who's calling, please?"

Introducing yourself

" This is Raghavan speaking."

" Hello, this is Raghavan from Speak International."

Asking for someone

" Could I speak to Mr. Raman, please?"

" I'd like to speak to Mr Raman, please."

" Could you put me through to Mr Raman, please?"

" Could I speak to someone who …"

Explaining

" I'm afraid Mr. Raman isn't in at the moment".

" I'm sorry, he's in a meeting at the moment."

" I'm afraid he's on another line at the moment."

" Putting someone on hold"

" Just a moment, please."

" Could you hold the line, please?"

" Hold the line, please."

Problems

" I'm sorry, I don't understand. Could you repeat that, please?"

" I'm sorry, I can't hear you very well. Could you speak up a little, please?"

" I'm afraid you've got the wrong number."

" I've tried to get through several times but it's always engaged."

" Could you spell that, please?"

Putting someone through

" One moment, please. I'll see if Mr Raman is available."

" I'll put you through."

" I'll connect you."

" I'm connecting you now".

Taking a message

" Can I take a message?"

" Would you like to leave a message?"

" Can I give him/her a message?"

" I'll tell Mr. Raman that you called"

" I'll ask him/her to call you as soon as possible."

" Could you please leave your number? I shall ask him to get back to you."

Pl.note: The above ones are samples only. A resourceful teacher may add more.

DAY-TO-DAY EXPRESSIONS (For dialogues)

COMMON PARLANCE

How are you?
Fine. Thank you.
How are you?
Me too.
How do you do?
How do you do?
It's good to see you again.
Glad to meet you.
Thank you.
Thanks very much.
Welcome.

Hello! How is everything?
Just fine. Thanks. What's new?
Nothing much.

I'm pleased to meet you.
The pleasure is mine.
I've heard Paul speak about you often.
Only good things! I hope.

Look who's here!

Are you surprised to see me?
Sure. I thought you were in Chennai.
I was, but I got back yesterday.

Sorry, May I help you?
So kind of you.
That's so nice of you.
Nice talking to you.
Nice meeting you.
It's getting late, and I've to go now.
Certainly. Come back soon.
In that case, I'll be seeing you.
Fine.
Thank you.
Welcome
So long. See you later.
Take care. Bye.
Good-bye.

Could you tell me the time, please?
Certainly. It is 5.35 p.m.
My watch says 5.40 p.m.
Then your watch is five minutes fast.

Excuse me. Can you tell me the way to …?
May I come in?
How is the weather today?
It is pleasant. / sunny / rainy / warm /windy.

I am sorry, Can you repeat what you have said.
I am sorry, I can't hear you properly.
It is not audible. Can you please repeat it?
Beg your pardon; I don't get your words clearly.
How do you feel now?
Are you ok?
I am fine. And how about you?
I am fine. Thank you.

GROUP DISCUSSION

Let me begin with introducing this concept,
Well, this is to convey that
At the outset, I am here to convey
At this juncture, I would like to
May I intervene?

May I add?
Kindly permit me to say
If you could allow me to say
Let me add a few words
Let me first answer your question
Can you please allow me to convey
Excuse me; I would like to add further

On behalf of my colleagues,
On their behalf
Firstly/ secondly/ thirdly.
Finally/ conclusively/ at the end / Summing up
Eventually/ in the event of
In spite of / otherwise/ although/ though

Please Note:

- The above ones are samples only.
- A resourceful teacher may add more.
- A potential student may exhibit variety.

VI SEMESTER

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22061- INDUSTRIAL ENGINEERING AND MANAGEMENT

DIRCETORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22061
Semester	:	VI
Subject Title	:	Industrial Engineering and Management

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Industrial Engineering and Management	5	80	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	PLANT ENGINEERING AND PLANT SAFETY	15
II	WORK STUDY, METHOD STUDY AND WORK MEASUREMENT	15
III	PRODUCTION PLANNING AND QUALITY CONTROL	15
IV	PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT	15
V	FINANCIAL MANAGEMENT AND MATERIALS MANAGEMENT	15
	REVISION AND TEST	5
	Total	80

RATIONALE:

In the Indian Economy, Industries and enterprises always find prominent place. After globalization, the government of India has announced liberalization policy of starting an enterprise which resulted in the mushroom growth of industries. The present day students should be trained not only in manufacturing processes but also in managing activities of industries. Training must be imparted to students not only to shape them as technicians but also as good managers.

The knowledge about plant, safety, work study techniques, personnel management and financial management will definitely mould the students as managers to suit the industries. Due to the presence of such personalities the industries will leap for better prosperity and development.

OBJECTIVES:

- Explain the different types of layout and compare them.
- Appreciate the safety aspects and its impacts on an organization.
- Compare different productivity improvement technique.
- Explain different work measurement techniques.
- Estimate standard time for a job.
- Explain production planning and control and its functions.
- Study the role of PPC as a tool for cost control.
- Prepare process control charts.
- Explain the principles of management and function of management.
- Compare different organizational structure.
- Explain the selection and training of staff.
- Analyse inventory control system and the tools used in stock control.
- Explain the procurement and consumption cycle.

INDUSTRIAL ENGINEERING AND MANAGEMENT

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**PLANT ENGINEERING AND PLANT SAFETY** **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 – Break down maintenance, preventive maintenance and scheduled maintenance. **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.	**15 Hrs**
II	**WORK STUDY, METHOD STUDY AND WORK MEASUREMENT** **Work Study:** Productivity – Standard of living – method of improving productivity – Objectives – Importance of good working conditions. 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. **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).	**15 Hrs**
III	**PRODUCTION PLANNING AND QUALITY CONTROL** **Production Planning and Control:** Introduction – Major functions of production planning and control – Pre planning – Methods of forecasting – Routing and scheduling – Dispatching and controlling – Concept of Critical Path Method (CPM)-Description only. Production – types-Mass production, batch production and job order production- Characteristics – Economic Batch Quantity (EBQ) – Principles of product and process planning – make or buy decision – problems. **Quality Control:** Definition – Objectives – Types of inspection – First piece, Floor and centralized inspection – Advantages and disadvantages. Quality control – Statistical quality control – Types of measurements – Method of variables – Method of attributes – Uses of X, R, p and c charts – Operating Characteristics curve (O.C curve) – Sampling inspection – single and double sampling plan – Concept of ISO 9001:2008 Quality Management System Registration / Certification procedure – Benefits of ISO to the organization.	**15 Hrs**

IV	**PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT** **Principles of Management:** Definition of management – Administration - Organization – F.W. Taylor's and Henry Fayol's Principles of Management – Functions of Manager – Types of Organization – Line, Staff, Taylor's Pure functional types – Line and staff and committee type – Directing – Leadership - Styles of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation –Modern management techniques- Just In Time – Total Quality Management (TQM) – Quality circle – Zero defect concept – 5S Concept- Management Information Systems. **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.	**15 Hrs**
V	**FINANCIAL MANAGEMENT AND MATERIAL MANAGEMENT** **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. **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.	**15 Hrs**

Text Books :

1) Industrial Engineering and Management, O.P. Khanna, Revised Edition Publications (P) Ltd – 2004, 67/4 Madras House, Daryaganj, New Delhi – 110002.
2) Engineering Economics and Management, T.R. Banga & S.C. Sharma, McGraw Hill Editiion. 2 – 2001, New Delhi.

Reference Books :

1) Management, A global perspective, Heinz Weihrich, Harold Koontz, 10th Edition, McGraw Hill International Edition 1994.
2) Essentials of Management, 4th Edition, Joseph L.Massie, Prentice-Hall of India, New Delhi 2004.

22061 INDUSTRIAL ENGINEERING AND MANAGEMENT

Model Question Paper – I

Time: 3 Hrs. **Max. Marks : 75**

PART– A
Marks 15 x 1= 15

Note : Answer any 15 Questions. All Questions carry equal marks.

1. What is a plant?
2. Define line layout.
3. What is meant by maintenance?
4. State any two provisions of safety.
5. Define method study.
6. State any two objectives of method study.
7. What is operation process chart?
8. What is PMTS?
9. What is PPC?
10. Define scheduling.
11. Explain first piece inspection.
12. What do you mean by producer's risk?
13. Define Administration.
14. Harmony and not discord – explain.
15. What is an organization chart?
16. Define motivation.
17. State the types of capital required.
18. List the sources of capital.
19. What is meant by prime cost?
20. Define depreciation.

PART – B

Marks 5 x 12 = 60

Answer all Questions **5x12=60**

21.	A.	What are the different types of plant layout? Explain any two with neat sketches (OR)	12
	B.	State the important Provisions of Factories Act 1948 governing safety & health of workers.	12
22.	A.	With a neat sketch. Explain man type flow process chart. (OR)	12
	B.	Write short notes on the following	
		(i) Ratio delay study	6
		(ii) Analytical estimation	6
23.	A.	What is forecasting? Explain the different techniques of forecasting. (OR)	12
	B.	Write short notes on	
		(i) Double sampling plan	6
		ii) OC curve for a simple plan	6
24.	A.	A Worker completes a job in 6 hrs. The allowed standard time for the job is 8 hrs. His wage Rate is Rs.5 per hour. Calculate the total earnings of the worker under the following Systems of payment	
		i) Halsey's 50% plan	6
		ii) Rowan's plan (OR)	6
	B.	State the principles of management as enumerated by Henry Fayol. Explain any eight of them	12
25.	A.	Explain by means of a block diagram how the selling price of a product is determined. (OR)	12
	B.	Explain how total cost of inventory can be efficiently controlled by "ABC Analysis" technique.	12

22061 INDUSTRIAL ENGINEERING & MANAGEMENT-II
MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. Define Plant
2. List any two Safety law's
3. State one major factor that causes industrial dispute.
4. For what purpose screw conveyors are used.
5. Give any two objectives of work study.
6. List any four tools used in method study.
7. Define standard time.
8. What is production study.
9. What is the definition of EBQ?
10. State the UCL & LCL of R-Chart?
11. Explain the term dispatching.
12. Define attributes inspection.
13. What are the types of organization?
14. What are two methods of wage payment plan?
15. Define Quality Circle.
16. State any two qualities of a good leadership.
17. State any two types of debentures.
18. State any two objectives of stock control system.
19. What is lead time?
20. What is ABC analysis?

PART – B
Marks 5 x 12=60
Answer all the Questions

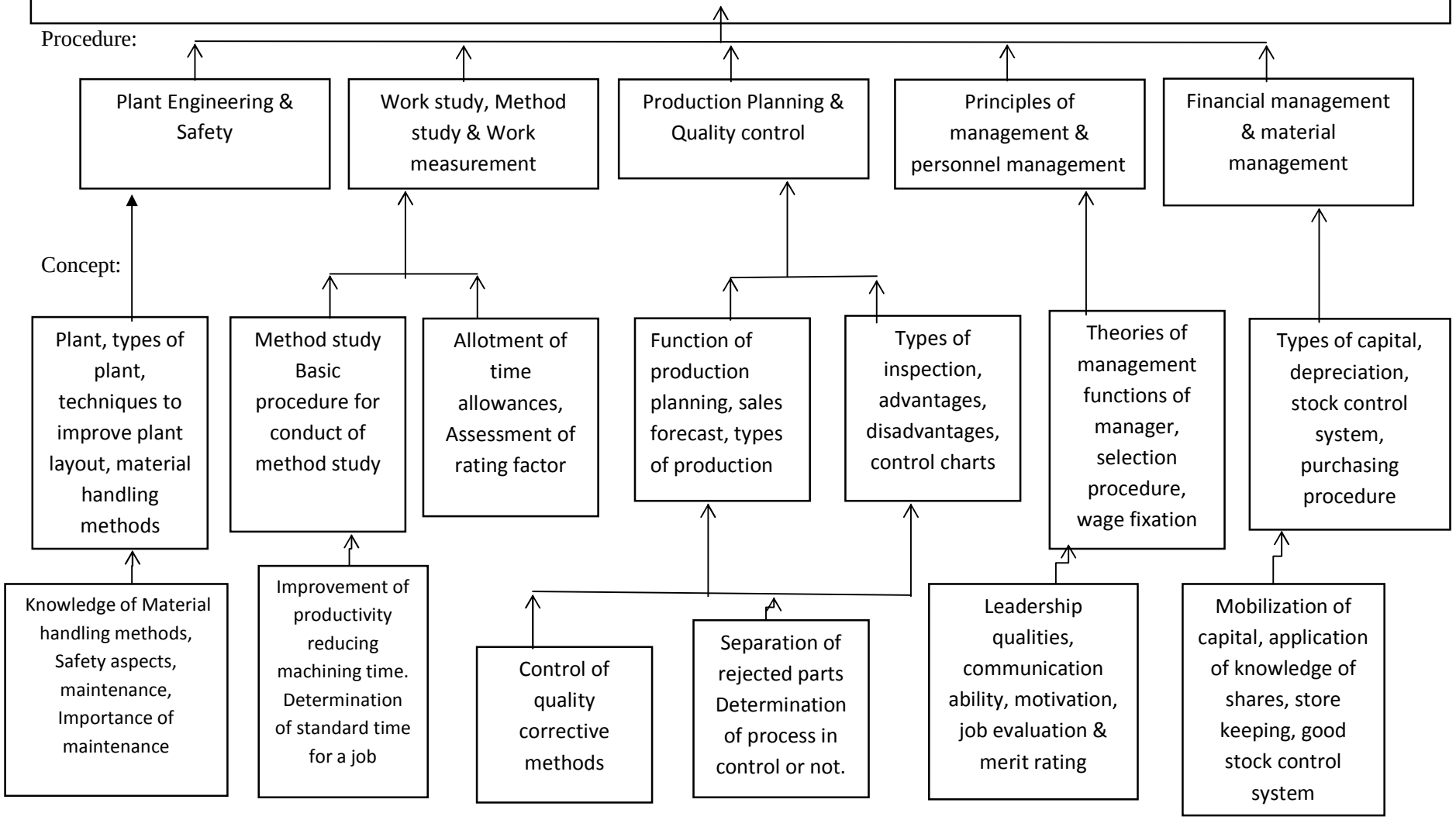
21	a. i)	What are the different types of plant layout? Explain any one type of layout with a neat sketch. What are its advantages.		(6)
	ii)	Explain the various factors to be considered for selection of equipment.		(6)
		(or)		
	b.i)	Briefly explain the procedure for preventive maintenance .		(6)
	ii)	Explain the planning for accident prevention.		(6)
		(or)		
22.	a.i)	Explain ratio delay study.		(6)
	ii)	Explain various allowance added to basic time.		(6)
		(or)		
	b.i)	State the objectives of work measurement.		(6)
	ii)	Describe with diagram how rating factor is applied in calculating normal time for below average performer.		(6)
23	a.i)	Explain OC curve for a simple plan.		(6)
	ii)	Explain roaming inspection.		(6)
		(or)		
	b.i)	Explain the procedure for construction of a $\overline{X}$- Chart.		(6)
	ii)	Explain characteristics of a job order type production.		(6)
24	a.i)	Explain any four of the Henry Fayol's principles of management.		(6)
	ii)	Explain the key factors for the success of TQM.		(6)
		(or)		
	b.i)	Explain the selection process in personnel management.		(6)
	ii)	Explain the factors affecting wage structure.		(6)
25.	a.i)	Write short notes on receiving a issuing of material.		(6)
	ii)	Briefly explain purchasing procedure.		(6)
		(or)		
	b)i)	Explain general overhead in factory costing.		(6)
	ii)	Explain the factors which determine the working capital requirements.		(6)

LEARNING STRUCTURE

22061 INDUSTRIAL ENGINEERING AND MANAGEMENT

Applications

Enable to understand types of plant, safety practices followed, work study techniques followed, understand the principles of management and personnel arrangement, analyse the principles of financial management, Material Management and apply the knowledge in the field of industries



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22062 - COMPUTER INTEGRATED MANUFACTURING

DIRCETORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22062
Semester	:	VI
Subject Title	:	Computer Integrated Manufacturing

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
Computer Integrated Manufacturing	5	80	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	**Topics**	**Hours**
I	INTRODUCTION CIM AND COMPUTER AIDED DESIGN & ANALYSIS	15
II	COMPUTER AIDED MANUFACTURING AND RAPID PROTOTYPING	15
III	CNC MACHINE AND COMPONENTS	15
IV	PART PROGRAMMING	15
V	FMS, INTEGRATED MATERIAL HANDLING AND ROBOT	15
	REVISION AND TEST	5
	Total	80

RATIONALE:

As per the latest requirements in the Industries this enables to learn the assistance of computer in the field of design and manufacturing areas. It's able to learn the latest manufacturing concepts of in the shop floors and manufacturing methods like RPT. They are able to know about the working of principles of CNC machines and programming techniques are included. The application of material handling equipments and robots are learnt based on the automation in the industries.

OBJECTIVES:

- Understand the concept and requirement of the integration of the design and manufacturing.
- Acquire knowledge about the computer assistance in the design process and analysis.
- Understand the concepts of manufacturing with computer assistance in the shop floor.
- Learn the principle and working of the CNC machines.
- Understand the principle of latest manufacturing machines like EDM and RPT.
- Learn the method of CNC programming with international codes.
- Acquire the knowledge in the material handling equipment and robot.

COMPUTER INTEGRATED MANUFACTURING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**INTRODUCTION CIM AND COMPUTER AIDED DESIGN & ANALYSIS** **CIM:** Introduction of CIM – concept of CIM - evolution of CIM – CIM wheel – Benefits – integrated CAD/CAM. **CAD:** Computer Aided Design **–** Introduction – CAD definition – Shigley's design process – CAD activities – benefits of CAD. Types of CAD system –Host and terminal based CAD system - PC based CAD system – workstation based CAD system – graphics workstation – CAD software packages. 2D&3D transformations – translation, scaling, rotation and concatenation. Geometric modeling: Techniques: Wire frame modeling – surface modeling – solid modeling: Boundary representation – Constructive Solid Geometry – Comparison. Graphics standard – Definition –Need - GKS – IGES – PHIGS – DXF. Cost involved in design changes – Concept of Design for Excellence (DFX) – Guide lines of Design for Manufacture and assembly (DFMA). **Finite Element Analysis:** Introduction – Development - Basic steps – Advantage.	**15 Hrs**
II	**COMPUTER AIDED MANUFACTURING AND RAPID PROTOTYPING** **CAM:** Definition – functions of CAM – benefits of CAM – Group technology – Part families - Parts classification and coding - coding structure – Optiz system, MICLASS system and CODE System - process planning – CAPP – Types of **CAPP :** Variant type, Generative type – advantages of CAPP - production planning and control – computer integrated production management system – Master Production Schedule (MPS) – Capacity planning – Materials Requirement Planning (MRP) –Manufacturing Resources Planning (MRP-II)– Shop floor control system - Just in time manufacturing philosophy- Introduction to enterprises resources planning. Product Development Cycle – Sequential engineering – Concurrent engineering. Rapid proto typing: concept and applications – materials – types - Stereo lithography – laser sintering – Deposition Modeling - 3D printing.	**15 Hrs**
III	**CNC MACHINE AND COMPONENTS** **CNC Machines:** Numerical control – definition – components of NC systems – development of NC – DNC – Adaptive control systems – working principle of a CNC system – Features of CNC machines - advantage of CNC machines – difference between NC and CNC – Construction and working principle of turning centre – Construction and working principle of machining centers – machine axes conventions turning centre and machining centre – design considerations of NC machine tools. CNC EDM machine – Working principle of die sinking and wire EDM machines - Coordinate Measuring Machines: construction and working principles.	**15 Hrs**

	Components of CNC machine. **Drives:** spindle drive – dc motor – Feed drives – dc servo motor and stepper motor – hydraulic systems – Slide ways – requirement – types – friction slide ways and anti friction slide ways - linear motion bearings – recirculation ball screw – ATC – tool magazine – feedback devices – linear and rotary transducers – Encoders - in process probing.	
IV	**PART PROGRAMMING** **PART PROGRAMMING:** NC part programming – methods - manual programming – conversational programming – APT programming - Format: sequential and word address formats - sequence number – coordinate system – types of motion control: point-to-point, paraxial and contouring – Datum points: machine zero, work zero, tool zero NC dimensioning – reference points – tool material – tool inserts - tool offsets and compensation - NC dimensioning – preparatory functions and G codes, miscellaneous functions and M codes – interpolation: linear interpolation and circular interpolation - CNC program procedure. Part Program – macro – sub-program – canned cycles: stock – mirror images – thread cutting – Sample programs for lathe : Linear and circular interpolation - Stock removal turning – Peck drilling – Thread cutting and Sample programs for milling: Linear and circular interpolation – mirroring – sub program – drilling cycle – pocketing – Generating CNC codes from CAD models – post processing	**15 Hrs**
V	**FMS, INTEGRATED MATERIAL HANDLING AND ROBOT** Types of manufacturing - introduction to FMS – FMS components – FMS layouts – Types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machining systems – benefits of FMS - introduction to intelligent manufacturing system – virtual machining. Computer Integrated material handling – AGV: working principle – types - benefits – Automatic Storage and Retrieval Systems (ASRS). ROBOT – definition – robot configurations – basic robot motion – robot programming method – robotic sensors - industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.	**15 Hrs**

Text Books :

1) CAD/CAM/CIM , R.Radhakrishnan, S.Subramanian, New Age International Pvt. Ltd.
2) CAD/CAM , Mikell P.Groover, Emory Zimmers, Jr.Prentice Hall of India Pvt., Ltd.
3) NC Programming, S.K.Sinha, Galgotia Publications Pvt. Ltd.

Reference Books :

1) CAD/CAM Principles and Applications, Dr.P.N.Rao, Tata Mc Graw Hill Publishing Company Ltd.
2) CAD/CAM, Ibrahim Zeid, Mastering Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3) Automation, Production Systems, and Computer-Integrated Manufacturing, Mikell P. Groover, Pearson Education Asia.
4) Computer control of manufacturing systems,Yoram Koren, McGraw Hill Book.

22062 COMPUTER INTEGRATED MANUFACTURING
MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

PART-A
Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1 Define is CAD.
2 List the benefits of CIM.
3 What is translation?
4 Mention the advantages of FEA.
5 Define CAM.
6 What is process planning?
7 What is concurrent engineering?
8 Mention the applications of RPT
9 Define NC.
10 Differentiate between NC and CNC.
11 What is encoder?
12 Mention the types of slide ways.
13 Mention the different formats of part program.
14 What is reference points?
15 Mention the different shapes of tool inserts.
16 What is NC dimensioning?
17 List the benefits of FMS.
18 What is AGV?
19 Define robot.
20 List the robot programming methods.

PART – B
Marks 5 x 12=60
Answer all the Questions

21	a i)	Mention the basic steps of FEA.		4
	ii)	Explain the activities of CAD in design process.		8
		(or)		
	b i)	Compare the wire frame modeling with surface modeling.		2
	ii)	Explain the constructive solid geometry modeling technique.		10
22	a i)	Write briefly about Enterprise Resource Planning.		4
	ii)	What is GT? Explain the optiz system of coding.		8
		(or)		
	b i)	Write briefly about the Shop Floor Control.		4

	ii)	Explain the computer integrated production management system.		8
23	a i)	Explain the working of ATC.		4
	ii)	Explain the working principle of turning centre.		8
			(or)	
	b i)	What is the feed back device?		2
	ii)	Explain the working of linear and rotary transducers.		10
24	a i)	Write briefly about conversational programming.		4
	ii)	Explain about the APT programming language.		8
			(or)	
	b i)	Write the procedure to create CNC manual part program.		4
	ii)	Write a part program to create a mirroring image in a CNC milling machine using a sub program.		8
25	a i)	Explain the working principle of AGV.		8
	ii)	Write briefly about ASRS.		4
			(or)	
	b i)	Write briefly on intelligent manufacturing system.		4
	ii)	Explain the different types of FMS.		8

22062 COMPUTER INTEGRATED MANUFACTURING
MODEL QUESTION PAPER-II

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1 List the benefits of CAD.
2 What is graphic workstation?
3 What is concatenation?
4 What is the need of graphic standard?
5 List the benefits of CAM.
6 What is capacity planning?
7 List the advantages of CAPP.
8 What is sequential engineering?
9 What are the advantages of CNC machine?
10 What are the purposes of CMM?
11 What are the requirements of slide ways?
12 What is the purpose of ATC?
13 What is NC part programming?
14 What is tool offsets?
15 What is linear interpolation?
16 What is sub program?
17 What is FMS?
18 What is virtual machining?
19 List the types of sensors used in robot.
20 List the benefits of AGV

PART – B

Marks 5 x 12=60

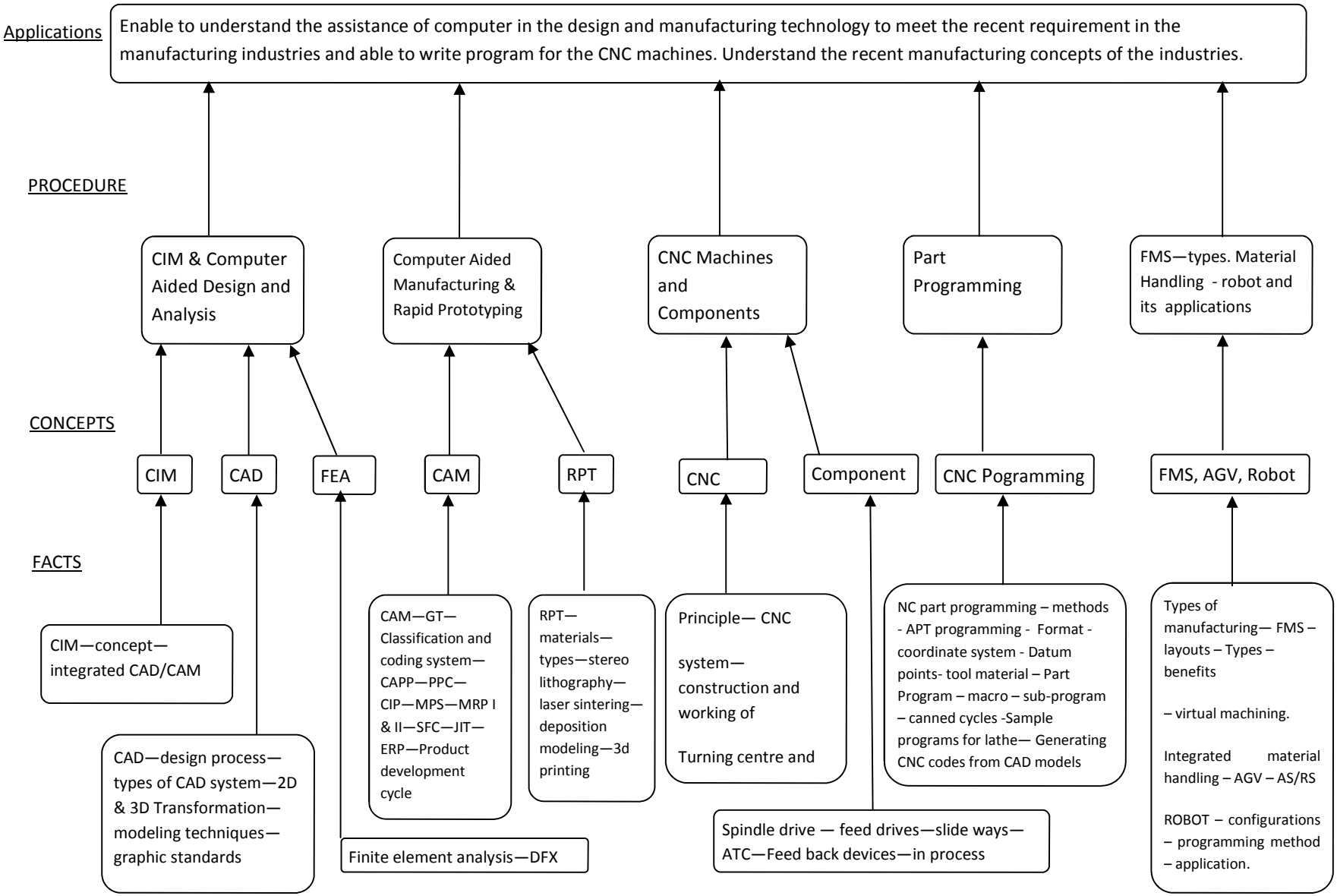
Answer all the Questions

21	a i)	Write briefly about the cost involved in design process.		4
	ii)	Explain the Shigley's design process.		8
		(or)		
	b i)	What is graphic standard?		2
	ii)	Explain the IGES graphic standard.		10
22	a i)	Write briefly about Material Requirement Planning.		4

	ii)	What is CAPP? Explain the generative method of CAPP.	8
		(or)	
	b i)	Write briefly about the product development cycle.	4
	ii)	What is RPT? Explain the working of stereo lithography.	8
23	a i)	Write briefly about adaptive control system.	4
	ii)	Explain the working principle of CNC system.	8
		(or)	
	b i)	Write briefly about the linear motion bearing.	2
	ii)	Explain the working principle of CMM.	10
24	a i)	Write briefly about tool inserts.	4
	ii)	Write a part program to make M20 X 1.5 thread in CNC lathe.	8
		(or)	
	b i)	Explain the types of motion control in CNC machine.	4
	ii)	Write a part program for stock removal in turning.	8
25	a i)	Explain the FMS components.	8
	ii)	Explain the FMS layout with sketches.	4
		(or)	
	b i)	Write briefly about the basic robot motion.	4
	ii)	Explain the different industrial applications of robot.	8

LEARNING STRUCTURE

22062 COMPUTER INTEGRATED MANUFACTURING



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22081- AUTOMOBILE ENGINEERING

DIRCETORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22081
Semester	:	VI
Subject Title	:	Automobile Engineering

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
			Internal Assessment	**Board Examination**	**Total**	
Automobile Engineering	5	80	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	**Topics**	**Hours**
I	AUTOMOBILE ENGINES	15
II	FUEL AND FUEL FEED SYSTEMS	15
III	TRANSMISSION AND POWER TRAIN	15
IV	AUTOMOBILE CHASSIS	15
V	AUTOMOBILE ELECTRICAL EQUIPMENTS & POLLUTION CONTROL	15
	REVISION AND TEST	5
	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.
- Appreciate the modern techniques for automobile pollution control.

AUTOMOBILE ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
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 – Expansion control in pistons – 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 – methods of cam shaft drive arrangements – Valve and Valve mechanism – L-I-F-T. Diesel engine – Stages of Combustion – Delay period – Variables affecting delay period – Methods of generating air swirl in diesel engine combustion chambers – Types of combustion chambers – merits and demerits. Cooling systems – purpose – types – air and water cooling systems – merits and demerits – thermo siphon system - pump assisted water cooling systems – components – water pump, fan - thermostat – types - radiator – types – pressure cap – vapour recovery cooling system – merits - vented and pressurized expansion tank – temperature sensors - troubles in cooling system – loss of coolant , overheating and over cooling – causes. 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 pumps - oil filters – full flow and bypass filter systems - Troubles in lubrication system – oil leakage , low oil pressure, high oil pressure and excessive oil consumption – causes.	**15 Hrs**
II	**FUEL AND FUEL FEED SYSTEMS** Requirements of an ideal petrol – Octane number – detonation - Pre-ignition – properties of a good diesel fuel – Cetane number – Diesel knock – methods of controlling diesel knock – comparison of detonation and diesel knock - fuel additives – Alternate fuels for petrol and diesel engines Layout of fuel feed system of petrol engine – types of fuel feed systems – A.C. Mechanical fuel pump – S.U. Electrical fuel pump – fuel filter – Air cleaners - types – Carburetion – Classification of Carburetors – Simple carburetor – defects - Carburetor circuits – Solex Carburetor - Construction and operation – petrol injection – merits and demerits – DTSI – VTI – CCVTI – PGMFI – MPFI system. Layout of diesel 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 - governors – Mechanical and Pneumatic governors - fuel filters – primary and secondary filters	**15 Hrs**
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.	**15 Hrs**

	Gear box – purpose – various resistance to motion – types of gear boxes – sliding mesh , constant mesh and synchromesh – floor shift gear changer – 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 – forces in the rear axles – Semi floating , three quarter floating and full floating rear axles – Axle housing – types.	
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 – properties of tyres – tubeless tyre - tyre wear and tyre service.	**15 Hrs**
V	**AUTOMOBILE ELECTRICAL EQUIPMENT & POLLUTION CONTROL** 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 – battery coil ignition system –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. Pollution – Pollutants – source of pollutants – pollution control techniques for petrol and diesel engines emissions – controlling crank case emission (PCV) – controlling evaporative emission (VRS , VSS , VVR , ECS and EEC) – Treatment of exhaust gas (Catalytic converter , EGR) – introduction to automobile electronics – radio interference – suppressors – audio, video systems.	**15 Hrs**

Text Books:

1) Automobile engineering vol- 1, vol – 2, Kirpal singh, Standard publishers distributors New Delhi.
2) Automobile Engineering, G.B.S.Narang, Khanna Publishers, New Delhi.
3) Automotive Mechanics, William H.crouse and Donald .L. Anglin, Tata Mc Graw – Hill Publishing Company Ltd, New Delhi.
4) The Automobile, Harbans Singh Reyat, S.Chand & Co Ltd, New Delhi

Reference Books :

1) Vehicle and Engine technology. Vol. I,Heinz Heisler, , ELBS
2) Automotive Mechanics,Joseph Heitner, East –west Press (P) Ltd, New Delhi
3) Internal Combustion engines, M.L.Mathur & R.P.Sharma, Dhanpat Rai & Sons, New Delhi
4) Automobile Engineering,R.B.Gupta, Satya Prakashan, New Delhi

22081 AUTOMOBILE ENGINEERING
MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

PART-A
Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. State the function of a fly wheel.
2. Define delay period in diesel engine.
3. What is the need of a thermostat in cooling system of an IC engine?
4. Mention any two solid lubricants used in IC engine.
5. Define octane number of petrol.
6. Sketch and name the parts of pintle type of fuel nozzle employed in diesel engine.
7. State the principle involved in a venturi system of a carburetor
8 Name the element of a secondary filter used to remove water droplets from diesel.
9. Sketch the arrangement of 'front engine rear wheel drive' and name the parts.
10. State the function of torsional springs employed in a clutch plate.
11. What is the type of clutch used in motor cycles?
12. Why do we employ a 'slip joint' in the front end of a propeller shaft?
13. Define 'caster angle'.
14. What is the type of oil used in telescopic type shock absorber?
15. What does the term "bleeding off " refer to?
16. State the importance of 'breaker strips' used in radial-ply tyres
17. What is the purpose of diodes used in alternator ?
18. Why do we use condenser in the primary circuit of a battery coil ignition system?
19, Name any two air pollutants.
20. Mention the metal used as reducing catalyst in a catalytic convertor.

PART – B
Marks 5 x 12=60

Answer all the Questions

21 a.(i) Differentiate 'wet livers and dry livers. (6)
(ii) Briefly explain the stages combustion of diesel engine (6)
(or)
b. Explain with a neat sketch the working and advantages of a radiator pressure cap. (12)

22.	a.(i)	Briefly explain the working of a simple carburetor with a neat sketch.	(6)
	(ii)	Briefly explain primary type of fuel filter used in diesel engine	(6)
		(or)	
	b.	Sketch and explain a fuel injector.	(12)
23.	a.(i)	Write down any six functions of clutch	(6)
	(ii)	Explain briefly the construction of semi floating of rear axle	(6)
		(or)	
	b.	Explain with a neat sketch the working of conventional type of differential	(12)
24.	a.(i)	Write down the principle of Ackermann steering mechanism with a simple diagram	(6)
		(ii).Write shot notes on a). disc wheel b.) wire wheel.	
	ii)	Explain with neat diagram the working of power steering.	(6)
		(or)	
	b.	Explain with neat diagram the working of power steering.	(12)
25.	a.	Explain the working of over running clutch drive with a neat diagram.	(12)
		(or)	
	b.	Explain with a neat diagram EGR system used to treat the exhaust gas.	(12)

22081 AUTOMOBILE ENGINEERING
MODEL QUESTION PAPER-II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. State the functions of a piston.
2. What is the function of fly wheel?
3. What is the purpose of pressure relief valve in a lubrication system?
4. Define scavenging.
5. Define detoration.
6. State the principle used in venturi of a carburetor.
7. Sketch a pintle type nozzle & name the parts.
8. Define compression ratio.
9. Sketch the arrangement of front engine rear wheel drive.
10. State any one advantages of helical gear over spur gear.
11. What is the purpose of clutch?
12. What is the necessity to have a final drive?
13. Sketch the Elliot type stub axle & name the parts.
14. State the functions of a steering gear box.
15. State any one advantages of independent suspension system.
16. What is the self energizing action of a brake shoe?
17. Define battery capacity.
18. Mention the valve of a specific gravity for fully charged battery below 32 ^{0}C
19. State the functions of slip ring and brushes used in alternator.
20. Define the pollutant particulate.

PART – B
Marks 5 x 12=60

Answer all the Questions

21	a. i)	Sketch the cross section of various types of piston rings and briefly explain about their functions.		(6)
	ii)	Sketch the side valve mechanism and explain.		(6)
		(or)		
	b. i)	Explain with neat sketch bellows type thermostat.		(6)
	ii)	Explain with neat sketch fully pressure lubrication system.		(6)
22.	a. i)	Sketch and explain the working of simple carburetor		(6)
	ii)	Sketch and explain briefly about oil bath type air cleaner.		(6)
		(or)		
	b. i)	Describe the working of a Mechanical governor with a neat diagram.		(6)
	ii)	Explain the working of secondary filter with neat diagram.		(6)
23	a. i)	Explain the working of a fluid coupling with neat diagram.		(6)
	ii)	Explain with the neat diagram the working of synchromesh unit.		(6)
		(or		
	b. i)	Describe the working of conventional differential.		(6)
	ii)	Sketch and explain the working of a fully floating rear axle.		(6)
24	a. i)	Explain the Ackerman steering mechanism with neat diagram .		(6)
	ii)	Explain the working of rack and pinion gear box with the neat diagram.		(6)
		(or)		
	b. i)	Explain the working of air suspension with the neat diagram.		(6)
	ii)	Describe the process of bleeding off in hydraulic brake system with a neat diagram.		(6)
25.	a. i)	Sketch and explain battery coil ignition system.		(6)
	ii)	Explain the working principle of solenoid switch with a simple sketch.		(6)
		(or)		
	b. i)	Explain with neat sketch the working of a flasher unit.		(6)
	ii)	Explain the working of catalytic convertor with a simple sketch.		(6)

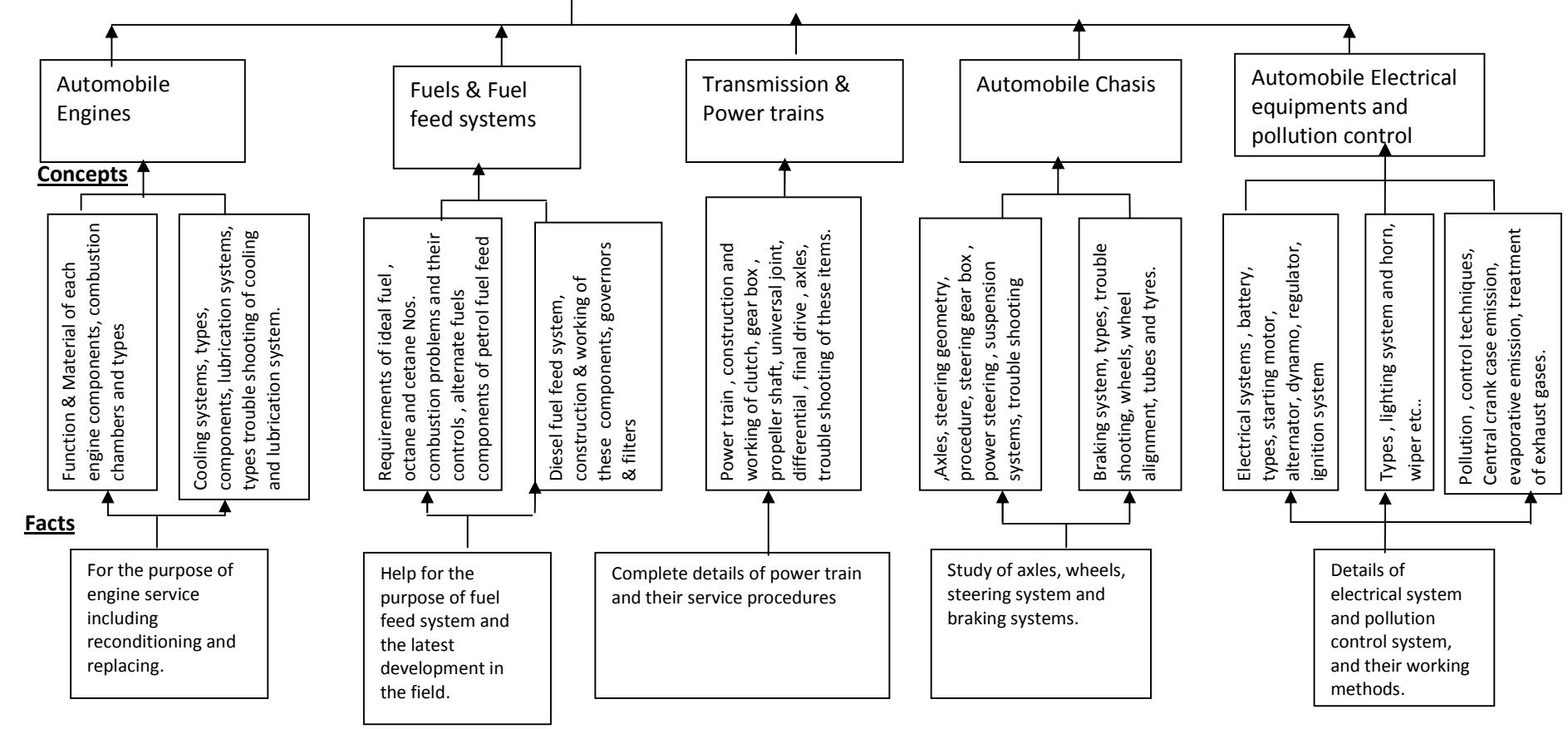
LEARNING STRUCTURE

22081 AUTOMOBILE ENGINEERING

Applications

To get knowledge about the leading field of this automobile technology by studying the titles of automobile engines, transmission system, chasis, frames, electrical equipments and apply the gained knowledge for the further improvement and service to society.

Procedure



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22082- ROBOTICS

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22082
Semester	:	VI
Subject Title	:	Robotics

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Robotics	5	80	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	FUNDAMENTALS OF ROBOT TECHNOLOGY	15
II	ROBOT CONTROLLER, DRIVE SYSTEMS AND END EFFECTERS	15
III	SENSORS AND MACHINE VISION	15
IV	ROBOT KINEMATICS AND ROBOT PROGRAMMING	15
V	ROBOT APPLICATIONS IN MANUFACTURING	15
	REVISION AND TEST	5
	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.

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.

ROBOTICS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**FUNDAMENTALS OF ROBOT TECHNOLOGY** Introduction – Definitions-Robot Anatomy – Basic configuration of Robotics – Robot Components – Manipulator, End effecter, Driving system, Controller and Sensors. Mechanical arm – Degrees of freedom – Links and joints – Types of joints – Joint notation scheme – Pitch, Yaw, Roll – Classification of robots – Work envelope, Work Volume – Structural Characteristics of Robotics – Effect of structure on Control, Work envelop and Work volume.	**15 Hrs**
II	**ROBOT CONTROLLER, DRIVE SYSTEMS AND END EFFECTERS** Robot controller – Four types of controls – Open loop and closed loop controls – Speed of response and stability – Precision of movements: Spatial resolutions, accuracy and repeatability. Pneumatic drives – Hydraulic drives – Mechanical drives – Electrical drives – Stepper motors, DC Servo motors and AC Servo motors – Salient features – Applications and Comparisons of Drives. End effecters – Grippers – Mechanical Grippers, Magnetic Grippers, Vacuum Grippers, Two fingered and Three fingered Grippers, Internal and External Grippers – End Of Arm Tooling (EOAT)- Selection and Design considerations.	**15 Hrs**
III	**SENSORS AND MACHINE VISION** Requirements of Sensors – Principles and applications of the following types of sensors – Position sensors: Piezo-electric sensors, LVDT, Resolvers, Optical encoders and Pneumatic position sensors – Range sensors – Proximity sensors: Inductive, Capacitive, Ultrasonic and Optical proximity sensors – Touch sensors: Binary sensors, Analog sensors – Wrist sensors – Slip sensors. Machine vision system – Camera – Frame grabber – Sensing and digitizing image data – Signal conversion – Image storage – Lighting techniques – Image processing and analysis – Data reduction: Edge detection, Feature extraction and object recognition – Applications – Inspection, Identification, Visual serving and navigation.	**15 Hrs**
IV	**ROBOT KINEMATICS AND ROBOT PROGRAMMING** Forward kinematics, Inverse kinematics and differences – Forward kinematics and Reverse kinematics of manipulators with Two, Three and Four degrees of freedom – Deviations. Robot programming – Teach pendent programming – Lead through programming – Robot programming languages – VAL Programming – Motion commands, Sensor commands, End effecter commands and Simple programs.	**15 Hrs**

V	**ROBOT APPLICATIONS IN MANUFACTURING** Robot applications – Material handling – Press loading and unloading – Die casting – Machine tool loading and unloading – Spot welding – Arc welding – Spray painting – Assembling – Finishing – Automatic Guided Vehicle – Adopting robots to workstations – Requisite robot characteristics and Non requisite robot characteristics – Stages in selecting robots for industrial applications – Safety considerations for robot operations – Robotics in the future – Economical analysis of robots – Social implications.	**15 Hrs**

Text Books:

1) "Industrial Robotics – Technology, Programming and Applications", M.P.Groover, MC Graw Hill, 2001

Reference Books:

1) "Robotics Control, Sensing, Vision and Intelligence",Fu.K.S.Gonzalz.R.C., and Lee C.S.G, ,McGraw-Hill Book Co., 1987
2) "Robotics for Engineers",Yoram Koren, McGraw-Hill Book Co., 1992
3) "Robotics and Image Processing", Janakiraman.P.A, Tata McGraw-Hill,1995

22082 ROBOTICS
MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

PART-A
Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Define the term 'Robotics'.
2. Classify the Robots?
3. What is meant by Work envelope?
4. Define End effector.
5. What is meant by open loop control system?
6. Define End effector?
7. What is meant by gripper?
8. What is meant by accuracy of Robot?
9. What is a Piezo-electric sensors?
10. What is a proximity sensors?
11. What is frame grabber?
12. State any two techniques in image processing and analysis.
13. What is meant by Reverse Kinematics?
14. What is Lead through programming?
15. Give any two Robot programming Languages.
16. What is teach pendant?
17. What is Palletizing?
18. State the purpose of automated guided vehicle.
19. State any one Economic Analysis of Robots.
20. What is meant by Future Robots?

PART-B
Marks 5 x 12=60

Answer all the questions

21. a)

(i) Explain the basic configuration of Robot with a neat sketch. (6)
(ii) Describe the Robot Components. (6)

(OR)

b)

(i) Explain the structural characteristics of Robot. (6)
(ii) Explain the types of links with neat sketches. (6)

22. a)

(i) Explain the types of drive system used in Robots. (6)
(ii) Explain the types of Electromagnetic Grippers. (6)

(OR)

b)

(i) Illustrate the various types of stepper motors with neat sketches. (6)
(ii) Explain the factors to be considered for selection and design of Grippers. (6)

23. a)

(i) Explain the machine vision Applications in Robots. (6)
(ii) Explain the operation of Ultrasonic sensor with a neat sketch. (6)

(OR)

b)

(i) Describe the types of optical encoders with neat sketches. (6)
(ii) Explain the various techniques in image processing and analysis. (6)

24. a)

(i) Explain Forward Transformation of manipulator with two degrees of freedom. (6)
(ii) Explain the generations of Robot Programming languages. (6)

(OR)

b)

(i) Explain Reverse kinematics of manipulator with two degrees of freedom. (6)
(ii) Explain motion commands and sensor commands with an example. (6)

25. a)

(i) Explain Requisite and non requisite Robot characteristics. (6)
(ii) Explain the Robot applications in the field of machine tool loading and unloading operations. (6)

(OR)

b)

(i) Explain the various social considerations for implementing the Robots. (6)
(ii) Describe the various types of workstations & Adopting the Robots. (6)

22082 ROBOTICS
MODEL QUESTION PAPER-II

Time: 3 Hrs **Max Marks : 75**

PART-A
Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Define the term ‘Robot’.
2. State the Degree of freedom associated with wrist.
3. What is meant by work Envelope?
4. Define End effector.
5. What is meant by open loop control system?
6. What is on line Programming?
7. Give any two basic commands used in Robot.
8. What is meant by accuracy of Robot?
9. What is the principle of Piezo electric sensor?
10. Define machine vision system.
11. Define frame grabber.
12. State any two techniques in image Processing and analysis.
13. What is meant by Reverse Kinematics?
14. What is Lead through Programming?
15. Give any two Robot Programming Languages.
16. What is teach Pendant?
17. Mention any two applications of Robot.
18. State any two Robot request characteristics.
19. State two advantages of future Robot.
20. Mention Economical analysis of Robot.

PART – B

Marks 5 x 12=60

Answer all the Questions

21.	a.(i).	Explain the basic configuration of robot with a neat sketch.	6
	ii)	Describe the Robot components.	6
		(or)	
	b.i)	Explain the structural Characteristics of a Robots.	6
	ii)	Explain the types of links with a neat sketch.	6
22.	a.(i).	Explain the types of drive system used in Robots.	
	ii)	Describe the types of Electromagnetic Grippers.	
		(or)	
	b.i)	Illustrate the various types of stepper motors with its neat sketches.	6
	ii)	Explain the factors to be considered for selection and Design of Grippers.	6
23.	a.(i).	Explain the Machine vision applications in Robots.	6
	ii)	Explain the operation of ultrasonic sensor with a neat sketch.	6
		(or)	
	b.i)	Describe the types of optical encoders with a neat sketches.	6
	ii)	Explain the various techniques in image processing and analysis.	6
24.	a.(i).	Explain forward transformation of manipulator with two degrees of freedom.	6
	ii)	Explain the generations of Robot programming languages.	6
		(or)	
	b.i)	Explain Reverse kinematics of manipulator with two degrees of freedom.	6
	ii)	Explain Motion commands and Sensor commands with an example	6
25.	a.(i).	Explain Requisite and Non Requisite robot characteristics.	6
	ii)	Explain the Robot applications in the field of machine tool loading and unloading operation.	6
		(or)	
	b.i)	Explain various social considerations for implementing the Robots.	6
	ii)	Explain the stages in selecting Robots in industrial applications.	6

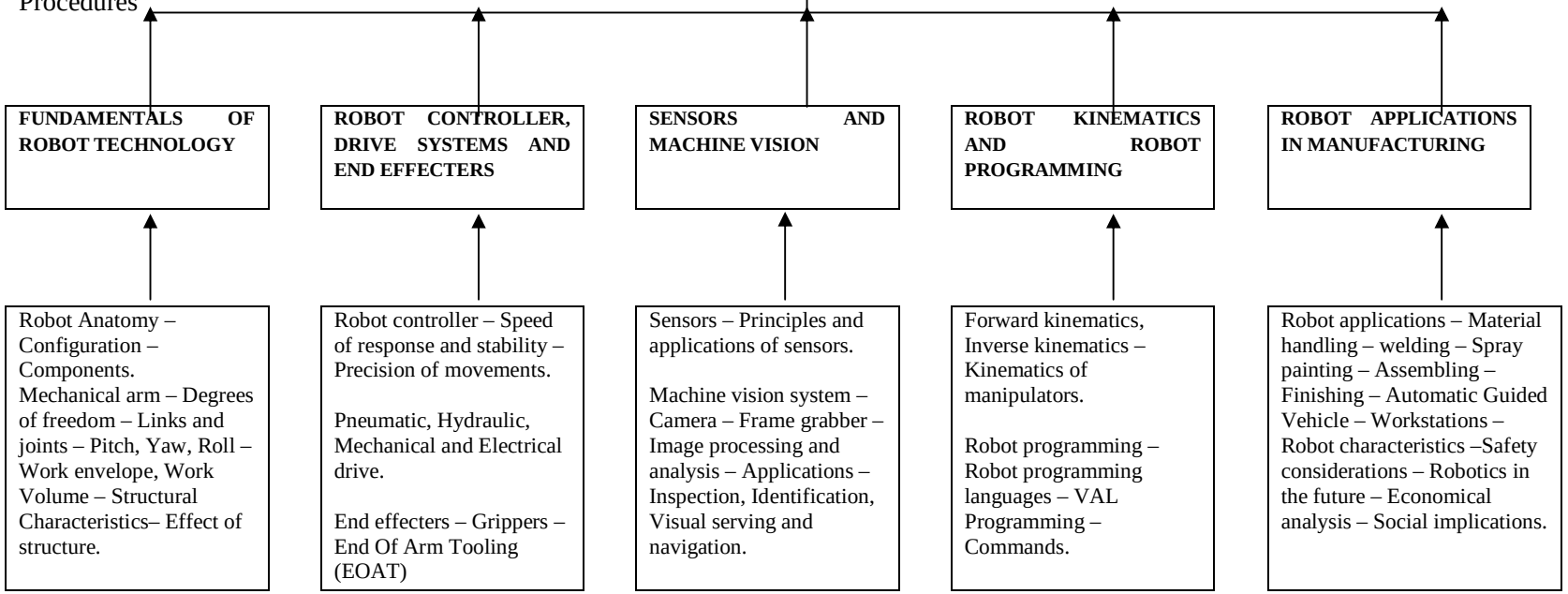
LEARINING STRUCTURE

22082 ROBOTICS

Applications:

Enable to understand construction, working and programming of robot to use it in various industrial applications like loading and unloading etc.,

Procedures



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22083 – REFRIGERATION AND AIR-CONIDITIONING

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : Diploma in Mechanical Engineering
Course Code : 1020
Subject Code : 22083
Semester : VI
Subject Title : Refrigeration and Air-Conditioning

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Refrigeration and Air-Conditioning	5	80	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	Topics	Hours
I	REFRIGERATION SYSTEM AND REFRIGERATION EQUIPMENTS	15
II	VAPOUR COMPRESSION REFRIGERATION SYSTEM ,VAPOUR ABSORPTION REFRIGERATION SYSTEM AND CRYOGENIC REFRIGERATION SYSTEMS	15
III	REFRIGERATION FLOW CONTROLS, REFRIGERANTS AND LUBRICANTS AND APPLICATIONS OF REFRIGERATION	15
IV	PSYCHOMETRICS AND COMFORT AIR CONDITIONING SYSTEMS	15
V	COOLING LOAD CALCULATIONS AND DUCT DESIGN , ENERGY CONSERVATION TECHNIQUES	15
	REVISION AND TEST	5
	Total	80

RATIONALE:
Food preservation is the basic need of food industry to improve effective utilisation of food. Hence the study of refrigeration principles, system and its effectiveness are essential. Comfort is the basic requirement of customers and machines through air-conditioning and hence learning the concept of air-conditioning and methods of air-conditioning facilitates quality design of air conditioners.

OBJECTIVES:

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

REFRIGERATION AND AIR-CONDITIONING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**REFRIGERATION SYSTEM AND REFRIGERATION EQUIPMENTS** Thermodynamic state of a pure substance, 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 – and its application of air cycle-problems 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 Hrs**
II	**VAPOUR COMPRESSION REFRIGERATION SYSTEM ,VAPOUR ABSORPTION REFRIGERATION SYSTEM AND CRYOGENIC REFRIGERATION SYSTEMS** 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 – effect of evaporative pressure and condenser pressure-problems – liquid vapour refrigeration heat exchangers - advantages and disadvantages of superheating and under cooling –use of flash chamber and accumulator. Simple absorption system – Electrolux system - solar absorption refrigeration system- absorption system comparison with mechanical refrigeration system. Refrigerators for above 2 K- Philips Refrigerator--Giffered McMohan refrigerator- refrigerators for below 2 K - Magnetic refrigeration systems.	**15 Hrs**
III	**REFRIGERATION FLOW CONTROLS, REFRIGERANTS AND LUBRICANTS AND APPLICATIONS OF REFRIGERATION** Capillary tube-automatic expansion valve-thermostatic expansion valve-electronic expansion valve-solenoid valve-evaporator pressure regulator – suction pressure regulator-classification of refrigerants-selection of a refrigerant-properties and applications of following refrigerants SO_2, CH_4, F_{22}, and NH_3 –CFCs refrigerants- equivalent of CFCs refrigerants (R-123a,R-143a,R-69S)- blends of refrigerants(R400 and R500 Series) - lubricants used in refrigeration and their applications. 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 Hrs**

IV	**PSYCHOMETRICS AND COMFORT AIR CONDITIONING SYSTEMS** Psychrometry properties - 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 – adiabatic mixing – evaporative cooling - problems – governing optimum effective temperature – comfort chart-design consideration. Equipment for air conditioning and insulation factors – air purification – 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 and split air conditioners –– properties of ideal insulator, types of insulating materials .	**15 Hrs**
V	**COOLING LOAD CALCULATIONS AND DUCT DESIGN , ENERGY CONSERVATION TECHNIQUES** Different heat sources – conduction heat load – radiation load of sun – occupants load – equipment load - infiltration air load – miscellaneous heat sources –fresh air load - problems. Classification of duct systems - Duct design – equal friction method – velocity reduction method – problems. Chilled water Systems -Air handling Units. Energy conservation and design decisions - heat reclaim – thermal storage – ice builder – ice harvester – variable refrigerant flow (VRF) – variable primary flow (VPF).	**15 Hrs**

Text 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

Reference Books:

1) A course in refrigeration and air conditioning , Domkundwar,
2) Principles of refrigeration, Dossat ,
3) Home refrigeration and air conditioning, Audels, Theo.Audel & Co. publisher, 1996 Edn.49, West 23rd Street, New York. - 1998
4) Refrigeration and air conditioning, C.P Arora,
5) “cryogenic systems” Randell Fd Barron.

22083 REFRIGERATION AND AIR-CONDITIONING
MODEL QUESTION PAPER-I

Time: 3 Hrs **Max Marks : 75**

PART-A

Marks 15 x 1= 15

Answer any 15 Questions-All Questions carry equal marks.

1. Define COP of a refrigeration system.
2. State Carnot theorem.
3. Define a ton of refrigeration.
4. List out the various types of compressor.
5. Draw T-s and P-h diagram of a vapour compression refrigeration system.
6. Give two advantages of VCR system over VAR system.
7. State any two disadvantages of superheating.
8. What are the function of accumulator in a VCR system.
9. What are the lubricants used in the refrigeration system.
10. What is the use of capillary tube in a refrigeration system?
11. Give some two desirable properties of refrigerant.
12. State any two application of refrigeration system.
13. State the Daltons law of partial pressure.
14. Define sensible heat and latent heat.
15. List out the equipment for air conditioning.
16. Define the term dew point temperature.
17. What are the materials used as insulators in air conditioning system.
18. What is meant by air handling unit.
19. What are the various heat loads in an air conditioning system.
20. Define vpf.

PART-B

Answer all the questions :

21. a.i) Define conduction,convectionand radiation modes of heat transfer
    ii) Explain rotary compressors.

    (or)

    b. Explain forced circulation with neat sketch
22. a. A refrigeration system works between the temp limits of 37 degree celsius and -13 degree celsius. Find the amount of ice that will be produced per KWh at 260k from water available at 27 degree celsius. Take cp of ice and water as cpi=2.09kj/kg-k and cpw=4.197kj/kg-k and hs=335kj/kg.

    (or)

    b. With the neat sketch explain the working of vapour absorptionrefrigeration system
23. a.i) Give the various application of refrigeration system
    ii) List out the affects caused by using various refrigerants to the environment

(or)

b.i) Explain the working of slow freezing and quick freezing refrigeration System.

ii) List out some of the desirable properties of refrigerants

24. a.i) Define the term psychrometer and psychrometry

ii) Draw the neat layout of the psychrometric chart and indicate the various processers available on it.

(or)

b. Explain the working of window type air conditioning with the sketch.

25. a. Explain conduction heat load and radiation of sun.

(or)

b. Explain variable refrigerant flow with neat sketch

22083 REFRIGERATION AND AIR-CONDITIONING
MODEL QUESTION PAPER-II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. What is pure substance?
2. State the unit of refrigeration.
3. What is the purpose of cooling towers?
4. State any two types of condenser used in refrigeration.
5. What is super heating?
6. Define the term refrigeration effect.
7. What are the functions of flash chamber?
8. State the purpose of accumulator.
9. State any two types of expansion valve.
10. What is refrigerants?
11. What is CFC's refrigerators?
12. What is slow freezing?
13. Define the term dry air.
14. State the Avogadro's law.
15. What is sensible heating?
16. Define relative humility.
17. What is room cooling load?
18. Write an equation to find radiation load of sun.
19. What is fresh air load?
20. List out any two types of dust systems.

PART – B
Marks 5 x 12=60

Answer all the Questions

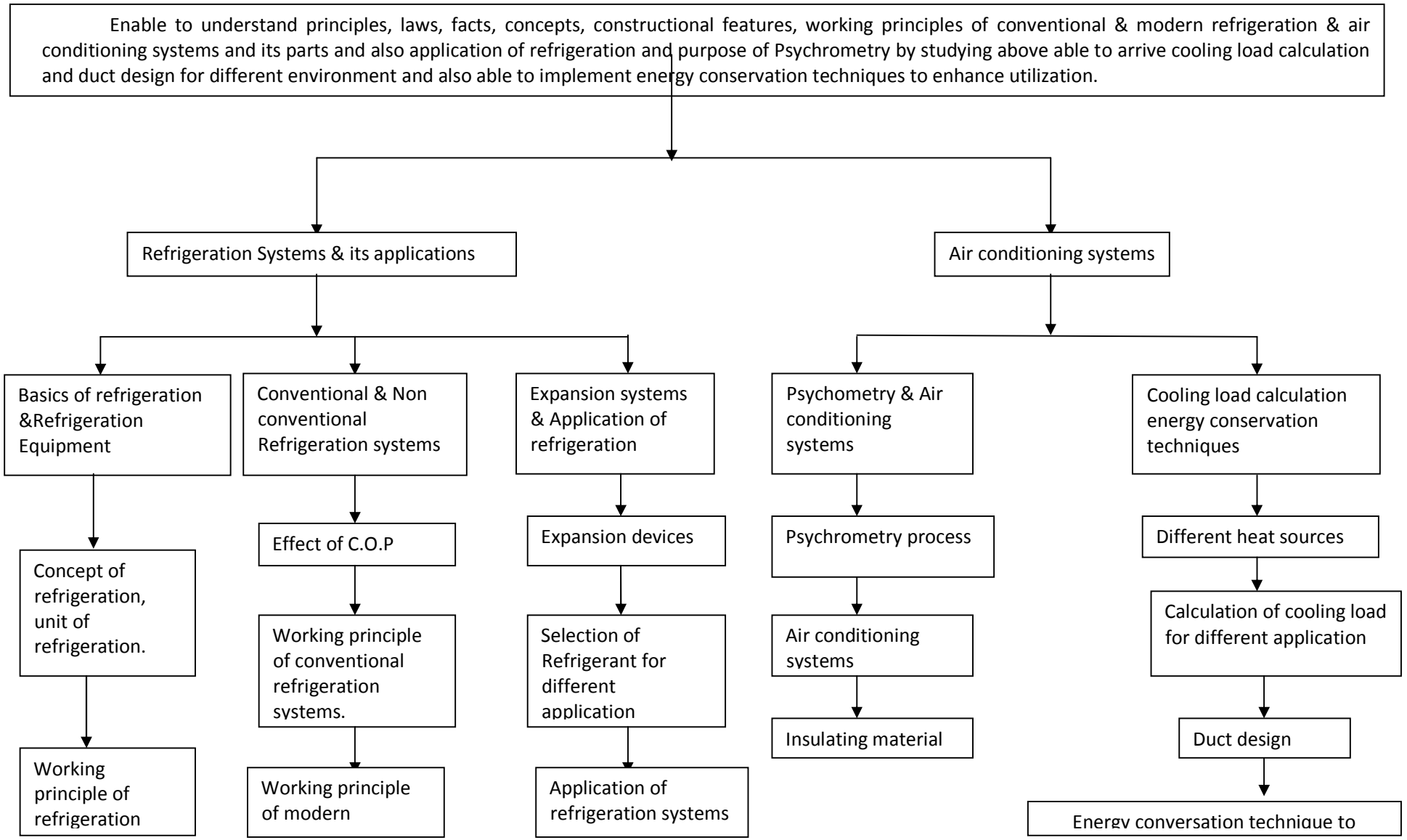
21	a. i)	Explain the thermo electric refrigeration		(6)
	ii)	A refrigeration system has a working temperature of -30^{0}C and 40^{0}C what is the maximum COP possible? If the actual COP is 75 % of the maximum, calculate the actual refrigerating effect produced per KW-hr. (or)		(6)
	b. i)	Explain the construction & working principle of a water cooled condenser.		(8)
	ii)	What .are the advantages & disadvantages of air cooled condenser?		(4)
22.	a. i)	Briefly analyse the T- and P- diagram of vapour compression system.		(12)
	b. i)	An ammonium refrigerator works between -10^{0}C and 38 ^{0}C.Its works under simple saturated cycle Cp for liquid = 4.75 KJ/Kg ^{0}K and Cp for vapour = 3.00 KJ/Kg ^{0}K using referigration table calculate the following (i) Power per ton for refrigeration ii) Co-efficient of performance.		(12)
23	a. i)	Give properties of F-22		(6)
	ii)	Explain about the lubricants used in refrigeration.		(6)
		(or)		
	b. i)	Explain the properties and applications of sulphur Di-oxide & methane.		(12)
24	a. i)	Sketch and explain the heating and process on psychrometic chart.		(8)
	ii)	Explain bypass factor.		(4)
		(or)		
	b. i)	The atmospheric air at 25^{0}C DBT and 12^{0}C WBT is flowing at the rate of 100 m^3/min through the dust.the dry saturated stream at the rate of 72Kg/h.Calculate the specific humunity and enthalpy of the leaving air.Also determine the DBT,WBT & RH of the leaving air.		(12)
25.	a. i)	Explain in detail the different heat sources to be considered in designing of air conditioning system.		(12)
		(or)		
	b. i)	Air flowing at the rate of 100 m^3/min at 40^{0}C DBT and 50% RH is mixed with another stream flowing at the rate of 20 m^3/min at 26^{0}C DBT and 50% RH.The mixture flows over a cooling coil whose ADP temperature is 10 ^{0}C and bypass factor is 0.2.Find DBT and RH of air leaving the coil.If this air is applied to an air conditioned room where 26^{0}C DBT and 50% RH are maintained.		(12)

LEARNING STRUCTURE

22083 REFRIGERATION AND AIR-CONDITIONING

Applications

Enable to understand principles, laws, facts, concepts, constructional features, working principles of conventional & modern refrigeration & air conditioning systems and its parts and also application of refrigeration and purpose of Psychrometry by studying above able to arrive cooling load calculation and duct design for different environment and also able to implement energy conservation techniques to enhance utilization.



DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22084 – PROTO-TYPING IN PRODUCT DESIGN

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22084
Semester	:	VI
Subject Title	:	Proto-Typing in Product Design

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
			Internal Assessment	**Board Examination**	**Total**	
Proto-Typing in Product Design	5	80	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit No	**Topics**	**Hours**
I	DIGITAL PROTO TYPING FOR PRODUCT DESIGN	15
II	ASSEMBLEY SRUCTURE AND DESIGN DOCUMENTATION	15
III	PRINCIPLE OF RAPID PROTOTYPING AND LIQUID BASED RP SYSTEMS	15
IV	SOLID BASED RP SYSTEM AND POWDER BASED RP SYSTEM	15
V	RAPIDP TOOLING AND REVERSE ENGINEERING	15
	REVISION AND TEST	5
	Total	80

OBJECTIVE:

- Understand the difference between a DP tools used in the industry.
- Understanding the user interface of the DP tool & three basic scenarios for sharing data among multiple teams.
- Advantages of 3D Modeling compared to 2D Modeling.
- Designing a part & assembly using the DP tool.
- Use the design Accelerator & dynamic simulation in the DP tool.
- Understanding the advantages of having the complete documentation and visualization.

PROTO – TYPING IN PRODUCT DESIGN

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DIGITAL PROTO TYPING FOR PRODUCT DESIGN** Introduction To digital prototyping and PL.M identify the main stages in the design process cycle. The principles and importance of concurrent engineering. Three basics scenario for sharing data among multiple teams. How digital design software supports concurrent engineering. Ideation and conceptual design base introduction, benefits and use cases of ideation and conceptual design.	**15 Hrs**
II	**ASSEMBLEY SRUCTURE AND DESIGN DOCUMENTATION** Top Down and Bottom up design methods, manufacturing and engineering bill of materials(BOMs), Team and Collaborative based design, Assembly environment, constraints, standard components design for change in context, design documentation requirements, importance and benefits of design documentation. Design visualization throughout product development, benefits of design visualization.	**15 Hrs**
III	**PRINCIPLE OF RAPID PROTOTYPING AND LIQUID BASED RP SYSTEMS** **PRINCIPLE OF RAPID PROTOTYPING** History-solid freeform fabrication-commercial development-RP development-3D system's stereo lithography process-3D system's selective laser sintering-3D helisys laminated object manufacturing-stratasys fused deposition modeling-principles of rapid prototyping-creation of solid models-conversion to STL file-slicing-making or growing the prototyping-post processing. **LIQUID BASED RP SYSTEMS** Materials-photopolymer development-photopolymer chemistry classification-3D systems stereo lithography process-SLA system-advantages-merits-demerits-application. Solid creation system-d-MEC modeling- CMET solid object UV laser plotter-SOUP process-SOUP machines advantages-disadvantages.	**15 Hrs**
IV	**SOLID BASED RP SYSTEM AND POWDER BASED RP SYSTEM** **SOLID BASED RP SYSTEM** Materials-polymer metal-composites stratasys fused deposition modeling systems helisys - Laminated object manufacturing systems-solidscapes 3D systems - Multijet modeling systems-principle-process-product-advantages-disadvantages for all the above 4 systems **POWDER BASED RP SYSTEM** Materials-polymer-metal-ceramic-3D systems principle –process-protect-advantages-disadvantages for all the above 4 systems	**15 Hrs**

V	**RAPID TOOLING AND REVERSE ENGINEERING** **RAPID TOOLING** Room temperature vulcanising silicone rubber mould-CAST aluminum and zinc Kirk site tooling-vacuum casting-plastic mould-investment cast tooling **DIRECT METHOD :** Copper polyamide tooling-direct metal laser sintering-selective laser sintering rapid steel-laminated tooling-laser engineering net shaping-controlled metal buildup. **REVERSE ENGINEERING** Measuring device-contact type non contact type-CAD model constriction from point cloud-preprocessing, point clouds to surface model creation, medical data processing data handling and reduction method-uniform and non uniform grid method, three dimensional grid method-application	**15 Hrs**

Reference Books:

1. Product Design,- K.Otto and K.Wood, Pearson Education.
2. The Mechanical Design Process, D.G.Ullman, McGraw-Hill.
3. Engineering Design, G.Pahl and W.Beitz, Springer.
4. Mechanical Engineering Design, forth Edition, Joseph E. Shigley & Larry D. Mitchell, McGraw-Hill.
5. Design of machine elements—V.B. Bhandari. Tara Mcgraw Hill Pub.
6. Mastering Autodesk Inventor – Sybex.
7. Autodesk Inventor 2012 for Designers by CADCIM Technologies.

22084 PROTO-TYPING IN PRODUCT DESIGN

MODEL QUESTION PAPER – I

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. Define Digital Prototyping Technology.
2. State the relationship between PLM and Concurrent Engineering.
3. What are the common challenges for product engineering?
4. State usage of 3D solid modeling in product design.
5. What is assembly?
6. Define Top down design.
7. Name any 2 constraints in modeling.
8. State the advantages of Conceptual design phase.
9. State the types of RP systems.
10. State application of RP in industry.
11. What is slicing?
12. What is meant by post processing?
13. What is meant by polymerization?
14. State the general properties of polymer.
15. What is Rapid Tooling?
16. State any 2 advantages of Rapid Tooling.
17. State the need for Reverse Engineering.
18. Explain the fundamentals of Rapid Prototyping.
19. Explain the basic principle involved in solidscape prototyping.
20. Compare traditional method of investment casting with that of using RP.

PART – B
Marks 5 x 12=60

Answer all the Questions

21	a.	Describe the digital prototyping and main stages in product design.	(12)
		(or)	
	b.	Explain the importance of Concurrent Engineering.	(12)
22.	a.	Differentiate top down and bottom up design work flow assembly	(12)
		(or)	
	b.	How the digital design tools are used in the conceptual phase.	(12)
23	a.	Explain the five step process of RP in detail	(6)
		(or)	
	b.	Make a detailed note of SOUP process with neat sketch, its principle, merits and limitations	(6)
24	a.i)	Explain the process of Multijet Ink Modeling system in detail	(6)
	ii)	State its advantages, Disadvantages and applications.	(6)
		(or)	
	b.	Explain the principle of sinter bonding.	(6)
		Explain the steps involved in 3D system Selective Laser Sintering process.	(6)
25.	a) i)	Explain Room Temperature Vulcanising Rubber Moulding procedure with neat sketch.	(6)
	ii)	State the advantages of Rapid Tooling.	(6)
		(or)	
	b) i)	Explain preprocessing operations involved in Reverse Engineering	(6)
	ii)	Compare Curve based Modeling with Polygon based Modeling.	(6)

22084 PROTO-TYPING I N PRODUCT DESIGN

MODEL QUESTION PAPER – II

Time: 3 Hrs **Max Marks : 75**

PART – A

Marks 15 x 1 = 15

Answer any 15 Questions – All Questions Carry Equal Marks

1. What is meant by prototyping?
2. State any 2 stages of design process.
3. State the advantages of Conceptual Engineering.
4. Define Concurrent Engineering.
5. List out the phases in product development.
6. State the benefits of Digital Prototyping.
7. What is Design Visualisation?
8. State the importance of Design Documentation.
9. State various workflows in assembly design.
10. Which file format is used for RP?
11. List out the materials used for rapid prototyping.
12. Mention any 2 direct contact measuring device used in RP.
13. What is Rapid Tooling?
14. State any 2 advantages of Reverse Engineering.
15. What is point cloud data?
16. Define Bill Of Materials.
17. Explain any one noncontact type measuring device used in RE.
18. Distinguish between conventional prototype and rapid prototype..
19. Briefly explain powder based materials used for Steoriolithography process..
20. Explain any one noncontact type measuring device used in RE.

PART – B
Marks 5 x 12=60

Answer all the Questions

21	a	Describe the main stages in design process in Digital Prototyping. .	(12)
		(or)	
	b	Explain any one method of data sharing system in multiple team	(12)
22.	a	Write short notes on assembly environment, constraints and standard components	(12)
		(or)	
	b	Explain the design visualization in product development	(12)
23	a.i)	Explain how a part is generated using Stereo lithography process.	(8)
	ii)	Explain any 2 liquid based materials used in RP.	(4)
		(or)	
	b.	Explain the steps involved in post processing in RP?	(8)
	ii)	What are the shortcomings of STL file format?	(4)
24	a.i)	Explain the process of Fused Deposition Modeling system in detail with its flow diagram	(8)
	ii)	State its applications and uses.	(4)
		(or)	
	b.i)	Explain the MIT's3D Printing process with neat sketch	(8)
	ii)	Mention its major applications.	(4)
25.	a)	Explain any 3Direct methods of Rapid Tooling.	(12)
		(or)	
	b)i)	Explain Data handling reduction methods used in Reverse Engineering	(8)
	ii)	Mention applications of Reverse Engineering.	(4)

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22064 – COMPUTER INTEGRATED MANUFACTURING PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22064
Semester	:	VI
Subject Title	:	Computer Integrated Manufacturing Practical

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Computer Integrated Manufacturing Practical	6	96	25	75	100	3 Hrs

OBJECTIVES:

- Study the working principle of CNC machines
- Study the datum points and offsets.
- Differentiate incremental System with absolute system
- Study the simulation software package.
- Write program and simulate in the Lathe software and Milling software.
- Prepare a part program, edit and execute in CNC Turning centre.
- Prepare a part program, edit and execute in CNC Machining centre.
- Produce components in the CNC Turning centre and CNC Machining centre.

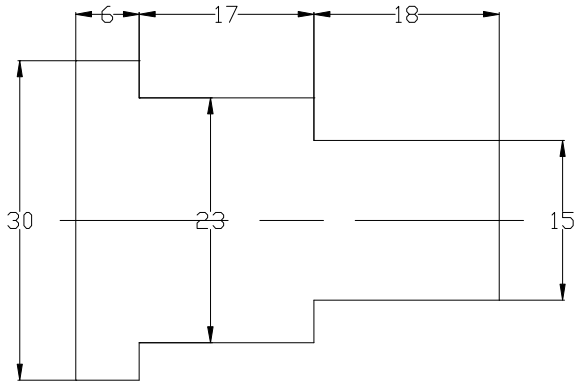
Introductions (12Hours)

1. Study of CNC lathe, milling
2. Study of international standard G-Codes and M-Codes
3. Program writing – Turning simulator – Milling simulator, IS practice – commands – menus
4. Editing the program in the CNC machines.
5. Execute the program in the CNC machines.

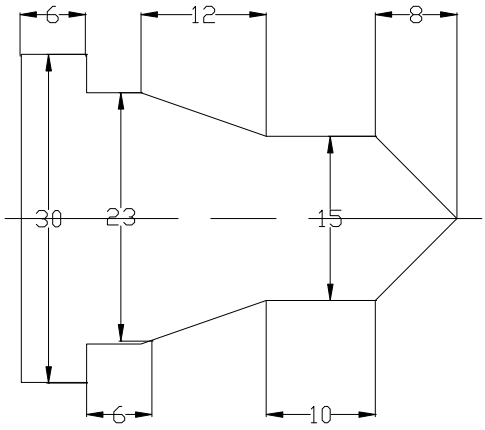
PART A (Simulation) – 36 Hrs.

CNC Turning Simulation

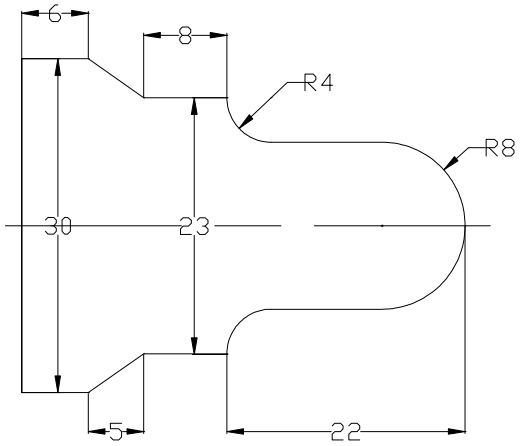
1. Create a part program for step turning and simulate in the software - Using Linear interpolation.



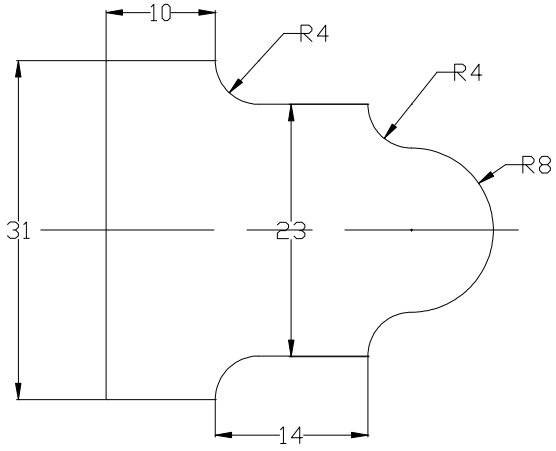
2. Create a part program for taper turning and simulate in the software - Using Box turning cycle.



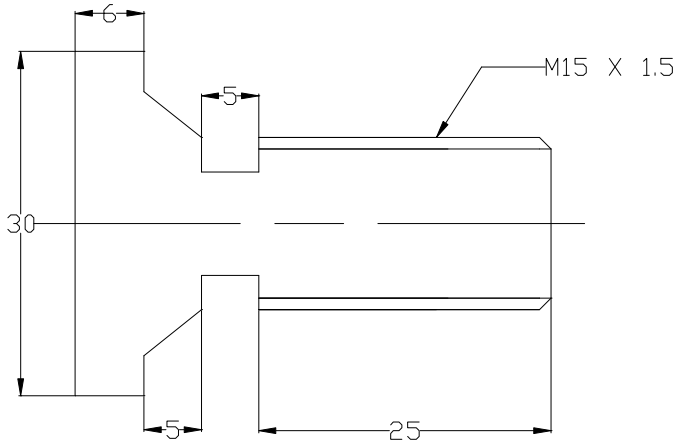
3. Create a part program for circular interpolation and simulate in the software - Using Circular interpolation.



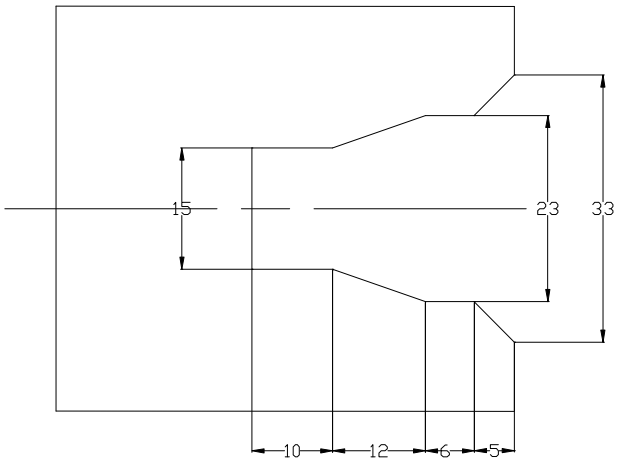
4. Create a part program for multiple turning operations and simulate in the software - Using Stock removal cycle.



5. Create a part program for thread cutting, grooving and simulate in the software - Using canned cycle.

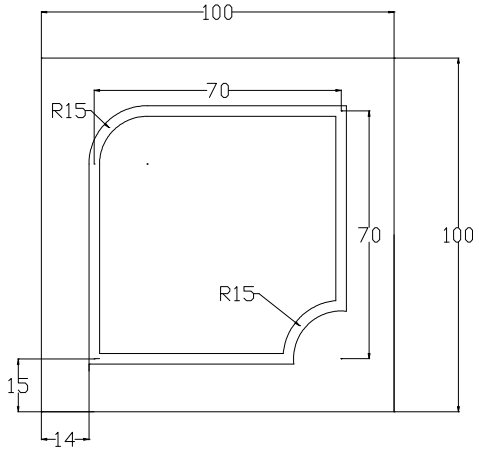


6. Create a part program for internal drills, boring and simulate in the software.

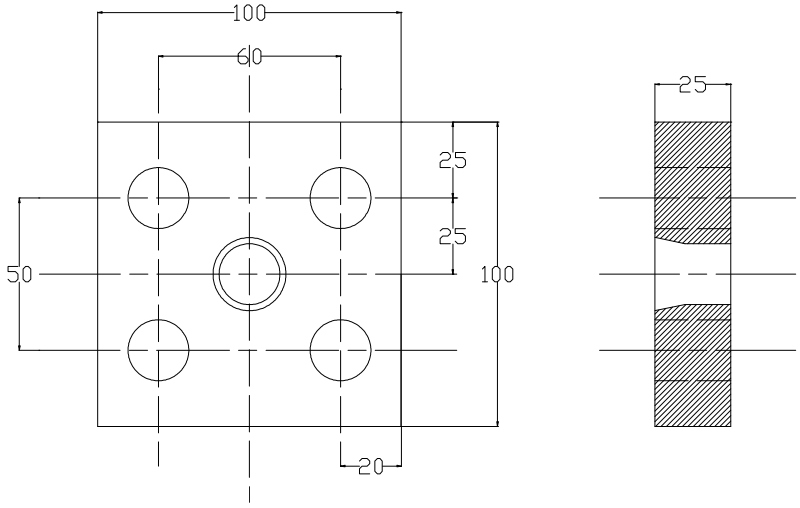


CNC Milling Simulation

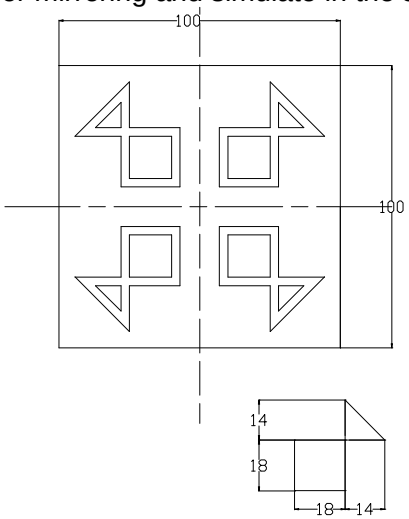
1. Create a part program for grooving and simulate in the software - Using Linear interpolation and Circular interpolation.



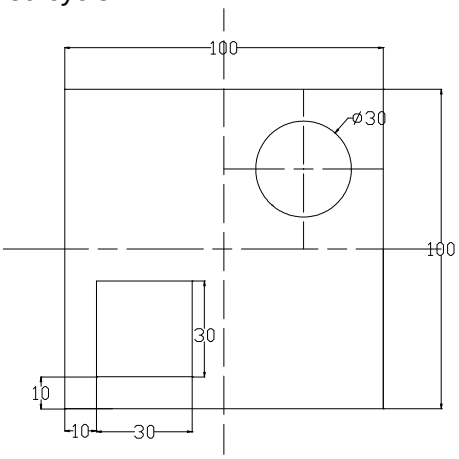
2. Create a part program for drilling and counter sinking and simulate in the software - Using canned cycle.



3. Create a part program for mirroring and simulate in the software - Using subprogram.



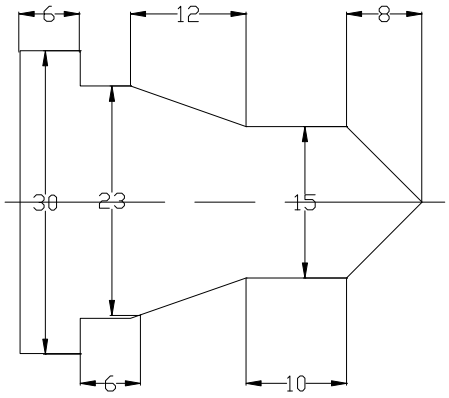
4. Create a part program for rectangular and circular pocketing and simulate in the software - Using canned cycle.



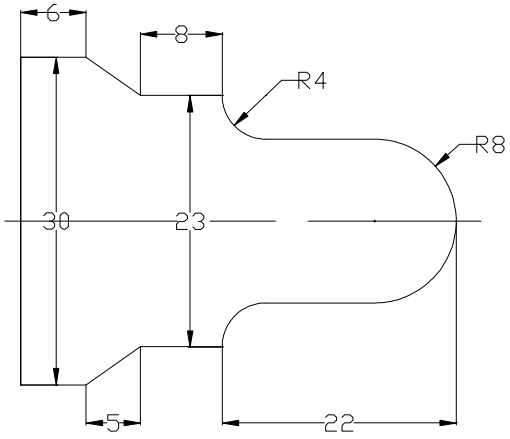
PART B (Machining) – 36 Hrs.

CNC Turning Machine Material: Aluminum or acrylic fibre rod or Plastic

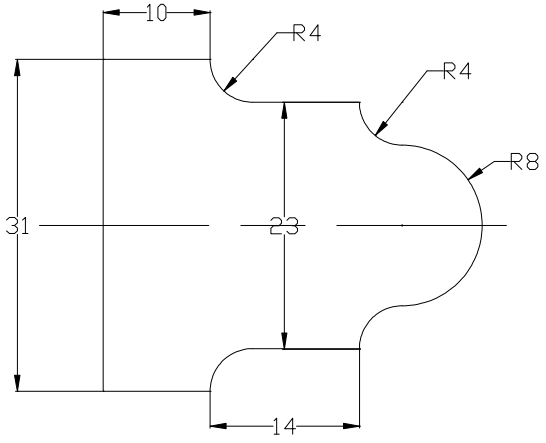
1. Using Box turning cycle – Create a part program for step and taper turning and produce component in the Machine.



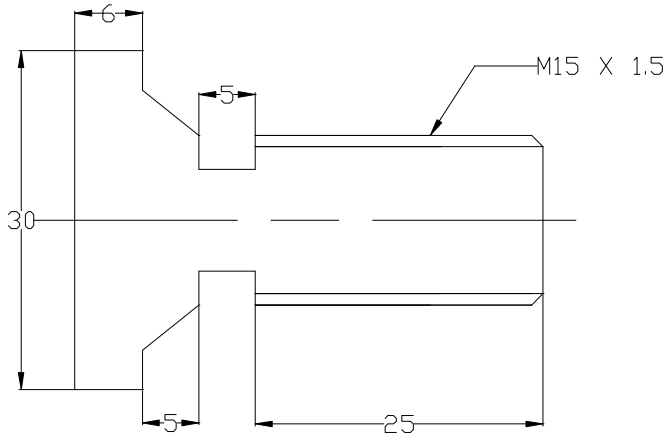
2. Using Circular interpolation - Create a part program for circular interpolation and produce component in the Machine.



3. Using Stock removal cycle – Create a part program for multiple turning operations and produce component in the Machine.

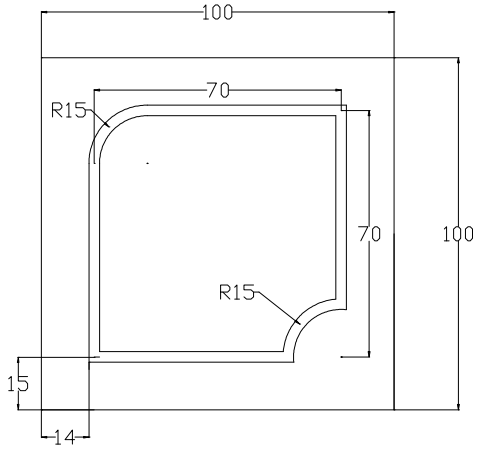


4. Using canned cycle - Create a part program for thread cutting, grooving and produce component in the Machine.

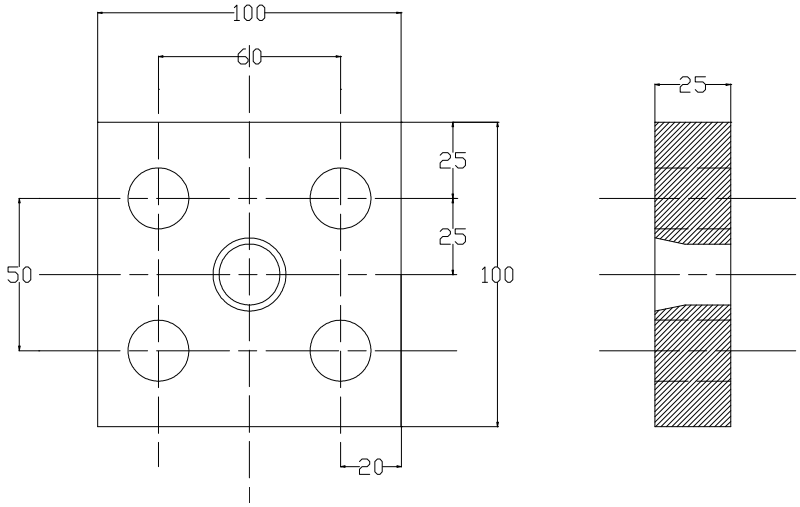


CNC Milling Machine Material: Aluminum or acrylic fibre or plastic

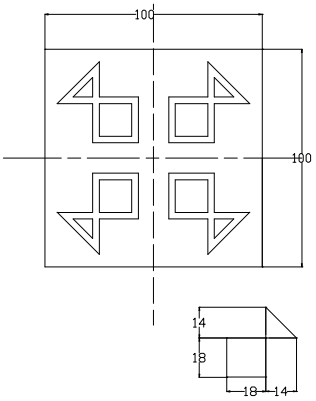
1. Using Linear interpolation and Circular interpolation – Create a part program for grooving and produce component in the Machine.



2. Using canned cycle - Create a part program for drilling, counter sinking and produce component in the Machine



3. Using subprogram - Create a part program for mirroring and produce component in the Machine.



Revision and Test **12 Hrs**

BOARD EXAMINATION

Note: Examination should be conducted to produce the components in the Machine. The exercises should be given accordingly by the external examiner. Students should be allowed to the machine after simulation and with print out.

Allocation of marks for Board Examination

PART –A		
Writing the part program	:	20
Execution/ Simulation in the software	:	20
PART-B		
Enter and editing the program in the machine	:	20
Component machining	:	10
Viva voice	:	5
External Marks	:	75

Minimum Facilities required for 60 intakes. Based on the intake strength the facilities should be improved.

1. Personal computer (Pentium processor) – 15 Nos.
2. Off line CNC Lathe and Milling simulation software – 15 users.
3. CNC Turning Machine - 2 Nos.
4. CNC Milling Machine – 2 Nos.
5. Laser Printer – 1 No.

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22065 – PROCESS AUTOMATION PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22065
Semester : VI
Subject Title : Process Automation Practical

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Process Automation Practical	4	64	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

- Use PLC system and its elements for process control
- Write ladder logic for logic controls such as AND,OR
- 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
- Control sequential operation of pneumatic cylinders using PLC

EXERCISES

1. Study of PLC system and its elements

Control a Process Using PLC

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.
5. Off –Delay control of a motor.
6. Automatic operation of a Double acting cylinder-single cycle.
7. Automatic operation of a Double acting cylinder-single cycle - forward, time delay, return.
8. Automatic operation of Double acting cylinder-Multi cycle.
9. Automatic operation of Double acting cylinder-N cycles (using counter function block)

10. Sequential operation of a Double Acting Cylinder and a motor.
11. Sequential operation of two Double Acting Cylinders for the sequence A+, B+, B-, A-.

BOARD EXAMINATION

All the exercises should be given (except the study exercise) and students are allowed to select an exercise by a lot.

Duration:3hrs Max marks:75

ALLOCATION OF MARKS	**Max Marks**
• Logic Circuit Diagram	30
• Entry and Edit of Logic circuit	30
• Execution of circuit	10
• VIVA VOCE	5
TOTAL	75

LIST OF EQUIPMENTS

1. Programmable Logic Controller (PLC) Trainer Kit with 1
   a) Solenoid operated DVCs
   b) Pneumatic Double Acting cylinders with limit switches
      Stepper motor

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22085 – AUTOMOBILE ENGINEERING PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22085
Semester	:	VI
Subject Title	:	Automobile Engineering Practical

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Automobile Engineering Practical	4	64	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

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.
- Service carburettors.
- Dismantle and assemble fuel injection pump & fuel injectors.
- Dismantle and assemble of power transmission and differential unit.
- Dismantle and assemble steering gear box.
- Testing and charging of batteries.
- Overhauling of starter motor, alternator & dynamo.
- Troubleshoot the electrical circuits in automobile.

PART – A

1. Identification and application of mechanic's tools.
2. Dismantling and assembling of four stroke petrol engine and diesel engine and identification of parts.
3. Cleaning, inspecting and measuring cylinder bore using cylinder bore dial gauge and suggesting the next over size.
4. Removing decarburizing, inspecting and replacing connecting rods and adjusting the bearings.

5. Removing camshaft, replacing timing gears, removing valves, lapping and adjusting valve clearance.
6. Removing, servicing and replacing of fuel pump, oil pump & water pump.
7. Removing, servicing & replacing SOLEX carburetor/MPFI system.
8. Dismantling and assembling of inline fuel injection pump / CRDI system.
9. Dismantling, assembling & testing of injectors.

PART – B

1. Removing and replacing of pressure plate and clutch plate, fingers adjustment.
2. Dismantling, inspecting and assembling of gear box and find out the gear ratios.
3. Dismantling, inspecting and assembling of final drive and differential units. Adjusting of backlash and correct tooth contact of crown and pinion of differential unit.
4. Dismantling, assembling and adjusting of steering gear box and find gear ratio.
5. Test a battery with specific gravity test and charge the battery with constant amperage / voltage method.
6. Dismantling, overhauling and assembling of starter motor.
7. Dismantling, overhauling and assembling of alternator / dynamo.
8. Trace the automobile electrical system with respect to battery coil ignition system.
9. Trace the automobile electrical system with respect to (i) horn relay circuit, (ii) Wiper circuit & explain with neat circuit diagram.

BOARD EXAMINATION

One question from PART - A	-	35marks
One question from PART – B	-	35 marks
Viva – voce	-	05 marks
TOTAL	-	75 marks

LIST OF EQUIPMENTS

1. Automobile Mechanic’s tools-Complete Set
2. 4 stroke petrol engine- with all accessories
3. 4 stroke Diesel engine- with all accessories
4. Engine cylinder with liner and cylinder bore dial gauge
5. Internal circlip plier, bearing puller
6. Feeler gauge to check valve clearance, hammer and accessories
7. Compressor to supply high pressure air to clean oil and water filters.
8. Oil pump and water pump.
9. A.C. fuel pump / S.U. electric fuel pump.
10. SOLEX carburetor
11. MPFI.
12. Inline Fuel Injection Pump
13. CRDI
14. Injectors.
15. Clutch set arrangement with tools
16. Complete gear box with tools
17. Complete steering arrangement
18. Differential unit with axles

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22086 – ROBOTICS PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22086
Semester : VI
Subject Title : Robotics Practical

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Robotics Practical	4	64	25	75	100	3 Hrs

OBJECTIVES:

- Identify the parts of a Robot.
- Operate a Robot using teach pendent.
- Record the positions in a Robot.
- Write a program for pick & place of Robot.
- Write the program for welding application of Robot.
- Write the off-line and on-line program for spray painting application.
- Measure the Robot repeatability

LIST OF EXPERIMENTS:

1. Robot – System Connection and Component recognition.
2. Teaching the Robot using teach pendent using off-line programming.
3. Position recording using off-line programming.
4. Calculating work space / Work volume using off-line programming.
5. Homing operation using on-line and off-line programming.
6. Pick and place of object using on-line and off-line programming.
7. Pick and stack of the object using on-line and off-line programming.
8. Robot performing continuous Arc welding using off-line programming.
9. Continuous and intermittent motion using Wait command using off-line Programming.
10. Spray painting using off-line programming.
11. Pick and stack the object using Subroutine program using on- line and off-line programming.

12. Program using X, Y, Z Coordinates using off-line programming.
13. Teaching position via XYZ Coordinates using off-line programming.
14. Measurement of Robot motion using on-line and off-line programming.
15. Measurement of robot repeatability using on-line and off-line programming.

BOARD EXAMINATION

S.No.	Detail	Marks Allotted
1.	Exercise 1: Procedure	5
	Program	15
	Execution	15
2.	Exercise 2: Procedure	5
	Program	15
	Execution	15
3.	Viva Voce	5
	Total	75

LIST OF EQUIPMENTS

Computer with Accessories	:	15 Nos.
Simulation Softwares	:	ARISTO Software SCORE BASE Software
Hardware	:	6 Axis Robot, Teach Pendant control and PC Based control through Software

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22087 – REFRIGERATION AND AIR-CONDITIONING PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	:	1020
Subject Code	:	22087
Semester	:	VI
Subject Title	:	Refrigeration and Air-Conditioning Practical

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Refrigeration and Air-Conditioning Practical	4	64	25	75	100	3 Hrs

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.

PART-A

1. BASIC REFRIGERATION WORKSHOP OPERATION:

(a) Copper and steel tubing
-To study the various sizes of copper and steel tubing.
-To study the various tools used for operations.
-To become familiar with various operations on copper and steel tubing –Flaring, Swaging.
(b) Soldering methods used in R& A.C

2. TO STUDY THE CONSTRUCTION FEATURES OF THE FOLLOWING:

(a) Domestic refrigerators (b) Water coolers (c) Window Air Conditioner
(d) Split Type Air-Conditioner

3. PROPER METHODS OF SETTING AND ADJUSTING OF

(a) Thermostats
(b) Low pressure and high pressure cut-outs
(c) Thermostatic expansion valve
(d) Automatic Expansion Valve

PART-B

1. TEST PROCEDURES

I) To determine the refrigerating effect, C.O.P and the compressor capacity of a open type system with

i) Thermostatic expansion valve
ii) Capillary tube
iii) Automatic Expansion Valve

II) To determine the C.O.P of sealed system by using electrical measurements

i. To determine the capacity of a window air conditioner.
ii. To determine the efficiency of a cooling tower.
iii. Wiring of refrigerator, water cooler, desert cooler, room air conditioner - packaged air conditioner, panel board etc.

2. SERVICE PROCEDURES

i) To change refrigerant into service cylinder from storage cylinder.
ii) To evaluate the entire system
iii) To Pump down the system
iv) To Purge air from the system
v) To locate the leaks in a system.
vi) To charge the system
vii) To check the oil level in the compressor.
viii) Tracing the common faults in R& A.C units and their remedies.

BOARD EXAMINATION

1. One Question from	Part A	:	25 Marks
2. One Question from	Part B	:	45Marks
3. Viva voice		:	5Marks
	External Marks	:	75Marks

LIST OF EQUIPMENTS

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.

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22088 – RAPID PROTO - TYPING PRACTICAL

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name	:	Diploma in Mechanical Engineering
Course Code	:	1020
Subject Code	:	22088
Semester	:	VI
Subject Title	:	Rapid Pro-Typing Practical

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instructions		Examination			
Rapid Pro-Typing Practical	Hours/ Week	Hours/ Semester	Marks			Duration
	4	64	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

- Understand the difference between a DP tools used in the industry.
- Understanding the user interface of the DP tool & three basic scenarios for sharing data among multiple teams.
- Advantages of 3D Modeling compared to 2D Modeling.
- Designing a part & assembly using the DP tool.
- Use the design Accelerator & dynamic simulation in the DP tool.
- Understanding the advantages of having the complete documentation and visualization.

Exercise:

Introduction to DP Tool (15 hrs.) Getting to know the User **I**nterface – 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. Use IGES surfaces in the design process.

Introduction to DP tool (Designing the part)

1. Getting to know the User Interface
2. Work in sketching to define the form of the product
3. Work with constraint affecting design intend

4. Creating Complex forms for the product.

5. Work concurrently on an assembly project.

Managing the Assemblies (15 hrs.) Managing the assemblies Assemble a mechanical piece of equipment using constraints. Use Alt-drag to apply assembly constraints. Create an adaptive part. Use the Content Library. Use Design Accelerator. Create and use iMates to constrain parts. Use motion and transitional constraints. Use the contact Solver. Use design view representations. Work with weldments.

Managing the Assemblies

6. Working with different assembly constraints.

7. Working with different assembly design workflows

8. Design Accelerator & Design Validation tools.

9. Simulate direct and indirect motion on components in an assembly.

10. Working with welding assemblies (weldmet)

Analyzing a Design, Design Accelerator & Dynamic Simulation (15 hrs.) Analyze an assembly using drive constraints. Check assemblies for collision between parts. Analyze an assembly for interference. Calculate the physical properties of a part. Analyze faces and then apply a suitable draft angle. Use the Bolted Connection Generator. Design a chain drive. Design a shaft. Dynamic Simulation to Improve product Design Add a joint. Convert an existing constraint. Insert a spring. Insert a revolution joint. Drive a camshaft. View simulation results.

Analyzing a Design, Design Accelerator & Dynamic Simulation

11. Analyzing the assemblies for collision & interference.

12. Check the physical properties of product.

13. Create a set of fasteners for assemblies & perform the strength check.

14. Design the motor shaft & v-Belt chain drive.

15. Review the cam valve simulation.

Documents & Visualization (15 hrs.) Identify the basic stages of drawing creation. Describe the key characteristics of document management systems. Create a fully annotated orthographic sketch of a part. Describe the main parts of the Autodesk Inventor drawing environment. Describe drawing standards and why they are important. Create annotated views of a part. Creating a fully annotated set of drawing; create a

presentation file. Create an assembly drawing. Add balloons to the assembly. Create a parts list. Create and review a DWF file.

Render an assembly. Use existing lighting and scene styles. Create an animation file. Animate a camera.

Visualization , Documentation & other CAD Formats

16. Describe drawing Standards & Creating views (Base view, Projected view, Auxiliary, Section view, Detailed view)
17. Create presentation file
18. Detailing and Annotation (Retrieving dimensions from the model)
19. Creating part list & Adding balloons to the assembly.
20. Create and review a DWF file for better visualization

Designing Cable and Harness Assemblies Cable, & Tube & Pipe Assemblies (10 hrs.) Create a harness assembly. Manually add wires. Import wires using a wire list. Create harness segments. Route wires through the segment. Create a new tube and pipe style. Insert a fitting from the Content Center. Insert a published fitting. Create a route. Create a run.

Designing Cable and Harness Assemblies, & Tube & pipe Assemblies

21. Manually add the wires in the assembly & import wires using wire list.
22. Create harness segments & Routing wires through the segment.
23. Create a new tube and pipe style, Insert a fitting from the content

    Center.
24. Insert a published fitting. Create a route. Create a run.

DIPLOMA IN MECHANICAL ENGINEERING

L-SCHEME

2011-2012

22067 – PROJECT WORK

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

L-SCHEME
(Implements from the Academic year 2011-2012 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : 22067
Semester : VI
Subject Title : Project Work

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TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester : 16 Weeks

Subject	Instruction		Examination		
	Hours/ Week	Hours/ Semester	Assessment Marks		
			Internal	Board Exam	Total
PROJECT WORK	6	96	25	75	100

Minimum Marks for Pass is 50 out of which minimum 35 marks should be obtained out of 75 marks in the board Examination alone.

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
- Get exposure on industrial environment and its work ethics.
- Understand what entrepreneurship is and how to become an entrepreneur.
- Learn and understand the gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out 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.
- Understand the facts and importance of environmental management.

Understand and gain knowledge about disaster management

INTERNAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Detail of assessment	Period of assessment	Max. Marks
First Review	6th week	10
Second Review	14th week	10
Attendance	Entire semester	5
Total		**25**

EVALUATION FOR BOARD EXAMINATION:

Details of Mark allocation	Max Marks
Marks for Report Preparation, Demo, Viva-voce	45
Marks for answers of 15 questions which is to be set by the external examiner from the given question bank consisting of questions in the following three topics Entrepreneurship, Disaster Management and Environmental Management. Out of fifteen questions five questions to appear from each of the above topics i.e. 5 questions x 3 topics = 15 questions 15 questions x 2marks = 30 Marks	30
Total	**75**

DETAILED SYLLABUS

ENTREPRENEURSHIP, ENVIRONMENTAL & DISASTER MANAGEMENT

1. ENTREPRENEURSHIP

1.1 Introduction – Entrepreneur - characteristics of Entrepreneur - contributions of an Entrepreneur - functions of entrepreneur - Barriers to entrepreneurship - Roll of government in Entrepreneurial development.

1.2 Small scale industries (SSI) - SSI role in country's economic growth – importance of SSI - starting of an SSI - Government organization and Non-governmental organizations supporting SSI - DIC,NSIC,SIDO,KVIC, Development banks and their objectives - role of commercial banks in assisting SSI - Women entrepreneurs and opportunities – Subsidy and concessions to Small Scale Industries.

2. ENVIRONMENTAL MANAGEMENT

2.1 Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on Environment – Importance of Pollution Control – Types of Industries and Industrial Pollution.

2.2 Solid waste management – Characteristics of Industrial wastes – Methods of Collection, transfer and disposal of solid wastes – Converting waste to energy – Hazardous waste management Treatment technologies.

2.3 Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health.

2.4 Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management.

2.5 Noise pollution management – Effects of noise on people – Noise control methods.

3. DISASTER MANAGEMENT

3.1 Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life..

3.2 Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings - Cyclone shelters – Warning systems.

3.3 Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

LIST OF QUESTIONS

1. ENTREPRENEURSHIP

1. Define the term Entrepreneur.
2. What is Entrepreneurship? Explain.
3. List the various stages of decisions an entrepreneur has to make before reaching the goal of his project.
4. What is innovation?
5. State briefly the role of an entrepreneur in the economic growth of a country.
6. List the characteristics of an Entrepreneur.
7. What are the critical elements of an Entrepreneur?
8. State the major functions of an Entrepreneur.
9. What are barriers to Entrepreneurship?
10. Define Small Scale Industry.
11. What are the qualities of Entrepreneur?
12. What are the benefits of Entrepreneur?
13. What are the various SSI that can flourish in your district?

14. Identify the infrastructural needs for an industry.
15. What are the various agencies involved in the establishment and development of various SSI?
16. Name some of the agencies funding SSI.
17. Explain the roles played by Government in Entrepreneural development.
18. What are the various concessions and incentives available for a SSI.
19. Name some consumer products with wide demand that can be manufactured by a SSI?
20. What is feasibility study?
21. What is the importance of SSI?
22. What is DIC? State its functions.
23. What is NSIC? State its functions.
24. What is SIDO? State its functions.
25. Name the Development Banks in India working towards Entrepreneurial development.
26. State the role of commercial bank in assisting SSI sector.
27. What are the different phases of Entrepreneurial Development programme?
28. What is an Industrial Estate?
29. What are the facilities available in an Industrial Estate?
30. Identify the various training agencies associated with SSI.
31. List the governmental agencies from whom you shall get financial assistance for a SSI.
32. What is KVIC? State its objectives.
33. Name some state finance corporations.
34. What are the steps involved in preparing a feasibility report?
35. What are the factors to be considered regarding raw materials for a SSI?
36. What are the features of a SSI?
37. What are the advantages of becoming an Entrepreneur?
38. Name the Organizations offering assistance for the development of Women entrepreneurs.
39. State the business opportunities for Women entrepreneurs.
40. State the different subsidies given to SSI's.

2. ENVIRONMENTRAL MANAGEMENT

1. What is the responsibility of an Engineer-in-charge of an Industry with respect to Public Health?
2. Define Environmental Ethic.

3. How Industries play their role in polluting the environment?
4. What is the necessity of pollution control? What are all the different organizations you know, which deal with pollution control?
5. List out the different types of pollutions caused by a Chemical / Textile / Leather / Automobile / Cement factory.
6. What is meant by Hazardous waste?
7. Define Industrial waste management.
8. Differentiate between garbage, rubbish, refuse and trash based on their composition and source.
9. Explain briefly how the quantity of solid waste generated in an industry could be reduced.
10. What are the objectives of treatments of solid wastes before disposal?
11. What are the different methods of disposal of solid wastes?
12. Explain how the principle of recycling could be applied in the process of waste minimization.
13. Define the term 'Environmental Waste Audit'.
14. List and discuss the factors pertinent to the selection of landfill site.
15. Explain the purpose of daily cover in a sanitary landfill and state the minimum desirable depth of daily cover.
16. Describe any two methods of converting waste into energy.
17. What actions, a local body such as a municipality could take when the agency appointed for collecting and disposing the solid wastes fails to do the work continuously for number of days?
18. Write a note on Characteristics of hazardous waste.
19. What is the difference between municipal and industrial effluent ?
20. List few of the undesirable parameters / pollutants anticipated in the effluents from oil refinery industry / thermal power plants / textile industries / woolen mills / dye industries / electroplating industries / cement plants / leather industries (any two may be asked)
21. Explain briefly the process of Equalization and Neutralization of waste water of varying characteristics discharged from an Industry.
22. Explain briefly the Physical treatments "Sedimentation" and "Floatation" processes in the waste water treatment.
23. Explain briefly when and how chemical / biological treatments are given to the waste water.
24. List the four common advanced waste water treatment processes and the pollutants they remove.

25. Describe refractory organics and the method used to remove them from the effluent.
26. Explain biological nitrification and de-nitrification.
27. Describe the basic approaches to land treatment of Industrial Effluent.
28. Describe the locations for the ultimate disposal of sludge and the treatment steps needed prior to ultimate disposal.
29. List any five Industries, which act as the major sources for Hazardous Air Pollutants.
30. List out the names of any three hazardous air pollutants and their effects on human health.
31. Explain the influence of moisture, temperature and sunlight on the severity of air pollution effects on materials.
32. Differentiate between acute and chronic health effects from Air pollution.
33. Define the term Acid rain and explain how it occurs.
34. Discuss briefly the causes for global warming and its consequences
35. Suggest suitable Air pollution control devices for a few pollutants and sources.
36. Explain how evaporative emissions and exhaust emissions are commonly controlled.
37. What are the harmful elements present in the automobile smokes? How their presence could be controlled?
38. What is the Advantage of Ozone layer in the atmosphere? State few reasons for its destruction.
39. Explain the mechanism by which hearing damage occurs.
40. List any five effects of noise other than hearing damage.
41. Explain why impulsive noise is more dangerous than steady state noise.
42. Explain briefly the Source – Path – Receiver concept of Noise control.
43. Where silencers or mufflers are used ? Explain how they reduce the noise.
44. Describe two techniques to protect the receiver from hearing loss when design / redress for noise control fail.
45. What are the problems faced by the people residing along the side of a railway track and near to an Airport? What provisions could be made in their houses to reduce the problem?

3. DISASTER MANAGEMENT

1. What is meant by Disaster Management? What are the different stages of Disaster management?
2. Differentiate Natural Disasters and Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter ? When and where it is provided ? What are its requirements ?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river ?
18. What are the causes for fire accidents ? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings ? What are its requirements ?
20. How the imamates of a multistory building are to be evacuted in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.

22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding ?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation ?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearly lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?

41. Explain the legal / financial problems the management has to face if safely measures taken by them are found to be in adequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?
44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants?

SANDWICH DIPLOMA COURSE-INDUSTRIAL TRAINING

22091 Industrial Training I (Report writing & Viva Voce)

22092 Industrial Training II (Report writing & Viva Voce)

1. Introduction

The main objective of the sandwich Diploma course is to mould a well rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 Semesters of 3 ½ years duration, the subjects of 3years-Full Time Diploma Course being regrouped for academic convenience.

While in the 4th semester students under Industrial Training for 6 months(December through May). They also do course work in the institution for one day in a week, While in the 7th semester they undergo another spell of 6 months (June through November) Industrial training.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.

I SEM	II SEM	III SEM	IV SEM	V SEM	VI SEM	VII SEM

Institutional Study

Industrial Training

2. Attendance Certification

Every month students have to get their attendance certified by industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

3. Training Reports

The students have to prepare two types of reports:

- Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Internal Assessment marks.
- Comprehensive report at the end of each spell which will be used for Board Examination.

3.1 Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such record is called Industrial training Diary. Students have to write this report regularly. All days for the week should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc). The concern Industrial supervisor is to check periodically these progress reports.

3.2 Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant/product/process/construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc should be incorporated with the consent of the Organisation.

a. Scheme of Evaluation

1.1 Internal Assessment Marks

First Review (during 3rd month)	: 10 marks
Second Review (during 5th month)	: 10 marks
Attendance *	: 05 marks (Awarded same as in Theory)
Total	: 25 marks

1.2 Board Examination

Presentation about Industrial Training	: 20 marks
Comprehensive Training Report	: 30 marks
Viva-voce	: 25 marks
Total	: 75 marks

*** For awarding marks to attendance, the Industrial Training attendance has to be considered.**

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