DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

CENTRAL POLYTECHNIC COLLEGE

(AN AUTONOMUS INSTITUTION)

SYLLABUS

DIPLOMA IN MECHANICAL ENGINEERING

FULL TIME, SANDWICH & PART TIME

CPC 2016–2017

C - SCHEME

FROM THE ACADEMIC YEAR 2016–2017

CENTRAL POLYTECHNIC COLLEGE

(AN AUTONOMUS INSTITUTION)

DIPLOMA IN MECHANICAL ENGINEERING

C-SCHEME

(Implemented from the Academic year 2016 - 2017 onwards)

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CENTRAL POLYTECHNIC COLLEGE, CHENNAI – 113
(Autonomous Institution)

DIPLOMA COURSES IN ENGINEERING

(SEMESTER SYSTEM)
(Implemented from 2016 – 2017)

C –SCHEME
REGULATIONS

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 (31/2 years)

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

During 4^{th} and /or during 7^{th} 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 the 3 year full time diploma courses are being regrouped for academic convenience.

* Each Semester will have 15 weeks duration of study with 35 hrs. / Week for Regular Diploma programme and 18 hrs. / Week (21 hrs. / Week 1 year) for Part – Time Diploma programmes.

The Curriculum for all 6 Semesters of Diploma courses have been revised and the revised curriculum is applicable for the candidates admitted from the 2016–2017 academic year onwards.

2. Conditions for Admission:

Condition for admission to the Diploma courses is as follows:

The candidate 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 Examination 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	
		Subject studied	Subject studied	
			Related subjects	Vocational subjects
1	All the regular and Sandwich Diploma Courses	Mathematics, Physics & Chemistry	Mathematics, Physics & Chemistry	Related vocational subjects theory & practical

- For the Diploma Courses related with Engineering/Technology, the related/equivalent subjects prescribed along with Practical 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.
- *Candidates who have studied Commerce subjects are not eligible for Engineering Diploma courses.*

4. Age Limit: No Age limit.

5. Medium of Instruction: English.

6. Eligibility for the Award of Diploma:

No candidate shall be eligible for the diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in any institution affiliated to 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	3 ½ Years	6 ½ Years
Part Time	4 Years	7 Years

7. Subjects of Study and Curriculum outline:

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

8. Examinations:

Autonomous 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 Autonomous Board Examinations.

9. 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 Marks
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 60 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	60	2 Hrs
Test II	Unit-III & IV	End of 12th week	60	2 Hrs
Test III	**Model Examination- Compulsory** Covering all the 5 Units. (Autonomous Board Examinations-question paper-pattern).	End of 15th week	75	3 Hrs

 # - From the Academic year 2016-2017 onwards.

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

With No Choice:

Part A Type questions: 8 Questions X 4 mark … … 32 marks
Part B Type questions: 4 Questions X 7 mark … … 28 marks
Total **60 marks**

(or)

Suitable as per Question pattern

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. <u>For Practical Subjects:</u>

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

a) Attendance (Award of marks as same as Theory subjects)	:	**5**	**Marks**
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 Autonomous 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 Autonomous 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.

10. Life and Employability Skill Practical:

The Life and Employability 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 to increase the employability of students.

Internal assessment mark …… **25 Marks**

11. Project Work:

The students of all the Diploma Programmes 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 is 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	…	**30 marks**
Marks for Report Preparation, Demonstration &Presentation	…	**35 marks**
		……
Total		**65 marks**
		……

C) Written Test Mark (from 2 topics for 30 minutes duration) $:

ii) Environment Management 2 questions X 2 ½ marks = **5 marks**
iii) Disaster Management 2 questions X 2 ½ marks = **5 marks**
……
10 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 Autonomous Board Examination	--	**65 Marks**
Written Test Mark (from 2 topics for 1 hour duration)	--	**10 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 Autonomous Board examination.

12. Scheme of Examination:

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

13. Criteria for Pass:

1. No Candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the 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 Autonomous 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 Autonomous Board Theory Examinations and a minimum of 35 marks out of 75 marks in the Autonomous Board Practical Examinations.

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2019 onwards (Joined in first year in 2016 – 2017) will be done as specified below.

First Class with Superlative Distinction:

A candidate will be declared to have passed in **First Class with Superlative Distinction** if he/she secures not less than 75% of the marks in all the subjects and passes all the semesters in the first appearance itself and passes all subjects within the stipulated period of study 3/ 3 ½ / 4 years (Full Time/Sandwich/Part Time) without any break in study.

First Class with Distinction:

A Candidate will be declared to have passed in **First Class with Distinction** if he/she secures not less than 75% of the aggregate marks in all the semesters put together and passes all the semesters except the I and II semester in the first appearance itself and passes all subjects within the stipulated period of study 3/3 ½ /4 years 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 the semesters put together and passes all the subjects within the stipulated period of study 3/ 3 ½ / 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 pass out Final Examination from October 2019 / April 2020 onwards (both joined in First Year in 2016 – 2017)

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

The duration of each period of instruction is 1 hour and the total period of instruction hours excluding interval and Lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 period of instruction (Theory & Practical).

16. Seminar:

For seminar the total seminar 15 hours (15 weeks x 1 hour) should be distributed equally to total theory subject per semester(i.e 15 hours divided by 3/4 subject). A topic from subject or current scenario is given to students. During the seminar hour students have to present the paper and submit seminar material to the respective staff members, who is handling the subject. It should be preserved for 2 semesters and produced to the flying squad and the inspection team at the time of inspections/ verification.

Diploma in Mechanical Engineering

List of Equivalent Subjects for B- Scheme to C-Scheme

THIRD SEMESTER

B-SCHEME		C-SCHEME	
Subject code	**Name of the Subject**	**Subject code**	**Name of Subject**
MEB310	Strength of Materials	MEC310	Strength of Materials
MEB320	Manufacturing Technology – I	MEC320	Manufacturing Processes
MEB330	Fluid Mechanics & Fluid Power	MEC330	Fluid Mechanics and Fluid Power
MEB340	Machine Drawing – CAD Practical	MEC440	Computer Aided drawing (2D& 3D) Practical
MEB350	Strength of Materials and Fluid Mechanics Lab	MEC350	Strength of Materials and Fluid Mechanics Practical
MEB360	Work Shop – I (Smithy, Foundry & Welding)	MEC360	Workshop Practice – I(Welding & Foundry)
B0003	Computer Applications – Practical**	MEC370	Computer Applications and C Programming Practical

FOURTH SEMESTER

B-SCHEME		C-SCHEME	
Subject code	**Name of the Subject**	**Subject code**	**Name of Subject**
MEB410	Engineering Thermodynamics	MEC410	Heat Power Engineering
MEB420	Manufacturing Technology – II	MEC420	Special Machines
MEB430	Renewable Energy Sources	MEC620	Renewable Energy Sources
MEB440	Electrical and Electronics Engineering	MEC430	Electrical Drives and Control
MEB450	Heat Power Engineering Practical	MEC550	Heat Power Engineering Practical
MEB460	Electrical and Electronics Engineering Practical	MEC450	Electrical Drives and Control Practical
MEB470	Workshop –II Practical	MEC460	Workshop Practice – II Practical (Lathe & Drilling)

FIFTH SEMESTER

B-SCHEME		C-SCHEME	
Subject code	**Name of the Subject**	**Subject code**	**Name of Subject**
MEB510	Design of Machine Elements	MEC510	Design of Machine Elements
MEB520	Thermal Engineering	MEC520	Thermal Engineering
MEB530	Industrial Engineering & Industrial Management	MEC530	Industrial Engineering & Industrial Management
Elective Theory- I		**Elective Theory - I**	
MEB541	Refrigeration and Air Conditioning (ET-I)	MEC541	Refrigeration and Air Conditioning (ET-I)
MEB542	Metrology and Quality Control (ET-I)	MEC542	Metrology and Quality Control (ET-I)
B0002	Communications & Life Skills – Practical**	C0001	Life and Employability Skills Practical**
Elective Practical- I		**Elective Practical- I**	
MEB561	Refrigeration and Air Conditioning Practical (EP-I)	MEC561	Refrigeration and Air Conditioning Practical (EP-I)
MEB562	Metrology and Quality Control Practical (EP-I)	MEC562	Metrology and Quality Control Practical (EP-I)
MEB570	Workshop – III Practical	MEC470	Workshop – III Practical

SIXTH SEMESTER

B-SCHEME		C-SCHEME	
Subject code	**Name of the Subject**	**Subject code**	**Name of the Subject**
B0001	Entrepreneurial Development	-----	No equivalent
MEB610	Computer Aided Design and Manufacturing	MEC610	Computer Aided Design and Manufacturing
Elective Theory- II		**Elective Theory- II**	
MEB631	Automobile Engineering (ET-II)	MEC631	Automobile Engineering (ET-II)
MEB632	Mechatronics (ET-II)	----------	No equivalent
MEB640	Computer Aided Design and Manufacturing Practical	MEC650	Computer Aided Manufacturing – Practical
MEB650	Process Automation Practical	MEC660	Process Automation Practical
Elective Practical- II		**Elective Practical- II**	
MEB661	Automobile Engineering Practical (EP- II)	MEC641	Automobile Engineering Practical (EP-II)
MEB662	Mechatronics Practical (EP- II)	----------	No equivalent
MEB670	Project Work	MEC670	Project Work

ANNEXURE - II

C- SCHEME
Implemented from 2016– 2017

1020: DIPLOMA IN MECHANICAL ENGINEERING (FULL TIME)

CURRICULUM OUTLINE

THIRD SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial / Drawing	Practical	Total
MEC310	Strength of Materials	6			6
MEC320	Manufacturing Processes	5			5
MEC330	Fluid Mechanics and Fluid Power	5			5
MEC340	Machine Drawing		4		4
MEC350	Strength of Materials and Fluid Mechanics Practical			4	4
MEC360	Workshop Practice – I (Welding & Foundry)			4	4
MEC370	Computer Applications and C Programming Practical			6	6
	Seminar	1			1
TOTAL		17	4	14	35

FOURTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial / Drawing	Practical	Total
MEC410	Heat Power Engineering	6			6
MEC420	Special Machines	5			5
MEC430	Electrical Drives and Control	5			5
MEC440	Computer Aided Drawing (2D& 3D) Practical			6	6
MEC450	Electrical and Drives Control Practical.			4	4
MEC460	Workshop Practice – II Practical (Lathe & Drilling)			4	4
MEC470	Workshop Practice – III Practical			4	4
	Seminar	1			1
TOTAL		17		18	35

FIFTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC510	Design of Machine Elements	6			6
MEC520	Thermal Engineering	6			6
MEC530	Industrial Engineering & Industrial Management	5			5
Elective - I Theory		5			5
MEC541	Refrigeration and Air Conditioning (ET-I)				
MEC542	Metrology and Quality Control (ET-I)				
MEC550	Heat Power Engineering Practical			4	4
C0001	Life and Employability Skills – Practical**			4	4
Elective - I Practical					
MEC561	Refrigeration and Air Conditioning Practical (EP-I)			4	4
MEC562	Metrology and Quality Control Practical (EP-I)				
	Seminar	1			1
TOTAL		**23**		**12**	**35**

** Common to all Diploma Courses

SIXTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC610	Computer Aided Design and Manufacturing	6			6
MEC620	Renewable Energy Sources	5			5
Elective - II Theory		5			5
MEC631	Automobile Engineering (ET-II)				
MEC632	Robotics (ET-II)				
Elective - II Practical				4	4
MEC641	Automobile Engineering Practical (EP-II)				
MEC642	Robotics Practical (EP-II)				
MEC650	Computer Aided Manufacturing Practical			6	6
MEC660	Process Automation Practical			4	4
MEC670	Project Work			4	4
Seminar		1			1
TOTAL		**17**		**18**	**35**

ANNEXURE - II

C SCHEME
Implemented from 2016 – 2017

1020: DIPLOMA IN MECHANICAL ENGINEERING (FULL TIME)

SCHEME OF EXAMINATION

THIRD SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC310	Strength of Materials	25	75	100	40	3
MEC320	Manufacturing Processes	25	75	100	40	3
MEC330	Fluid Mechanics and Fluid Power	25	75	100	40	3
MEC340	Machine Drawing	25	75	100	40	3
MEC350	Strength of Materials and Fluid Mechanics Practical	25	75	100	50	3
MEC360	Workshop Practice – I (Welding & Foundry)	25	75	100	50	3
MEC370	Computer Applications and C Programming Practical	25	75	100	50	3

FOURTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC410	Heat Power Engineering	25	75	100	40	3
MEC420	Special Machines	25	75	100	40	3
MEC430	Electrical Drives and Control	25	75	100	40	3
MEC440	Computer Aided drawing (2D& 3D) Practical	25	75	100	50	3
MEC450	Electrical Drives and Control Practical	25	75	100	50	3
MEC460	Workshop Practice – II Practical (Lathe & Drilling)	25	75	100	50	3
MEC470	Workshop Practice – III Practical	25	75	100	50	3

FIFTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC510	Design of Machine Elements	25	75	100	40	3
MEC520	Thermal Engineering	25	75	100	40	3
MEC530	Industrial Engineering & Industrial Management	25	75	100	40	3
Elective - I Theory		25	75	100	40	3
MEC541	Refrigeration and Air Conditioning (ET-I)					
MEC542	Metrology and Quality Control (ET-I)					
MEC550	Heat Power Engineering Practical	25	75	100	50	3
C0001	Life and Employability Skills Practical **	25	75	100	50	3
Elective - I Practical						
MEC561	Refrigeration and Air Conditioning Practical (EP-I)	25	75	100	50	3
MEC562	Metrology and Quality Control Practical (EP-I)	25	75	100	50	3

** Common to all Diploma Courses

SIXTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC610	Computer Aided Design and Manufacturing	25	75	100	40	3
MEC620	Renewable Energy Sources	25	75	100	40	3
Elective - II Theory		25	75	100	40	3
MEC631	Automobile Engineering (ET-II)					
MEC632	Robotics (ET-II)					
Elective - II Practical						
MEC641	Automobile Engineering Practical (EP-II)	25	75	100	50	3
MEC642	Robotics Practical (EP-II)					
MEC650	Computer Aided Manufacturing Practical	25	75	100	50	3
MEC660	Process Automation Practical	25	75	100	50	3
MEC670	Project Work	25	75	100	50	3

ANNEXURE- II
C SCHEME
Implemented from 2016 – 2017

3020: DIPLOMA IN MECHANICAL ENGINEERING (PART TIME)

CURRICULUM OUTLINE

THIRD SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC310	Strength of Materials	4			4
MEC330	Fluid Mechanics and Fluid power	4			4
CBE15	Engineering Graphics-I		4		4
MEC350	Strength of Materials and Fluid Mechanics Practical			3	3
MEC370	Computer Applications and C Programming Practical			3	3
TOTAL		**8**	**4**	**6**	**18**

FOURTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC320	Manufacturing Processes	3			3
MEC410	Heat Power Engineering	4			4
CBE26	Engineering Graphics-II		3		3
MEC360	Work shop Practice – I Practical (Welding & Foundry)			4	4
MEC460	Workshop Practice – II Practical (Lathe & Drilling)			4	4
TOTAL		**7**	**3**	**8**	**18**

FIFTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC420	Special Machines	4			4
MEC430	Electrical Drives and Control	4			4
MEC340	Machine Drawing		3		3
MEC440	Computer Aided drawing (2D& 3D) Practical			4	4
MEC450	Electrical Drives and Control Practical			3	3
TOTAL		**8**	**3**	**7**	**18**

SIXTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC510	Design of Machine Elements	4			4
MEC520	Thermal Engineering	4			4
MEC470	Work shop Practice-III Practical			3	3
MEC550	Heat Power Engineering Practical			3	3
C0001	Life and Employability Skills Practical**			4	4
TOTAL		**8**	**-**	**10**	**18**

SEVENTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC610	Computer Aided Design and Manufacturing	4			4
MEC620	Renewable Energy Sources	4			4
Elective Theory-I					
MEC541	Refrigeration and Air Conditioning (ET-I)	4			4
MEC542	Metrology and Quality Control (ET-I)				
Elective Practical-I					
MEC561	Refrigeration and Air Conditioning Practical (EP-I)			3	3
MEC562	Metrology and Quality Control Practical (EP-I)				
MEC650	Computer Aided Manufacturing Practical			3	3
TOTAL		**12**	**-**	**6**	**18**

EIGHTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC530	Industrial Engineering & Industrial Management	4			4
Elective-II Theory		4			4
MEC631	Automobile Engineering (ET-II)				
MEC632	Robotics (ET-II)				
Elective-II Practical				4	4
MEC641	Automobile Engineering Practical (EP-II)				
MEC642	Robotics Practical (EP-II)				
MEC660	Processes Automation Practical			3	3
MEC670	Project Work			3	3
TOTAL		**9**	**-**	**09**	**18**

ANNEXURE- II
C-SCHEME
Implemented from 2016 - 2017

3020: DIPLOMA IN MECHANICAL ENGINEERING (PART TIME)

SCHEME OF EXAMINATION

THIRD SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC310	Strength of Materials	25	75	100	40	3
MEC330	Fluid Mechanics and Fluid Power	25	75	100	40	3
CBE15	Engineering Graphics-I	25	75	100	40	3
MEC350	Strength of Materials and Fluid Mechanics Practical	25	75	100	50	3
MEC670	Computer Applications and C Programming Practical	25	75	100	50	3

FOURTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC320	Manufacturing Processes	25	75	100	40	3
MEC410	Heat Power Engineering	25	75	100	40	3
CBE26	Engineering Graphics-II	25	75	100	40	3
MEC360	Work shop practice –I	25	75	100	50	3
MEC460	Workshop Practice – II Practical (Lathe & Drilling)	25	75	100	50	3

FIFTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC420	Special Machines	25	75	100	40	3
MEC430	Electrical Drives and Control	25	75	100	40	3
MEC340	Machine Drawing	25	75	100	40	3
MEC440	Computer Aided drawing (2D& 3D) Practical	25	75	100	50	3
MEC450	Electrical Drives and Control Practical	25	75	100	50	3

SIXTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC510	Design of Machine Elements	25	75	100	40	3
MEC520	Thermal Engineering	25	75	100	40	3
MEC470	Work shop Practice-III Practical	25	75	100	50	3
MEC550	Heat Power Engineering Practical	25	75	100	50	3
C0001	Life and Employability Skills Practical	25	75	100	50	3

SEVENTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC610	Computer Aided Design and Manufacturing	25	75	100	40	3
MEC620	Renewable Energy Sources	25	75	100	40	3
Elective-I Theory						
MEC541	Refrigeration and Air Conditioning (ET-I)	25	75	100	40	3
MEC542	Metrology and Quality Control (ET-I)					
Elective-I Practical						
MEC561	Refrigeration and Air Conditioning Practical (EP-I)	25	75	100	50	3
MEC562	Metrology and Quality Control Practical (EP-I)					
MEC650	Computer Aided Manufacturing Practical	25	75	100	50	3

EIGHTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC530	Industrial Engineering & Industrial Management	25	75	100	40	3
Elective-II Theory						
MEC631	Automobile Engineering (ET-II)	25	75	100	40	3
MEC632	Robotics (ET-II)	25	75	100	40	3
Elective-II Practical						
MEC641	Automobile Engineering Practical (EP-II)	25	75	100	50	3
MEC642	Robotics Practical (EP-II)	25	75	100	50	3
MEC660	Processes Automation Practical	25	75	100	50	3
MEC670	Project Work	25	75	100	50	3

ANNEXURE – II
C- SCHEME
Implemented from 2016 – 2017

2020: DIPLOMA IN MECHANICAL ENGINEERING (SANDWICH)

CURRICULUM OUTLINE

THIRD SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC310	Strength of Materials	6			6
MEC330	Fluid Mechanics and Fluid Power	5			5
MEC410	Heat Power Engineering	6			6
MEC340	Machine Drawing		4		4
MEC350	Strength of Materials and Fluid Mechanics Practical			3	3
MEC440	Computer Aided Drawing (2D & 3D) Practical			4	4
MEC550	Heat Power Engineering Practical			3	3
MEC370	Computer Applications and C Programming Practical			3	3
	Seminar	1			1
TOTAL		**18**	4	13	35

FOURTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC320	Manufacturing Processes	3			3
MEC360	Workshop Practice I Practical (Welding & Foundry)			3	3
MEC480	Industrial Training Spell I #				NA
	Seminar	1			1
TOTAL		**4**	**-**	**3**	**7**

Examination will be conducted after completion of the training

FIFTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC510	Design of Machine Elements	5			5
MEC430	Electrical Drives and Control	4			4
MEC620	Renewable Energy Sources	4			4
MEC420	Special Machines	4			4
Elective - I Theory					
MEC541	Refrigeration and Air Conditioning (ET-I)	5			5
MEC542	Metrology and Quality Control (ET-I)				
MEC450	Electrical Drives and Control Practical			4	4
MEC460	Workshop Practice II Practical (Lathe & Drilling)			4	4
Elective - I Practical					
MEC561	Refrigeration and Air Conditioning Practical (EP-I)			4	4
MEC562	Metrology and Quality Control Practical (EP-I)				
	Seminar	1			1
TOTAL		**23**		**12**	**35**

SIXTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC520	Thermal Engineering	5			5
MEC530	Industrial Engineering & Industrial Management	5			5
MEC610	Computer Aided Design and Manufacturing	5			5
Elective - II Theory		5			5
MEC631	Automobile Engineering (ET-II)				
MEC632	Robotics(ET-II)				
MEC470	Work shop Practice-III Practical			3	3
MEC650	Computer Aided Manufacturing Practical			4	4
Elective - II Practical				4	4
MEC641	Automobile Engineering Practical(EP-II)				
MEC642	Robotics Practical (EP-II)				
C0001	Life and Employability Skills Practical			3	3
	Seminar	1			1
TOTAL		**21**		**14**	**35**

SEVENTH SEMESTER

Subject Code	Subject	HOURS PER WEEK			
		Theory	Tutorial/ Drawing	Practical	Total
MEC660	Processes Automation Practical			3	3
MEC670	Project Work			3	3
MEC710	Industrial Training spell II #				NA
	Seminar	1			1
TOTAL				**7**	**7**

Examination will be conducted after completion of the training

ANNEXURE – II

C SCHEME
Implemented from 2016 – 2017

2020: DIPLOMA IN MECHANICAL ENGINEERING (SANDWICH)

SCHEME OF EXAMINATION

THIRD SEMESTER

Subject Code	Subject	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC310	Strength of Materials	25	75	100	40	3
MEC330	Fluid Mechanics and Fluid Power	25	75	100	40	3
MEC410	Heat Power Engineering	25	75	100	40	3
MEC340	Machine Drawing	25	75	100	40	3
MEC350	Strength of Materials and Fluid Mechanics Practical	25	75	100	50	3
MEC440	Computer Aided Drawing (2D & 3D) Practical	25	75	100	50	3
MEC550	Heat Power Engineering Practical	25	75	100	50	3
MEC370	Computer Applications and C Programming Practical	25	75	100	50	3

FOURTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC320	Manufacturing Processes	25	75	100	40	3
MEC360	Workshop Practice I Practical (Welding & Foundry)	25	75	100	50	3
MEC480	Industrial Training Spell I #	25	75	100	50	3

Examination will be conducted after completion of the training

FIFTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC510	Design of Machine Elements	25	75	100	40	3
MEC430	Electrical Drives and Control	25	75	100	40	3
MEC620	Renewable Energy Sources	25	75	100	40	3
MEC420	Special Machines	25	75	100	40	3
Elective - I Theory						
MEC541	Refrigeration and Air Conditioning (ET-I)	25	75	100	40	3
MEC542	Metrology and Quality Control (ET-I)					
MEC450	Electrical Drives and Control Practical	25	75	100	50	3
MEC460	Work shop Practice II Practical (Lathe & Drilling)	25	75	100	50	3
Elective - I Practical						
MEC561	Refrigeration and Air Conditioning Practical (EP-I)	25	75	100	50	3
MEC562	Metrology and Quality Control Practical (EP-I)					

SIXTH SEMESTER

Subject Code	Subject	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC520	Thermal Engineering	25	75	100	40	3
MEC530	Industrial Engineering and Industrial Management	25	75	100	40	3
MEC610	Computer Aided Design and Manufacturing	25	75	100	40	3
Elective - II Theory						
MEC631	Automobile Engineering (ET-II)	25	75	100	40	3
MEC632	Robotics(ET-II)	25	75	100	40	3
MEC470	Workshop Practice III	25	75	100	50	3
MEC650	Computer Aided Manufacturing Practical	25	75	100	50	3
Elective - II Practical						
MEC641	Automobile Engineering Practical (EP-II)	25	75	100	50	3
MEC642	Robotics Practical (EP-II)	25	75	100	50	3
C0001	Life and Employability Skills Practical	25	75	100	50	3

SEVENTH SEMESTER

Subject Code	SUBJECT	Marks			Minimum for pass	Duration of Exam Hours
		Internal Assessment	Board Examination	Total		
MEC660	Processes Automation Practical	25	75	100	50	3
MEC670	Project Work	25	75	100	50	3
MEC710	Industrial Training II #	25	75	100	50	3

Examination will be conducted after completion of the training

Autonomous Examination - Question paper pattern

Common for all theory subjects except Machine Drawing and Design of Machine Elements

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

PART A - Carries 3 questions answer any two questions each carries 4 marks.

PART B - Carries 2 questions answer any one question carries 7 marks.

Unit	Part	No. of Question	Marks
I	A	2 x 4	**8** Marks
	B	1 x 7	**7** Marks
II	A	2 x 4	**8** Marks
	B	1 x 7	**7** Marks
III	A	2 x 4	**8** Marks
	B	1 x 7	**7** Marks
IV	A	2 x 4	**8** Marks
	B	1 x 7	**7** Marks
V	A	2 x 4	**8** Marks
	B	1 x 7	**7** Marks
Total			**75** Marks

Any tables required should be mentioned in the question pattern. Steam table, Design Data Book, Mollier chart, Psychometric Chart etc.

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DIPLOMA IN MECHANICAL ENGINEERING

C - SCHEME

2016 -2017 onwards

II YEAR

III SEMESTER

MEC310– STRENGTH OF MATERIALS

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC310**

Semester : III

Subject Title : **STRENGTH OF MATERIALS**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Strength of Materials	**Hours / Week**	**Hours / Semester**	**Marks**			**Duration**
	6	90	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	**Topics**	**Hours**
I	STATICS OF PARTICLE AND FRICTION	17
II	MECHANICAL PROPERTIES, SIMPLE STRESSES AND STRAINS	17
III	SF AND BM DIAGRAMS, THEORY OF SIMPLE BENDING	17
IV	GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS	16
V	TORSION AND SPRINGS	16
	TEST AND REVISION	7
	Total	**90**

OBJECTIVES

The students must be able to:

- Define various Support reaction and equilibrium.
- Calculate the deformation of materials, which are subjected to axial load and shear.
- Determine the moment of Inertia of various sections used in industries.
- Draw the Graphical representation of shear force and bending moment of the beam subjected to different loads
- Construct SFD and BMD
- Estimate the stresses induced in thin shells.
- 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	**STATICS OF PARTICLES:**	17

Introduction – Force - effects of a force - system of forces - resultant of force-Principle of transmissibility-parallelogram law of forces-triangular law-resultant of several forces acting on a particle- polygon law-resolution of a force into rectangular components –resultant of a system of forces acting on a particle using rectangular components-equilibrium of particles.

External and internal forces-moment of a force-Varignon's theorem-moment of a couple-equivalent couples-addition of couples-resolution of a force into a force and a couple - Free body diagram - Necessary and sufficient conditions for the equilibrium of rigid bodies in two dimension -Support reaction - types of support - removal of two dimensional supports - Simple problems only.

FRICTION:

Introduction-Definition-Force of friction-Limiting friction-Static friction-Dynamic friction-Angle of friction-co-efficient of friction-Laws of static and dynamic friction.

II MECHANICAL PROPERTIES, SIMPLE STRESSES AND STRAINS 17

1. Mechanical properties of materials: Engineering materials – Ferrous and non-ferrous materials **-** Definition of mechanical properties -Alloying elements-effect of alloying element - Fatigue, fatigue strength, creep – temperature creep – cyclic loading and repeated loading – endurance limit.

2. 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 – volumetric strain – 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.

3. Thermal Stresses and strains: Nature and magnitude of stresses due to change in temperature – total or partial prevention of expansion and contraction – temperature stress on composite bar– simple problems.

III SF AND BM DIAGRAMS OF BEAMS AND THEORY OF BENDING 17

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 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.

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.

IV GEOMETRICAL PROPERTIES OF SECTIONS AND THIN SHELLS 16

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.

V THEORY OF TORSION AND SPRINGS 16

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

Text Books:

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

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DIPLOMA IN MECHANICAL ENGINEERING

C - SCHEME

2016 -2017 onwards

II YEAR

III SEMESTER

MEC320– MANUFACTURING PROCESSES

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC320**

Semester : III

Subject Title : **MANUFACTURING PROCESSES**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

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

Topics and Allocation of Hours:

Unit	**Topics**	**Hours**
I	FOUNDRY TECHNOLOGY	14
II	WELDING TECHNOLOGY	14
III	FORMING TECHNOLOGY AND HEAT TREATMENT	14
IV	THEORY OF METAL CUTTING ,LATHE AND SEMIAUTOMATIC LATHE	13
V	AUTOMATIC LATHES, DRILLING MACHINE, METROLOGY	13
	TEST AND REVISION	7
	TOTAL	**75**

OBJECTIVES:

Students must be able to:

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

MANUFACTURING PROCESSES

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**Foundry Technology**	**14**

Patterns: Definition – types of pattern – solid piece – split piece - loose piece – match plate - sweep - skeleton – segmental – shell – pattern materials – pattern allowances.

Moulding: Moulding sand – constituents – types – properties of moulding sand – moulding sand preparation – moulding tools - moulding boxes – types of moulds – green sand mould – dry sand mould – loam mould – methods of moulding – moulding machines – jolting – squeezing – sand slinger construction and working principle.

Cores: Essential qualities of core – materials – core sand preparation – core binders – core boxes - CO_2 process core making – types of core.

Melting furnaces: Blast furnace – Cupola furnace – crucible furnace – types – pit furnace – coke fired – oil fired – electric furnace – types – direct arc – indirect arc – induction furnace – working principles.

Casting: Shell mould casting – investment casting – pressure die casting – hot chamber die casting – cold chamber die casting – gravity die casting – centrifugal casting – continuous casting - defects in casting – causes and remedies.

II Welding Technology **14**

Arc Welding: Definition – arc welding equipment – electrode types – filler and flux materials - arc welding methods – metal arc - Metal Inert gas (MIG) - Tungsten inert gas (TIG) - Submerged arc - Electro slag welding – resistance welding – spot welding – butt welding – seam welding – Plasma arc welding – Thermit welding – Electron beam welding – Laser beam welding – friction welding – ultrasonic welding – Induction welding - working principle – applications – advantages and disadvantages.

Gas welding: Oxy-acetylene welding – advantages - limitations - gas welding equipment - Three types of flames – welding techniques – filler rods. – Flame cutting – soldering – brazing – difference between soldering and brazing.

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.

III Forming Technology **14**

Forging: 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.

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.

Heat Treatment

Heat treatment processes – purpose – procedures – applications of various heat treatment processes – Iron – carbon equilibrium diagram – full annealing – process annealing stress relief

annealing - spherodising annealing – isothermal annealing – normalizing – hardening – tempering – quenching medium – different types and their relative merits – case hardening – pack carburizing – cyaniding – nitriding – induction hardening and flame hardening.

IV **Theory of metal cutting:** Introduction – orthogonal cutting – oblique cutting - single point cutting tool – nomenclature – types of chips – chip breakers – cutting tool materials – properties – tool wears – factors affecting tool life – cutting fluids – functions – properties of cutting fluid. **13**

Centre Lathe: Introduction - specifications – simple sketch – principal parts – head stock – back geared type – all geared type – feed mechanism - tumbler gear mechanism – quick change gear box – apron mechanism – work holding device – three jaw chuck – four jaw chuck – centres - faceplate – mandrel – steady rest – follower rest – machining operations done on lathe - straight turning – step turning - taper turning methods: form tool – tailstock set over method – compound rest method – taper turning attachment – knurling - Thread cutting – Facing – Boring – chamfering –grooving – parting-off – eccentric turning - cutting speed – feed - depth of cut - metal removal rate.

Semi-Automatic Lathes: Types of semi-automatic lathes – capstan and turret lathes – Geneva indexing mechanism – bar feeding mechanism - difference between turret and capstan – work holding devices – tool holders.

V **Automatic Lathes and Drilling and Metrology** **13**

Automatic Lathes

Automatic lathe – classification of single spindle automatic lathe – principle of automatic lathes – automatic screw cutting machines – multi spindle automatic lathes – use of cams in automats.

Drilling Machines: Drills - flat drills - twist drills – nomenclature of twist drill - types of drilling machines - bench type - floor type - radial type - gang drill – multi spindle type -principle of operation in drilling - methods of holding drill bit - drill chucks - socket and sleeve –drilling operation – reaming - counter sinking - counter

boring - spot facing – tapping - deep hole drilling.

Metrology: Definition – need of inspection – precision – accuracy – sensitivity - magnification – repeatability – calibration – comparator – Advantages – requirements – mechanical comparator – optical comparator – electrical comparator – pneumatic comparator – Principles – advantages and disadvantages.

Measuring instruments: Construction and principles only - Steel rule – Callipers: outside calliper – inside calliper – jenny calliper – Combination set – Feeler gauge – Pitch screw gauge – Vernier calliper – Digital calliper – Vernier height gauge – Micrometer – Inside micrometer – Thread micrometer – Slip gauges – requirement – Indian standard – care and use - Sine bar – types – uses – limitations – Working principle of clinometers, autocollimator, angle dekkor.

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) Introduction of basic manufacturing processes and workshop technology – Rajendersingh – New age International (P) Ltd. Publishers, 4835/24, Ansari Road, Daryaganj, New Delhi - 110002

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,
4) Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi 110 006 - 2006
5) Production Technology - P. C. SHARMA - Edn. X - S.Chand & Co. Ltd., Ram Nagar, New Delhi 110 055 - 2006
6) Production Technology – HMT - Edn. 18 - published by Tata McGraw Hill publishing Co. Ltd., 7 West Patel nagar, New Delhi 110 008. – 2001.

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DIPLOMA IN MECHANICAL ENGINEERING

C - SCHEME

2016 -2017 onwards

II YEAR

III SEMESTER

MEC330– FLUID MECHANICS AND FLUID POWER

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC330**

Semester : III

Subject Title : **FLUID MECHANICS AND FLUID POWER**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Fluid Mechanics and Fluid Power	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topics	Hours
I	PROPERTIES OF FLUIDS AND DIMENSIONAL ANALYSIS	14
II	FLOW OF FLUIDS AND FLOW THROUGH PIPES	14
III	IMPACT OF JETS AND HYDRAULIC TURBINES	14
IV	CENTRIFUGAL AND RECIPROCATING PUMPS	13
V	PNEUMATIC AND HYDRAULIC SYSTEMS	13
	TEST AND REVISION	7
	Total	75

OBJECTIVES:

The students must be able to:

- 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.

FLUID MECHANICS & FLUID POWER

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS**	14

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 and its applications - pressure measurement – piezometer tube – simple U-tube manometer – differential U-tube manometer – problems – precautious in using manometers – mechanical gauges – Bourdon's tube pressure gauge – diaphragm pressure gauge. Hydrostatic forces – definition – total pressure – centre of pressure- pressure diagrams.

Dimensional Analysis

Fundamental dimensions – dimensional homogeneity – uses of the principle of dimensional homogeneity- Buckingham's π theorem method.

II	**FLOW OF FLUIDS AND FLOW THROUGH PIPES**	14

FLOW OF FLUIDS

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 –venturi meter – derivation for discharge – orifice

meter – differences between venturi meter and orifice meter – problems. Orifice – types – applications – hydraulic coefficients – determining hydraulics coefficients – discharge through orifice discharging freely – problems – mouth pieces – classifications – discharge through external cylindrical mouth piece – problems.

FLOW THROUGH PIPES

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.

III IMPACTOF JETS AND HYDRAULIC TURBINES 14

IMPACT OF JETS

Impact of jet – on a stationary flat plate held normal to the jet and inclined to the direction of jet – on a flat plate moving in the direction of jet – on a series of moving plates or vanes – force exerted and work done by the jet– problem.

HYDRAULIC TURBINES

Hydraulics turbines – classifications – Pelton wheel – components and working – speed regulation – work done and efficiency of Pelton wheel – working proportions - problems – Francis and Kaplan turbines – components and working – draft tube – functions and types – surge tank – simple surge tank – differences between impulse and reaction turbines.

IV CENTRIFUGAL AND RECIPROCATING PUMPS 13

Centrifugal pumps

Centrifugal pumps **–** classifications – working of single stage – components (with types if any) multi stage pumps – advantages – priming – priming chamber – head of a pump – manometric, mechanical, overall efficiencies – problems - cavitation – special pumps – deep well and jet pumps – trouble shooting in centrifugal pumps.

Reciprocating pumps

Reciprocating pumps **–** classifications – 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 vessels (functions and working).- Fluid power pumps – external and internal gear, vane and piston pumps

V PNEUMATIC AND HYDRAULIC SYSTEMS 13

PNEUMATIC SYSTEMS

Pneumatic systems **–** elements – filter – regulator – lubricator unit – pressure control valves – pressure relief valves – pressure regulation valves – directional control valves – 3/2 DCV, -4/2 DCV, -4/3 DCV, 5/2 DCV, 5/3 DCV- flow control valves – throttle, shuttle and quick exhaust values – 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 / metering-out control –use of shuttle valve in pneumatic circuits – use of quick exhaust valve in pneumatic circuits – automatic operation of double acting cylinder – merits and demerits of pneumatic system – applications.

HYDRAULIC SYSTEMS

Hydraulic system **–** elements – merits and demerits – pneumatic system Vs hydraulic system- service properties of hydraulic fluids – hydraulic accumulators – weighted or gravity, spring loaded, gas operated, bladder type accumulators –– ISO symbols for hydraulic components – hydraulic circuits using sequence valve – counter balance valve – hydraulic circuit for – shaping machine, surface grinding or milling machine – hydraulic jack – hydraulic lift – hydraulic intensifiers – hydraulic press. Hydro –Pneumatic system - comparison of hydraulic and pneumatic system- advantages and application of Hydro pneumatics system.

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
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 PublicationsPvt.,Ltd,22,Golden House, Daryaganj, New Delhi – 110 002

CENTRAL POLYTECHNIC COLLEGE

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DIPLOMA IN MECHANICAL ENGINEERING

C - SCHEME

2016 - 2017 onwards

II YEAR

III SEMESTER

MEC340– MACHINE DRAWING

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC340**

Semester : III

Subject Title : **MACHINE DRAWING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Machine Drawing	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	4	60	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	**Topics**	**Hours**
I	SECTIONAL VIEWS	5
II	LIMITS, FITS AND TOLERANCES	5
III	SURFACE TEXTURE	5
IV	KEYS, SCREW THREADS AND THREADED FASTENERS	5
V	ASSEMBLE DRAWING	33
	TEST AND REVISION	7
	Total	60

OBJECTIVES:

The students must be able to:

- 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.	5
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	5
III	**SURFACE TEXTURE** Surface texture – importance – controlled and uncontrolled surfaces – Roughness – Waviness – lay – Machining symbols	5
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	5

V MANUAL DRAWING PRACTICE **33**

Detailed drawings of following machine parts are given to students to assemble and draw the Elevations / Sectional elevations / Plan / and Side views with dimensioning and bill of materials

1. Sleeve & Cotter joint
2. Knuckle joint
3. Screw Jack
4. Foot step bearing
5. Plummer Block
6. Universal Coupling
7. Simple Eccentric
8. Machine Vice
9. Protected type flanged coupling
10. Swivel bearing.

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, New Delhi
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

BOARD EXAMINATIONS

Question Pattern

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

Note: All the questions will be answered in drawing sheet only

PART A: (7 x 5 = 35)

Theory questions: (1 to 8)

Two questions from each unit (I to IV) will be asked.

Answer any seven questions from the given eight questions.

PART B: (1X 40 =40)

Answer any one question by selecting either (i) or (ii).

9. (i). Assemble and Draw any two views and bill of materials.

(OR)

(ii). Assemble and Draw any two views and bill of material

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C - SCHEME

2016 -2017 onwards

II YEAR

III SEMESTER

MEC350– STRENGTH OF MATERIALS AND FLUID MECHANICS PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : **MEC350**
Semester : III
Subject Title : **STRENGTH OF MATERIALS AND FLUID MECHANICS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Strength of Materials and Fluid Mechanics Practical	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

The students must be able to:

• Determine stress strain relations for steel and cast iron.

• Determine hardness of materials.

• Perform torsion, bending, impact and shear tests.

• Determine coefficient of discharge of venture meter and orifice meter.

• Determine the friction in pipes.

• Verify Bernoulli's theorem.

• Conduct performance test on centrifugal and reciprocating pump.

• Conduct performance test on impulse and reaction turbine.

• Design and make fluid power circuits.

I - STRENGTH OF MATERIALS LAB

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 and cast iron. (Equipment : UTM)

2. Hardness Test:

Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminium. (Equipment : Rockwell's Hardness Testing Machine)

3. Torsion test:

Torsion test on mild steel – relation between torque and angle of twist-determination of shear modulus-determination of elastic constants for mild steel. (Equipment : Torsion testing machine)

4. Bending and deflection tests:

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

(Equipment : Deflection testing arrangement)

5. Impact test:

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

(Equipment: Impact testing machine)

6. Tests on springs of circular section:

Determination of modulus of rigidity, strain energy, shear stress by load deflection method-Comparison and tension test (Closed coil spring only)

(Equipment: Tension testing arrangements)

7. Shear test:

Shear test on M.S. bar

(Equipment: Shear testing machine)

8. Compression Test:

Determination of compressive strength of concrete cube.

(Equipment: compression testing machine)

9. Test on wood:

Determination of strength of the given wood specimens under the following types of loading: (i.) Compression parallel to the grain. (ii) Compression Perpendicular to the grain, tension, bending.

II - FLUID MECHANICS LAB:

1. Verifying the Bernoulli's Theorem

(Equipment: The Bernoulli's Apparatus)

2. Determination of Coefficient of discharge of a Venturi meter (or) Orifice meter. (Equipment: A Centrifugal pump having the discharge line with Venturi meter or Orifice meter arrangement)

3. Determination of the Friction Factor in a Pipe

(Equipment: An arrangement to find friction factor)

4. Performance test on a reciprocating pump and draw the characteristic curves. (Equipment: A reciprocating pump with an arrangement for collecting data to find out the efficiency and plot the characteristic curves)

5. Performance test on a centrifugal pump and draw the characteristic curves.

(Equipment: A centrifugal pump with an arrangement for collecting data to find out the efficiency and plot the characteristic curves)

6. Performance test on an impulse turbine

(Equipment: An impulse turbine with an arrangement for collecting data to find out the efficiency)

7. Performance test on a reaction turbine

(Equipment: A Reaction Turbine with an arrangement for collecting data to Find out the Efficiency)

8. Determination of Coefficient of discharge of a small orifice (or) an external mouthpiece by constant head method.

(Equipment: An open tank fitted with a small orifice (or) an external mouthpiece and a collecting tank with piezo meter)

9. Determination of Coefficient of discharge of a small orifice (or) an external mouthpiece by variable head method.

(Equipment: An open tank fitted with a small orifice (or) an external mouthpiece and a collecting tank with piezo meter)

SCHEME OF EXAMINATION:

Strength of Materials Lab. (any one exercise)	:	35 marks (1½ Hrs)
Fluid Mechanics Lab. (any one exercise)	:	35 marks (1½ Hrs)
Viva – voce	:	05 marks
Total	:	75 marks

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C SCHEME

2016 -2017 onwards

II YEAR

III SEMESTER

MEC360– WORKSHOP PRACTICE – I

(WELDING & FOUNDRY)

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC360**

Semester : III

Subject Title : **WORKSHOP PRACTICE – I (WELDING & FOUNDRY)**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Workshop Practice – I (Welding & Foundry)	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

The students must be able to:

- Identify the tools used in foundry.
- Identify the tools and equipment 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.
- Prepare a record of work for all the exercises.

FOUNDRY SECTION

1. Introduction of tools and equipment
2. Types of patterns
3. Types of sand
4. Preparation of sand moulds
5. Core sands, preparation of cores

Exercises:

Prepare the green sand mould using the following patterns.

Solid pattern

1. Stepped pulley

Split pattern

2. Bent Pipe with core print
3. T-pipes with core print
4. Tumbles

Loose Piece Pattern

5. Dovetail

Core preparation

6. Core preparation for Bent pipe / T-pipe

WELDING SECTION

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

Exercises :

Make the following welding joint / cutting.

Arc welding (Raw Material: 25 mm x 6mm MS flat)

1. Lap joint
2. Butt joint
3. T- joint

Gas Welding (Raw Material: 25mm x 3mm Ms flat)

4. Lap joint

Gas cutting: (GI/MS Sheet - 3mm thickness)

5. Profile cutting – circular profile

Spot welding: (GI/MS Sheet)

6. Lap joint

Scheme of Examination

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise in each section.

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

Record note book should be submitted during examination.

Detailed allocation

Foundry		**: 35 marks**
Preparation of sand	- 10	
Ramming and vent holes	- 15	
Gate cutting / Finish	- 10	
Welding		**: 35 marks**
Edge preparation	- 10	
Welding / Cutting	- 15	
Joint strength / Finish	- 10	
Viva-voce		**: 05 marks**
Total		**: 75 marks**

LIST OF EQUIPMENT

Welding:

1. Arc welding booth	-	2 No's with welding transformer
2. Gas welding unit	-	1 Set (Oxygen and acetylene cylinder)
3. Flux	-	Sufficient quantity
4. Electrode	-	Sufficient quantity
5. Welding rod	-	Sufficient quantity
6. Welding shield	-	5 Nos.
7. Gas welding goggles	-	5 Nos.
8. Leather Glows 18''	-	10 Sets.
9. Chipping hammer	-	10 Nos.
10. Spot welding machine	-	1 No.
11. Personal protective equipment	-	Sufficient quantity
12. Fire safety equipment	-	Sufficient quantity

Foundry:

1. Moulding board	-	15 Nos.
2. Cope box	-	15 Nos.
3. Drag box	-	15 Nos.
4. Core box	-	10 Nos.
5. Shovel	-	5 Nos.
6. Rammer set	-	15 Nos.
7. Slick	-	15 Nos.
8. Strike-off bar	-	15 Nos.
9. Riddle	-	5 Nos.
10. Trowel	-	15 Nos.
11. Lifter	-	15 Nos.
12. Cleaning Brush	-	20 Nos.
13. Vent rod	-	15 Nos.
14. Drawspike	-	15 Nos.
15. Gate cutter	-	15 Nos.
16. Runner & riser	-	15 Nos. each
17. Patterns	-	Sufficient quantity

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017onwards

II YEAR

III SEMESTER

MEC370– COMPUTER APPLICATIONS AND C PROGRAMMING PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC370**

Semester : III

Subject Title : **COMPUTER APPLICATIONS AND C PROGRAMMING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Computer Applications and C Programming Practical	**Hours / Week**	**Hours / Semester**	**Marks**			**Duration**
	6	90	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

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

- Use the different facilities available in the word processor
- Analyze the data sheet
- Create and manipulate the database
- Prepare PowerPoint presentation
- Think the logic to solve the given problem.
- Describe the concepts of constants, variables, data types and operators.
- Develop programs using input output operations.
- Write programs using different looping and branching statements.
- Write programs based on arrays.
- Write Programs using string handling functions, defined functions, Structures and Union

PART – A: COMPUTER APPLICATIONS (40 Hrs)

WORD PROCESSING

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

Exercises

1. 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.

2. Create the following table using align, border, merging and other attributes.

DIRECTORATE OF TECHNICAL EDUCATION e-governance particulars					
Register Number	**June**	**July**	**August**	**September**	**Cumulative %**
16304501					
16304502					
16304503					
16304504					
16304505					

SPREADSHEET

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

Exercises

3. 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.

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

DATABASE

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

Exercises

5. 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.

6. 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

7. Make a presentation with atleast 10 slides. Use different customized animation effects on pictures and clip art on any four of the ten slides.

PART – B: C-PROGRAMMING

Program Development & Introduction to C 16Hrs

1.1 Program Algorithm & flow chart:- Program development cycleProgramming language levels & features. Algorithm – Properties & classification of Algorithm, flow chart – symbols, importance & advantage of flow chart.

1.2 Introduction C: - History of C – features of C structure of C program – Compiling, link & run a program. Diagrammatic representation of program execution process.

1.3 Variables, Constants & Data types:. C character set-TokensConstants- Key words – identifiers and Variables – Data types and storage – Data type Qualifiers – Declaration of Variables – Assigning values to variables- Declaring variables as constants- Declaration – Variables as volatile- Overflow & under flow of data

1.4 C operators:-Arithmetic, Logical, Assignment .Relational, Increment and Decrement, Conditional, Bitwise, Special Operator precedence and Associativity. C expressions – Arithmetic expressions – Evaluation of expressions- Type cast operator

1.5 .I/O statements: Formatted input, formatted output, Unformatted I/O statements

DECISION MAKING,ARRAYS and STRINGS 17 Hrs

2.1 Branching:- Introduction – Simple if statement – if –else – else-if ladder , nested if-else-Switch statement – go statement – Simple programs.

2.2 Looping statements:- While, do-while statements, for loop, break & continue statement – Simple programs

2.3 Arrays:- Declaration and initialization of One dimensional, Two dimensional and Character arrays – Accessing array elements – Programs using arrays

2.4 Strings :- Declaration and initialization of string variables, Reading String, Writing Strings – String handling functions (strlen(),strcat(),strcmp()) – String manipulation programs

FUNCTIONS, STRUCTURES AND UNIONS 17 Hrs

3.1 Built –in functions: -Math functions – Console I/O functions – Standard I/O functions – Character Oriented functions – Simple programs.

3.2 User defined functions:- Defining functions & Needs-, Scope and Life time of Variables, , Function call, return values, Storage classes, Category of function – Recursion – Simple programs

3.3 Structures and Unions:- Structure – Definition, initialization, arrays of structures, Arrays with in structures, structures within structures, Structures and functions – Unions – Structure of Union – Difference between Union and structure – Simple programs.

LAB EXERCISES

Part – B

1. Write a simple C program. a. Print your name and address. b. Find simple and compound interest

2. Write a C program to swap two variable's using(i)third variable and(ii) without using a third variable.

3. Write a program converts the given temperature in Fahrenheit to Celsius using preprocessor.

4. Write a program to find the largest number between given three numbers.

5. Write a program to perform following tasks a. Find factorial of a number b. Print prime numbers up N times.

6. Write a program to prepare the total marks for N students by reading the Reg.No, Name, Mark1 to Mark6 by using array of structures.

Scheme of Examination

Note: All the exercises have to be completed. Two exercises will be given for examination by selecting one exercise in each PART.

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

Record note book should be submitted during examination.

ALLOCATION OF MARKS

PART - A		**:**	**35 marks**
	Editing / Creation	-	10
	Formatting	-	20
	Out put	-	05
PART - B		**:**	**35 marks**
	Flow Chart	-	10
	Programming	-	20
	Out Put	-	05
Viva-voce		**:**	**05 marks**
Total		**:**	**75 marks**

LIST OF EQUIPMENT

1. Personal computer – 30 Nos.
2. Printer – 1 No.
3. Required Softwares :

MS Office Proffessional, C Software – Sufficient to the strength.

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017 onwards

II YEAR

IV SEMESTER

MEC410– HEAT POWER ENGINEERING

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING
Course Code : 1020
Subject Code : **MEC410**
Semester : IV
Subject Title : **HEAT POWER ENGINEERING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Heat Power Engineering	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topics	Hours
I	BASICS OF THERMODYNAMICS AND THERMODYNAMIC PROCESSES OF PERFECT GASES	17
II	STEADY FLOW ENERGY EQUATION AND AIR CYCLES	17
III	AIR COMPRESSORS AND GAS TURBINES	17
IV	FUELS AND COMBUSTION OF FUELS AND I C ENGINES	16
V	PERFORMANCE OF I C ENGINES AND HEAT TRANSFER	16
	TEST AND REVISION	7
	Total	90

OBJECTIVES

Students must be able to:

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

HEAT POWER ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**FUNDAMENTALS OF THERMODYNAMICS AND THERMODYNAMICS PROCESSES** **Fundamentals of Thermodynamics:-** Introduction – definitions and properties – units – temperature, conditions – heat – specific heat constants – work – power – energy – thermodynamics systems – types – intensive and extensive properties – thermodynamics process – cycle – point and path function – equilibrium –zeroth and first laws of thermodynamics – Second law of thermodynamics- Kelvin planks and clauses statements- heat engine- thermal efficiency – refrigerators, heat pumps and Air conditioners- Reversible and irreversible processes- thermodynamic reversibility- irreversibility- conditions of reversibility- carnot principles- carnot theorem- corollary of the carnot theorem-problems. Expansion of gases -Perfect gases – law of perfect gases – General gas equation- characteristic gas equation- relation between specific heats and gas constant- universal gas constant- change in internal energy –enthalpy – entropy- change in entropy- general equation for change in entropy.	17

Thermodynamic processes:-Constant volume, Constant pressure, Constant temp.(isothermal) ,Isentropic (reversible adiabatic) and, Polytropic Processes – p-V and T-s diagrams, work done , change in internal energy , heat transfer , change in enthalpy, change in entropy for above processes –Simple problems – hyperbolic ,Free expansion and throttling processes(Description only) .

II STEADY FLOW ENERGY EQUATION AND AIR CYCLES 17

Steady flow system- control volume- law of conservation of energy – steady flow energy equation- Assumptions- engineering applications- steam boiler – condenser – nozzles- steam and gas turbines – reciprocating and rotary compressors- Non flow energy equation - Problems.

Air cycles – assumptions – air standard efficiency – Carnot cycle – Otto cycle – Joule cycle – Diesel cycle – ideal and actual P.V diagrams of Diesel cycles – comparison – problems – Dual combustion cycle (Description only)

III AIR COMPRESSORS AND GAS TURBINES 17

Air Compressors:- Uses of compressed air – classifications of Air compressor – reciprocating compressor - single stage reciprocating compressor – compression processes – clearance volume and its effects – volumetric efficiency – multi stage compression – merits and demerits – Two stage compressor with imperfect cooling- with perfect inter cooling – rotary compressors – Roots blower - vane blowers – centrifugal and axial flow air compressors

Gas turbines – uses - classifications – merits and demerits - constant pressure combustion gas turbine – gas turbine with intercooler, re heater, regenerator - effects – closed cycle gas turbines - merits and demerits– jet propulsion -turbojet engines – turbo propeller engines – ramjet– Working principle - merits and demerits – Comparison of air craft and industrial gas turbines- application of gas turbines-Rocket engines – solid and liquid propellant rockets- applications of rockets.

IV FUELS AND COMBUSTION OF FUELS AND INTERNAL COMBUSTION ENGINES **16**

Fuels and Combustion of fuels:

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.

Internal Combustion Engines:

Introduction – classifications of I.C engines – I.C engine components – function, material and method of manufacturing - working principles of four stroke and two stroke petrol and diesel engines – comparison of valve timing and port timing diagrams – fuel supply system – working principle of simple carburetor – types – diesel fuel pump and injectors – working principles – lubrication and cooling of I.C engines.

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V PERFORMANCE OF IC ENGINE AND HEAT TRANSFER **16**

Performance of IC engine:

Performance of IC engines – testing – thermodynamic and commercial tests – indicated power – brake power – friction power – efficiencies of I.C engines – brake thermal, mechanical and relative efficiencies - Morse test - procedure – heat balance sheet – problems.

Heat Transfer:

Basic concepts – modes of heat transfer - conduction heat transfer – resistance concept – heat conduction through a cylinder - heat conduction through a sphere – convective heat transfer – simple definitions – simple problems – radiation heat transfer - introduction.

Text Book:

1) Thermal Engg, R.K .Rajput , ,8th Edition, Laxmi publications, Pvt Ltd , New Delhi.
2) Applied Thermodynamics ,P.K. Nag, ,2ndEdition,TATAMcgraw - 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.LBallaney , 24th Edition ,Khanna Publishers, New Delhi.
2) Thermal Engineering ,B.K. Sarkar , 3rd Edition , DhanpatRai& Sons New Delhi .
3) Applied Thermodynamics, Domkundwar and .P.Kothandaraman, 2ndEdition, Khanna publishers, New Delhi.

CENTRAL POLYTECHNIC COLLEGE

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017 onwards

II YEAR

IV SEMESTER

MEC420– SPECIAL MACHINES

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC420**

Semester : IV

Subject Title : **SPECIAL MACHINES**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Special Machines	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topics	Hours
I	MANUFACTURING OF PLASTIC COMPONENTS	14
II	RECIPROCATING MACHINES	14
III	MILLING MACHINES- GEAR MANUFACTURING - FORMING AND GENERATING PROCESS	14
IV	GRINDING, BROACHING, BORING AND JIG BORING	13
V	JIGS &FIXTURES, PRESS WORKING &NON-CONVENTIONL MACHINING PROCESS.	13
	TEST AND REVISION	7
	Total	**75**

OBJECTIVES:

Students must be able to:

- Understand the plastic components and its process.
- Study the manufacturing of Composite materials.
- Study the working of various machine tools: Planer, Shaper and Slotter.
- Study the various work holding devices
- Study various types of milling cutter.
- Study the different types of grinders and grinding wheels.
- Study the broaching operation and their applications.
- Study the milling procedure for spur, helical and bevel gears.
- Study the various types of gear generating processes
- Study the use of non-conventional machining processes.
- Study the Compare the various types of jigs and fixtures.

SPECIAL MACHINES

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**MANUFACTURING OF PLASTIC COMPONENTS**	14
	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. 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.	
	Composite manufacturing: Introduction – characteristics of composite manufacturing - constituents – Glass fibers manufacturing process – hand laminating process – autoclave processing – filament winding – pultrusion process – liquid composite process – working principles by schematic diagram only – advantages – disadvantages.	

II RECIPROCATING MACHINES **14**

Planer: Introduction - description of double housing planer – specifications -principles of operation – drives - quick return mechanism - feed mechanism - work holding devices and special fixtures - types of tools - operations.

Shaper: Introduction – specifications – principles of operations standard shaper – quick return mechanism - crank and slotted link – hydraulic shaper - feed mechanism - work holding devices – fixture - operations.

Slotter: Introduction – specifications - method of operation - Whitworth quick return mechanism - feed mechanism - work holding devices - types of tools.

III MILLING MACHINES- GEAR MANUFACTURING - FORMING AND GENERATING PROCESS. **14**

Milling Machines: Types - column and knee type – plain - universal milling machine - vertical milling machine - principles of operation - specification of milling machines - work holding devices - tool holding devices - arbor - stub arbor - spring collet – adapter. Milling cutters: cylindrical milling cutter - slitting cutter -side milling cutter - angle milling cutter - T-slot milling cutter - woodruff milling cutter - fly cutter - nomenclature of cylindrical milling cutter. Milling operations: straddle milling - gang milling - vertical milling attachment.

Gear forming : Gear forming process in milling-dividing head-principles of operation-indexing plate - linear indexing-simple-differential angular and compound indexing – simple problems-gear milling, cutter selection-module-pressure angle-milling procedure for spur, helical and bevel gears-problems

Generating Process: gear shaper - gear hobbing - principle of operation only. Gear finishing processes: burnishing – shaving - grinding and lapping - gear materials.

IV GRINDING - BROACHING - BORING AND JIG BORING **13**

GRINDING: Types and classification – specifications - rough grinding – pedestal grinders - portable grinders - belt grinders - precision grinding - cylindrical grinder - centerless grinders – surface grinder - tool and cutter grinder - planetary grinders - principles of operations -

grinding wheels – abrasives - natural and artificial diamond wheels - types of bonds - grit, grade and structure of wheels - wheel shapes and sizes - standard marking systems of grinding wheels - selection of grinding wheel - mounting of grinding wheels - Dressing and Truing of wheels - Balancing of grinding wheels.

Broaching: Types of broaching machine - horizontal, vertical and continuous broaching - principles of operation - types of broaches – classification - broach tool nomenclature - broaching operations.

Boring and Jig boring:

Boring machines-horizontal and vertical types-fine boring machines-boring tools-jig boring machine-measuring system-hole location procedure-deep hole boring.

V JIGS AND FIXTURES- PRESS WORKING -NON- CONVENTIONAL MACHINING PROCESSES. **13**

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-applications.

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.

CENTRAL POLYTECHNIC COLLEGE

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DIPLOMA IN MECHANICAL ENGINEERING

C - SCHEME

2016 -2017 onwards

II YEAR

IV SEMESTER

MEC430– ELECTRICAL DRIVES AND CONTROL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC430**

Semester : IV

Subject Title : **ELECTRICAL DRIVES AND CONTROL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

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

Topics and Allocation of Hours:

Unit	**Topics**	**Hours**
I	DC CIRCUITS AND DC MACHINES	14
II	AC CIRCUITS AND AC MACHINES	14
III	STEPPER AND SERVO MOTORS & DRIVES	14
IV	POWER SUPPLIES AND LOGIC GATES	13
V	CONTROL ELEMENTS AND PLC	13
	TEST AND REVISION	7
	Total	**75**

OBJECTIVES:

Students must be able to:

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

ELECTRICAL DRIVES & CONTROL

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DC CIRCUITS AND DC MACHINES**	**14**
	Definition- Electric current, voltage and resistance -Ohm's law and Kirchoff's law. Resistance in series and parallel and series, parallel – simple problemselectromagnetism(definitions only) – magnetic flux, flux density magnetic fieldintensity, MMF, permeability, reluctance, Faraday's law of electromagneticinduction, 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.	

II	**AC CIRCUITS AND AC MACHINES**	**14**

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 and universal motor 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 starter.

III	**STEPPER AND SERVO MOTORS & DRIVES:**	**14**

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

IV	**POWER SUPPLIES AND LOGIC GATES**	**13**

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.

V	**CONTROL ELEMENTS AND PLC**	**13**

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.

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.

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DIPLOMA IN MECHANICAL ENGINEERING

C - SCHEME

2016 -2017 onwards

II YEAR

IV SEMESTER

MEC440– COMPUTER AIDED DRAWING (2D &3D)

PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC440**

Semester : IV

Subject Title : **COMPUTER AIDED DRAWING (2D & 3D) PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Computer Aided Drawing (2D & 3D) Practical	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	6	90	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

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

- Practice on CADD commands in making 2D Drawings.
- Draw assembled drawings of different types of joints and couplings.
- Draw assembled drawings using CADD
- Draw sectional views using different types of sections.
- Draw isometric views using CAD
- Practice on CAD commands for 3D drawings.
- Draw 3D CAD drawings using solid modeling.
- Practice on Solid rendering.

INTRODUCTION

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.

DRAWING AIDS AND EDITING COMMANDS

Creating objects (2D) – Using draw commands – Creating text – Drawing with precision – Osnap options – drafting settings – drawing aids – Fill, Snap, Grid, Ortho lines – Isoplane- isocircle-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.

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.-Pagesetup, Plot preview, plot.

3D CAD DRAWING – SOLID MODELING

Predefined 3D objects – converting 2D plan into a 3D model – 3Dmesh – 3Dface - 3Dpoly – creating surfaces – Rulsurf – Revsurf – Tabsurf – Edgesurf – isolines - 3DView – viewports – Vpoint – hide – dview – modelspace - paper space.

3D solid primitives - creating region – pedit – extrude – revolve - combining object – union – subtract –intersect – Align – Fillet – chamfer - Advanced 3D editing techniques – align - 3D array –Mirror 3D -Rotate3D - Working with UCS – 3D coordinate system – DDUCS – Plan – UCS icon - Solid Rendering – material attaching and detaching – shade with color – slice and sectioning – script – 3D orbit – calculating mass properties

PART-A

2D CAD EXERCISES

Detailed drawings of following machine parts are to be given to students. Draw the assembled views (two views only) and bill of materials.

The elevation / sectional elevation / plan / sectional plan / side view with dimensioning.

1. Sleeve & Cotter joint
2. Screw jack
3. Plummer Block
4. Simple Eccentric
5. Machine Vice
6. Protected type flanged coupling
7. Universal Coupling

PART-B

3D SOLID MODELING

1. Geneva Mechanism
2. Cast Iron Block
3. Bearing Block
4. Bushed Bearing
5. Gib and Cotter joint
6. Screw Jack
7. Universal Coupling

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) AutoCAD with Applications - Sham Tickoo - Tata Mcgraw Hill.

Scheme of Examination

Note: All the exercises have to be completed. One exercise will be given for examination in each PART.

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

Record note book should be submitted during examination.

ALLOCATION OF MARKS

PART - A			**:**	**35 marks**
	Drafting in 2D	-	15	
	Assembly	-	15	
	Dimensioning	-	5	
PART - B			**:**	**35 marks**
	Drafting in 3D	-	15	
	Assembly	-	15	
	Mass properties	-	5	
Viva-voce			**:**	**05 marks**
Total			**:**	**75 marks**

LIST OF EQUIPMENT

1. Personal computer – 30 Nos.
2. Printer – 1 No.
3. Required Softwares :

CAD Package – Sufficient to the strength.

Modelling package : Solid works / Pro-E / Catia / Unigraphics / Autocad etc…

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017 onwards

II YEAR

IV SEMESTER

MEC450– ELECTRICAL DRIVES AND CONTROL PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC450**

Semester : IV

Subject Title : **ELECTRICAL DRIVES AND CONTROL PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Electrical Drives and Control Practical	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	4	60	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

Students must be able to:

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

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. Testing of AC starters- DOL , star - Delta starter
5. Load test on single phase induction motor
6. Load test on three phase squirrel cage motor
7. Testing of relays, contactors, push buttons and limit switch
8. Connection and Testing of MCB, ELCB

Part B

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

BOARD EXAMINATION

Note: All the exercises are to be completed. One exercise from Part A and another one from Part B should be given for the Examination.

Part A:		**35**
Circuit diagram	05	
Connections & Readings	15	
Calculations & Graph	15	
Part B:		**35**
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 - 3nos
   (0-750W,0-600V)
10. Loading rheostat 5A,230V - 1no
11. Tachometer 0-1000rpm - 1no
    (Analog type)
12. Variac 20A,250V - 2nos
    (Auto transformer)
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 - 4nos
18. Push button 2A ,220V - 2nos
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 - 1 no.
5. Logic Gates IC
   7400, 7408, 7432, 7404, 7402, 7486- 1 each
6. Stepper Motor Drive kit - 1no.
7. Servo Motor Drive Kit - 1no
8. Digital Multimeter - 1no.
9. LED, 7Segment LED, Laser Diode - 1 each

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017 onwards

II YEAR

IV SEMESTER

MEC460– WORK SHOP PRACTICE –II

(Lathe & Drilling)

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC 460**

Semester : IV

Subject Title : **WORK SHOP PRACTICE –II (Lathe & Drilling)**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Work Shop Practice – II (Lathe & Drilling)	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	4	60	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

- Identify the parts of a lathe.
- Identify the work holding devices.
- Set the tools for various operations.
- Operate the lathe and machine a component using lathe.
- Identify the parts of drilling machine.
- Perform the various drilling operations.
- Identify the various tools and its holding devices.
- Identify the work holding devices.
- Prepare the record of work for the exercises.

Lathe section:

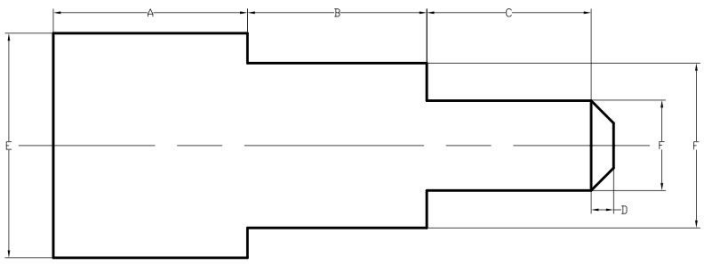
1. Introduction of safety in operating machines.
2. Study of lathe and its parts.
3. Types of tools used in lathe work.
4. Study of work holding devices and tool holding devices.

5. Setting of work and tools.
6. Operation of lathe.
7. Practice on a lathe.
8. Types of measuring instruments and their uses.

Exercises:

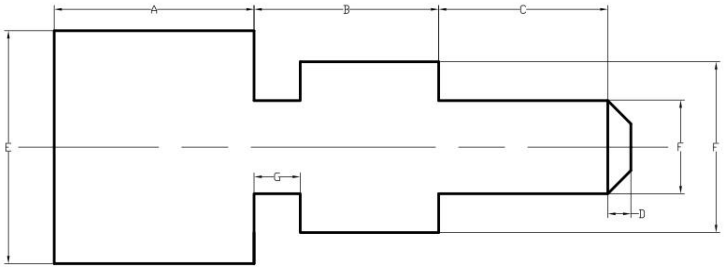
Make the following jobs in the lathe. Raw material Ø32 mm M.S. Rod

1. Facing, Step turning & Chamfering



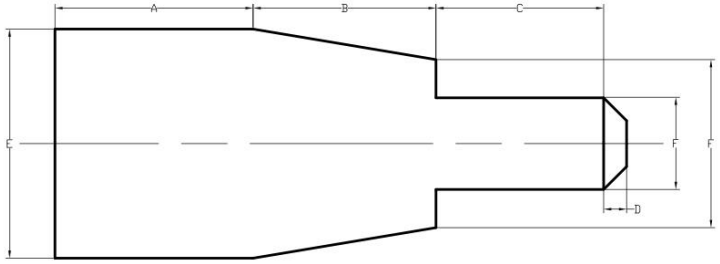
Dimensions			
Sl.No	Part Name	Actual	Obtained

2. Step turning & Groove cutting



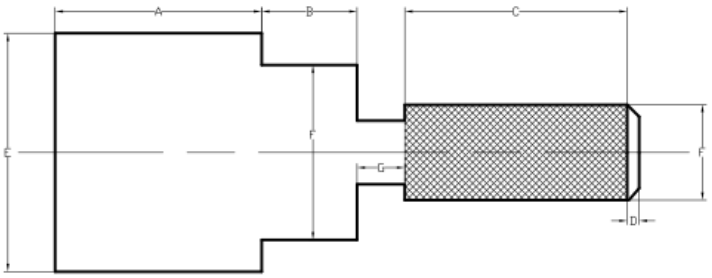
Dimensions			
Sl.No	Part Name	Actual	Obtained

3. Step turning & Taper turning



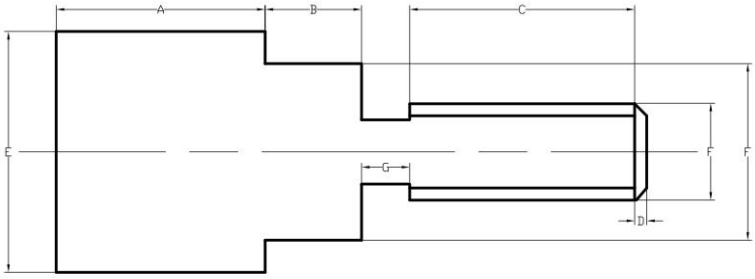
Dimensions			
Sl.No	Part Name	Actual	Obtained

4. Step turning & Knurling



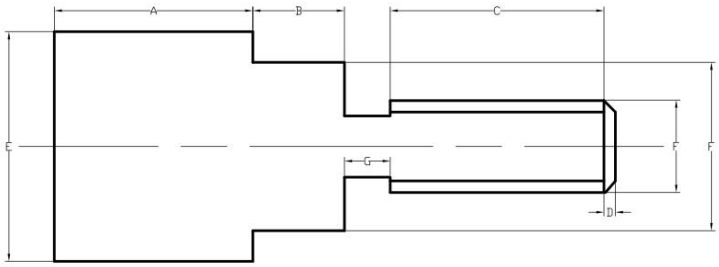
Dimensions			
Sl.No	Part Name	Actual	Obtained

5. Step turning & Thread cutting (L.H.)



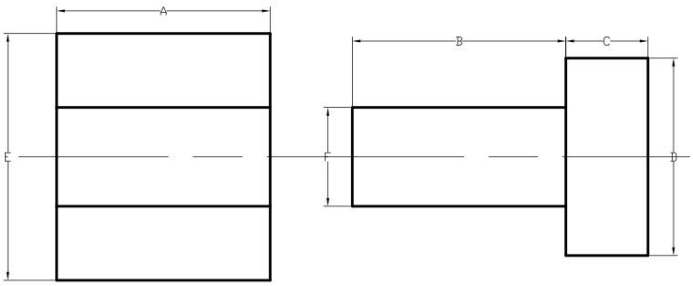
Dimensions			
Sl.No	Part Name	Actual	Obtained

6. Step turning & Thread cutting (R.H)



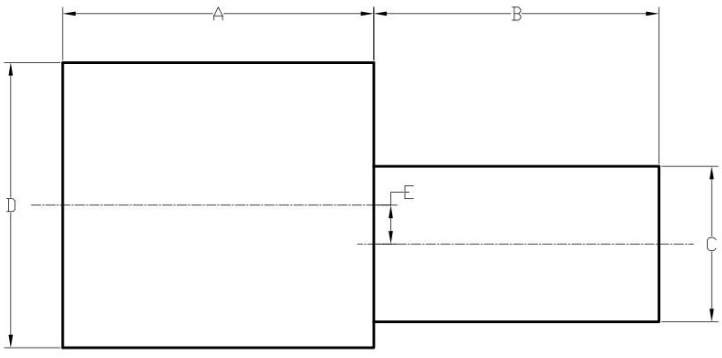
Dimensions			
Sl.No	Part Name	Actual	Obtained

7. Bush: Turning & Drilling



Dimensions			
Sl.No	Part Name	Actual	Obtained

8. Eccentric turning



Dimensions			
Sl.No	Part Name	Actual	Obtained

Drilling section:

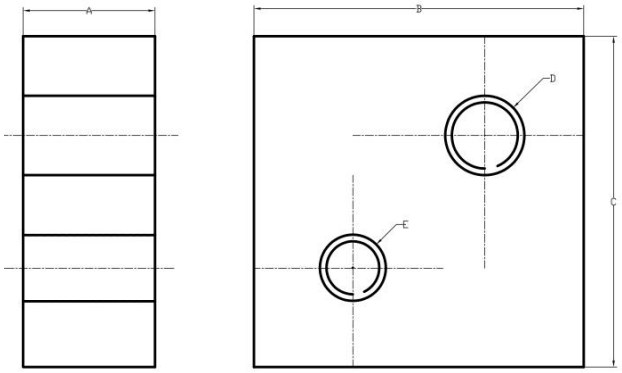
1. Introduction of safety in operating machines.
2. Study of drilling machines and its parts.
3. Study the types of tools used.
4. Study of work holding devices and tool holding devices.
5. Setting of work and tools.
6. Operation and practice.
7. Types of measuring instruments and their uses.

Exercises:

Make the following jobs in the drilling machine.

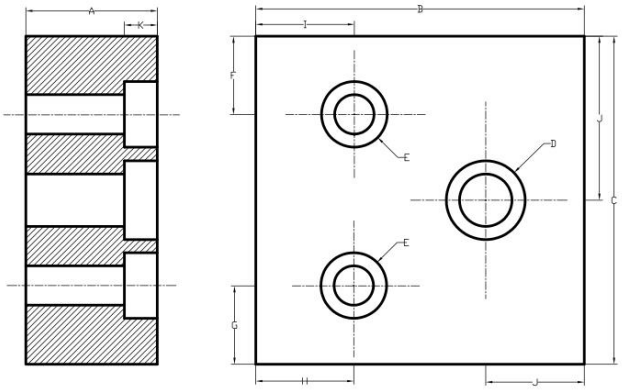
Raw material 50mm X 50mm X 20 mm thick M.S. Flat

1. Drilling & Tapping



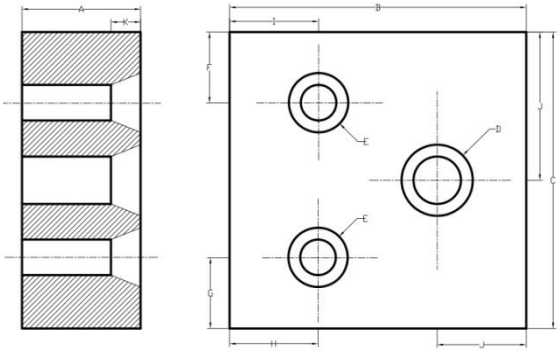
Dimensions			
Sl.No	Part Name	Actual	Obtained

2. Drilling & Counter boring



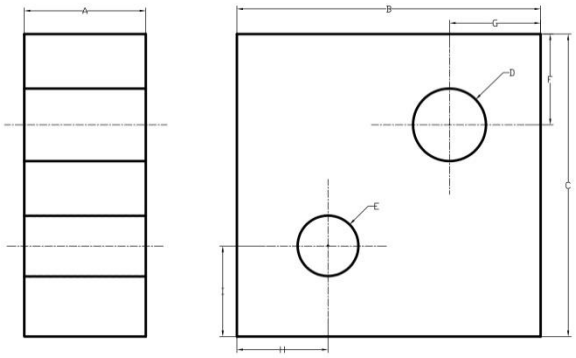
Dimensions			
Sl.No	Part Name	Actual	Obtained

3. Drilling & Counter sinking



Dimensions			
Sl.No	Part Name	Actual	Obtained

4. Drilling and Reaming – Radial drilling machine



Dimensions			
Sl.No	Part Name	Actual	Obtained

BOARD EXAMINATION

Note: All the exercises in both sections have to be completed. Two exercises will be given for examination by selecting one exercise in each section. All the exercises should be given in the question paper and students are allowed to select by a lot.

Record note book should be submitted during examination.

Lathe	**:**	**45 marks (2hours)**
Procedure / Preparation	10	
Machining / Dimensions	25	
Surface Finishing	10	
Drilling	**:**	**25 marks (1 hour)**
Procedure / Marking	10	
Dimensions	10	
Surface Finishing	5	
Viva-voce	**:**	**05 marks**
Total	**:**	**75 marks**

CENTRAL POLYTECHNIC COLLEGE

(AN AUTONOMUOUS INSTITUTION)

DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017 onwards

II YEAR

IV SEMESTER

MEC470– WORK SHOP PRACTICE -III

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC470**

Semester : IV

Subject Title : **WORK SHOP PRACTICE –III**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Work Shop Practice – III	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

At the end of the course the student will be able to :

- Identify a shaping machine and its parts.
- Identify a planing machine and its parts.
- Identify a slotting machine and its parts.
- Identify a milling machine and its parts.
- Identify a cylindrical grinder, surface grinder and tool and cutter grinder.
- Identify the tools and instruments.
- Identify the work holding devices.
- hold the work in proper work holding devices
- Set the tools in shaping, planning and slotting.
- Mount the cutter in the milling machine arbour.
- operate the dividing head and index plate
- calculate the indexing for work
- Operate shaping, planing, slotting, milling and grinding machines.
- Set tools in turret and capstan lathe.

Syllabus:

1. Introduction to shaping machine and its parts.
2. Introduction to planing machine and its parts.
3. Introduction to slotting machine and its parts.
4. Introduction to milling machine and its parts.
5. Introduction to grinding machine and its parts.
6. Introduction to turret and capstan lathe.
7. Introduction to work holding devices.
8. Types of tools used in shaping, planing and slotting machines.
9. Types of cutter used in milling machine.
10. Types of grinding wheels used in grinding machines.
11. Types of tools used in turret and capstan lathes.
12. Setting of work, tools and cutters in shaping, planing, slotting and grinding machines.
13. Operation performed in shaping, planing, slotting, milling and grinding machines.
14. Operation of shaping, planing, slotting, milling and grinding machines.

Scheme of Examination:

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

(ii) Dimensions of the component may be changed depending upon the availability of standard dimensioned material without omitting any operations.

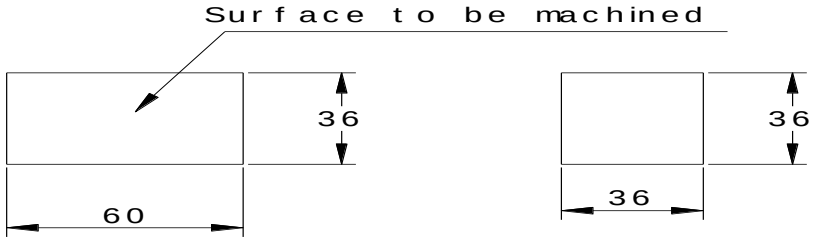
ALLOCATION OF MARKS

Job preparation/Marking	:	15
Machining/ operations	:	35
Dimensioning/surface finish	:	25
Viva-Voce	:	05

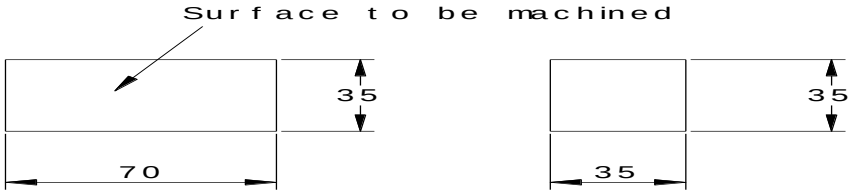
Total	=	75 marks

EXERCISES:

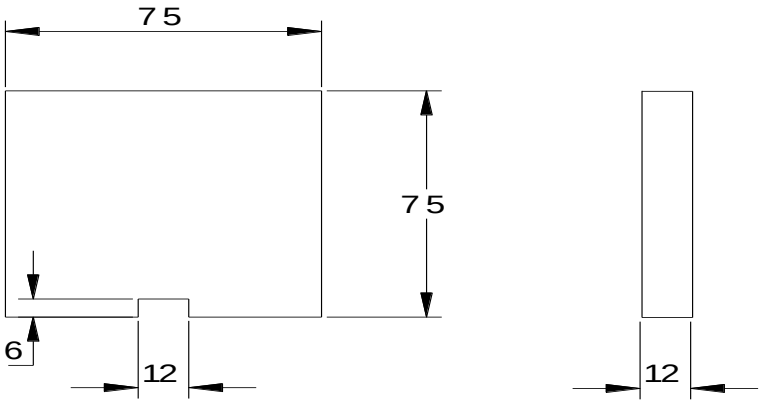
1. Study of Shaping machine and machine a flat surface



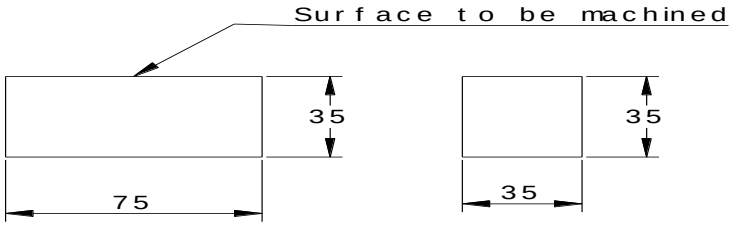
2. Study of Planing machine and machine a flat surface



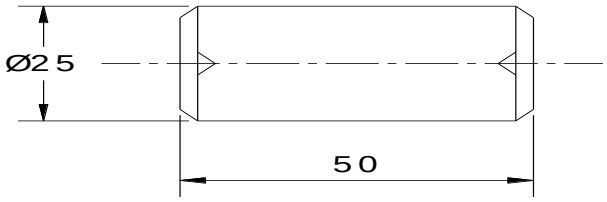
3. Study of slotting machine and machine a simple slot.



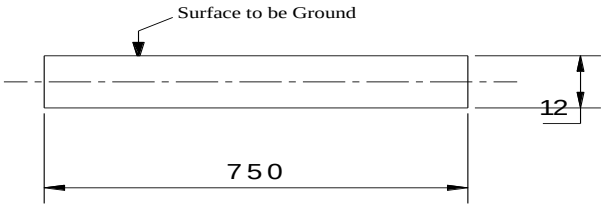
4. Study of Milling machine and machine a plane surface using plain milling cutter.



5. Study of Cylindrical grinder and grind a cylinder



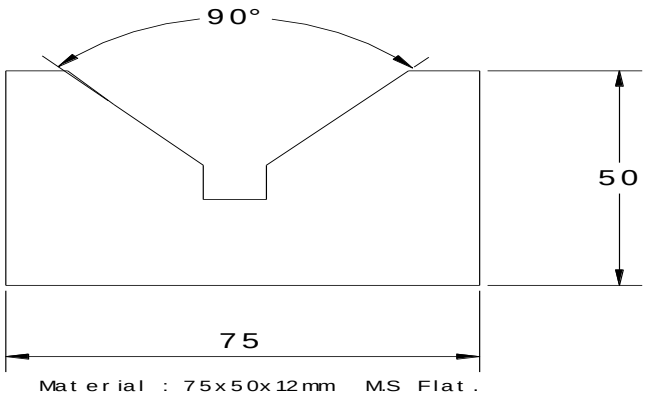
6. Study of surface grinder and grind a plane surface



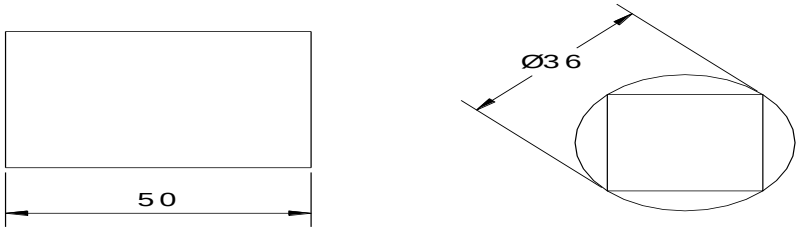
7. Study of tool and cutter grinder

8. Study of turret and capstan lathe and setting of tools to make simple component.

9. Shaping a V- Block



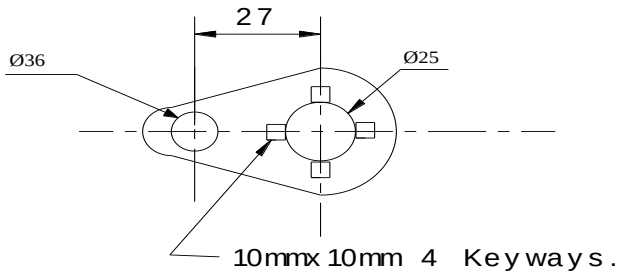
10. Planing a square



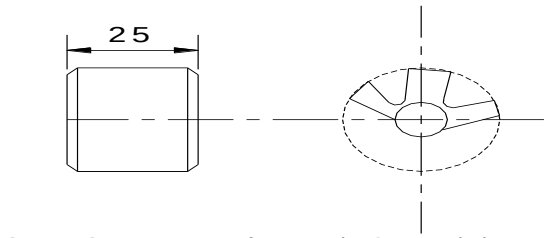
Material: Ø36mmx50mm M.S Round Rod

11. **Slotting :**

Drilling holes in Radial drilling machine. Making internal keyway and machining an external profile

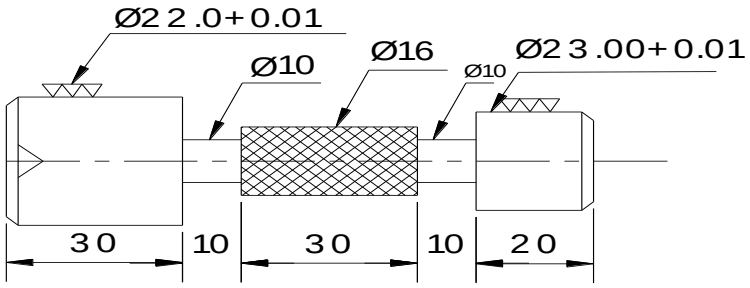


12. Gear Cutting in milling machine.



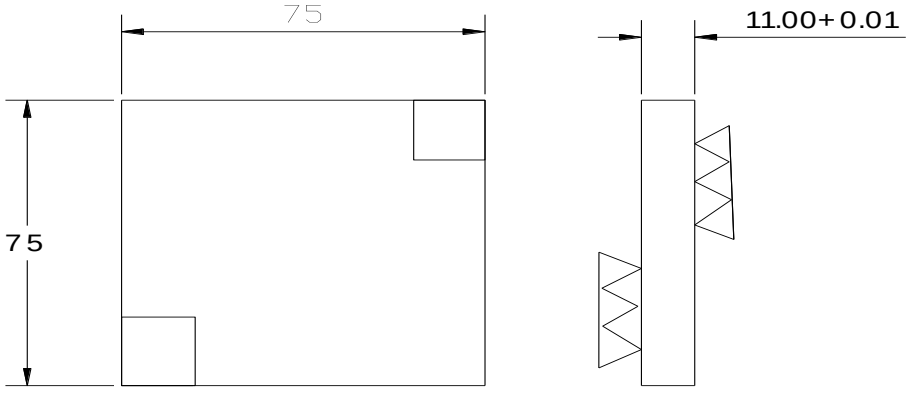
Spur Gear 1. No. of Teeth- 24 Module - 2mm
Spur Gear 2. No. of Teeth- 17 D.P - 10

13. Grinding a cylinder in cylindrical Grinding machine.



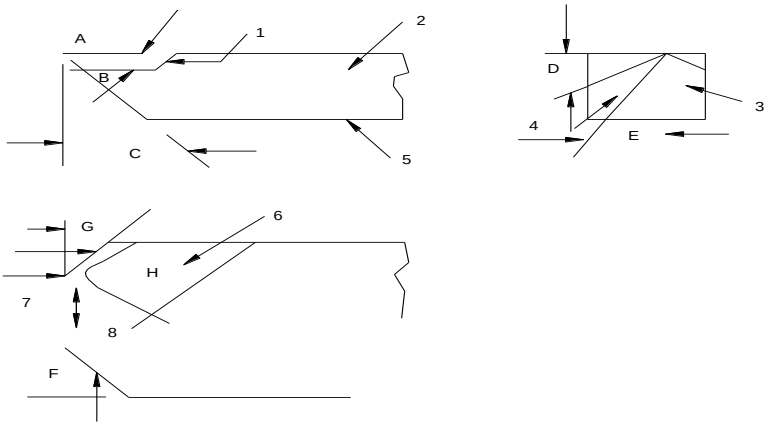
Material: Ø25x100mm MS Round Rod.

14. Grinding a Flat surface in surface grinder



Material:75x75x12mm

15. Grinding a single point cutting tool in tool and cutter grinder



A	-	Top rake angle	1 & 6	-	Face
B	-	Lip angle	2	-	Shank
C	-	Front clearance angle	3	-	Side flank
D	-	Side rake angle	4	-	End flank
E	-	End clearance angle	5	-	Base
F	-	Side cutting edge angle	6	-	End cutting edge
G	-	End cutting edge angle	7	-	Nose
H	-	Nose angle	8	-	Side cutting edge
			9	-	Nose radius

CENTRAL POLYTECHNIC COLLEGE

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DIPLOMA IN MECHANICAL ENGINEERING

C - SCHEME

2016 -2017 onwards

III YEAR

V SEMESTER

MEC510– DESIGN OF MACHINE ELEMENTS

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC510**

Semester : V

Subject Title : **DESIGN OF MACHINE ELEMENTS**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Design of Machine Elements	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	6	90	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	**Topics**	**Hours**
I	ENGINEERING MATERIALS, JOINTS & FASTENERS	17
II	DESIGN OF SHAFTS, KEYS AND COUPLINGS	17
III	DESIGN OF FRICTION DRIVES (FLAT BELT AND V-BELT)	17
IV	DESIGN OF BEARINGS	16
V	DESIGN OF LEVERS AND SPUR GEARS	16
	REVISION AND TEST	7
	TOTAL	**90**

OBJECTIVES:

Students must be able to:

- To study about the Design of riveted joints, welded joints, sleeve and cotter joint and knuckle joint.
- To know about the Design of eye bolts, cylinder cover studs.
- To learn about the Design of shafts, keys and couplings required for power transmission.
- To know about the different types of couplings.
- To study about the Design of flat and V-belt for power transmission.
- To Study about the various types of bearings and their applications.
- To know about the Design of journal bearings.
- To study about the Design of spur gear
- To know the Design of hand lever, foot lever and cranked lever.

DESIGN OF MACHINE ELEMENTS

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**ENGINEERING MATERIALS, JOINTS AND FASTENERS**	**17**

General Considerations in Machine Design. Engineering materials - Factors affecting selection of material – BIS designation of Ferrous materials – Preferred number - Factor of safety and allowable stress – Procedure for designing machine elements – Types of failures

Stresses: Tension, Compression, Shear, Bearing pressure Intensity, Crushing, bending and torsion - problem. Creep strain and Creep Curve- Fatigue, S-N curve, Endurance Limit - Stress Concentration – Causes & Remedies. Theories of Elastic Failures – Principal normal stress theory, Maximum shear stress theory & maximum distortion energy theory.

Joints: Design of sleeve and cotter joint, knuckle joint and welded joint.

Fasteners: Design of bolted joints - eye bolts- cylinder cover with bolts, studs – pins.

II DESIGN OF SHAFTS, KEYS AND COUPLINGS 17

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).

III DESIGN OF FRICTION DRIVES (Flat belts and V-belts) 17

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.

IV DESIGN OF BEARINGS 16

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.

V DESIGN OF LEVERS AND SPUR GEARS 16

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).

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.

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.

MEC510 DESIGN OF MACHINE ELEMENTS

MODEL QUESTION PAPER

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/mm2, 125 N/mm2 and 70 N/mm2 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/mm2. 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/mm2 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/mm2.	**(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/mm2; Crushing stress for bolt and key = 80N/mm2; Shear stress for C.I. = 8 N/mm2.	**(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 at1200rpm. 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 = 30x10-6; Permissible bearing pressure 0.7 to 1.4 N/mm2; 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:- **(15)**

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/ mm2 and shear stress for the shaft material is 40 N/mm2

(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:- **(15)**

(i) Type of load and service: steady load 8-10 hours per day.

(ii) Velocity factor CV=4.5/ (4.5+V), where V – velocity in m/sec.

(iii) Surface endurance limit σes= 630N/mm2.

(iv) E for steel = 2x105 N/mm2.

(v) E for Cast Iron = 1x105 N/mm2.

(vi) Assume deformation factor, C = 320kN/m.

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 - 2017 onwards

III YEAR

V SEMESTER

MEC520 – THERMAL ENGINEERING

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC520**

Semester : V

Subject Title : **THERMAL ENGINEERING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Thermal Engineering	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topics	Hours
I	FORMATION OF STEAM AND EXPANSIONS OF STEAM	17
II	STEAM BOILERS AND PERFORMANCE OF BOILERS	17
III	THERMAL POWER PLANT - STEAM TURBINES & STEAM CONDENSERS	17
IV	ENERGY ENGINEERING AND MANAGEMENT	16
V	REFRIGERATION AND AIR CONDITIONING	16
	REVISION AND TEST	7
	Total	90

OBJECTIVES:

Students must be able to:

- To learn about the various types of steam.
- To learn about the of boiler and various types of boilers
- Familiarize boiler mountings and accessories.
- To learn about the various circuits used in the steam power plant.
- to study about the working of a nuclear power plant.
- To learn about the the application of refrigeration and air- conditioning
- To learn about the the various parameters used in psychometry
- To learn about the different types of refrigeration & air- conditioning system.

THERMAL ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**FORMATION OF STEAM AND EXPANSIONS OF STEAM**	**17**
	Introduction-formation of steam-t-h diagram-t-v-diagram-t-s-diagram phase diagram-critical conditions-enthalpy of water-enthalpy of evaporation-conditions of steam-wet, dry and superheated steam-advantages of superheated steam-dryness fraction-enthalpy of wet, dry and superheated steam-specific volume of water and steam-density of steam-external work of evaporation-internal latent heat-internal energy of steam-entrophy of water and steam-steam tables-Mollier chart-problems. Expansion processes of steam-constant volume, constant pressure, constant temperature, hyperbolic, isentropic, polytropic and throttling processes-problems. Steam calorimeters-bucket, combined separating and throttling calorimeters-problems.	
II	**STEAM BOILERS AND PERFORMANCE OF BOILERS**	**17**
	Classification of boilers-high pressure boilers-Lamount and BHEL high pressure boilers-advantages of high pressure boilers, boiler mountings-function, construction and working-boiler accessories-function, construction and working-comparison of mountings and accessories-feed water treatment-methods-starting boiler from cold condition- safety	

precautions in boiler operation-Indian boiler act. Performance of boilers-actual, equivalent and factor of evaporation-boiler efficiency-Factors influencing boiler efficiency-boiler power-problems-efficiency of economizer and super heater-problems-boiler trail-heat losses in a boiler-heat balance sheet-problems.

III THERMAL POWER PLANT – STEAM TURBINE & STEAM CONDENSERS **17**

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 -pollutant and effects of pollution-pollution control-cyclone separator-wet scrubber-electrostatic precipitator-control of No2 and SO2. Steam turbine-steam power cycle-Carnot, Rankine and modified Rankine cycles-classification of steam turbine-necessity of compounding-Industrial turbines. Steam condenses - elements of condensing plant-classification of condensers-jet condenser types-surface condensers-types-merits and demerits of surface condensers-sources of air in condenser vacuum-vacuum efficiency-condenser efficiency-mass of cooling water required-mass of air present-number of tubes-problems.

IV ENERGY ENGINEERING AND MANAGEMENT **16**

Nuclear fuels-requirements-fissile and fertile fuels-Nuclear fission and fusion-chain reaction-radio activity-layout of nuclear power plant-merits and demerits-Nuclear reactors-classification-components of nuclear reactor-reactor core-moderators-control rods-coolant-reflectors-biological shield- and reactor vessel, functions and materials-pressurised water reactor-boiling water reactor-Candu type reactor-fast breeder reactor-effect of nuclear radiation – fuel cycle-disposal floating nuclear power plant, uranium enrichment methods of nuclear wastes-comparison of nuclear power plants with thermal power plants.

V REFRIGERATION AND AIR CONDITIONING **16**

Refrigeration-refrigerators and heat pumps-types and applications of refrigeration-vapour compression refrigeration system-vapour absorption system-comparison-refrigerating effect-capacity of refrigerating unit-C.O.P-actual C.O.P-power required-mass of ice produced-problems-C.O.P of reversed Carnot cycle-Bell-Coleman cycle- problems-

refrigerants-desirable properties-classification of refrigerants.

Air conditioning-psychometric properties-dry air-moist air-water vapour-saturated air-dry bulb temperature-wet bulb depression-dew point depression-dew point temperature-humidity-specific and relative humidity-psychometric chart-psychometric processes-sensible heating and cooling-humidification-dehumidification-simple problems using psychometric chart-air conditioning-classification and applications of air conditioning system-room air conditioning -central air conditioning-comparison-differences between comfort and industrial air conditioning-factors to be considered in air conditioning-loads encountered in air conditioning systems.

Text Books:

1. P.L.Ballaney, Thermal Engineering, Edn. 24, Khanna Publishers, 2B, North Market, Naisarak, New Delhi 110 006.

2. R.S.Khurmi and J.K.Gupta, Thermal Engineering, Edn. 18, published by S. Chand & Co., Ram Nagar, New Delhi 110 055.

Reference Books:

1. R.K.Rajput, Thermal Engineering

2. B.K.Sarkar, Thermal Engineering, Edn. 3, 1998, published by Dhanpat Rai & Sons, 1982, Naisarak, New Delhi 110 006.

3. S.Domkundwar, A.V.DomkundwarS.C.Arora, Power plant Engineering

4. Nagpal, Power plant Engineering, Edn. 8, published by by 24, Khanna Publishers, 2B, North Market, Naisarak, New Delhi 110 006.

5. P.C.Sharma, Power plant Engineering

6. G.D.Rai, Non Conventional Energy sources, Edn.4, Published by 24, Khanna Publishers, 2B, North Market, Naisarak, New Delhi 110 006.

7. P.L.Ballaney, Refrigeration and Air condition, Edn. 4, published by by 24, Khanna Publishers, 2B, North Market, Naisarak, New Delhi 110 006.

8. Manohar Prasad, Refrigeration and Air-condition, 1993, Edn. Published by H.S.Popali for Wiley Eastern Ltd., 4835/24 Ansari Road, Daryaganj, New Delhi 110 053.

CENTRAL POLYTECHNIC COLLEGE

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 - 2017 onwards

III YEAR

V SEMESTER

MEC530– INDUSTRIAL ENGINEERING AND MANAGEMENT

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC530**

Semester : **V**

Subject Title : **INDUSTRIAL ENGINEERING AND MANAGEMENT**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

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

Topics and Allocation of Hours:

UNIT NO.	**TOPIC**	**HOURS**
I	PLANT ENGINEERING AND PLANT SAFETY	14
II	WORK STUDY, METHOD STUDY AND WORK MEASUREMENT	14
III	PRODUCTION PLANNING AND QUALITY CONTROL	14
IV	PRINCIPLES, PERSONNEL MANAGEMENT AND ORGANIZATIOAL BEHAVIOR	13
V	FINANCIAL AND MATERIAL MANAGEMENT	13
	REVISION AND TEST	7
	TOTAL	**75**

OBJECTIVES:

Students must be able to:

- To study the different types of layout.
- To study the safety aspects and its impacts on an organization.
- To study different work measurement techniques.
- To study production planning and control and its functions.
- To study basic and modern management techniques.
- To study the staff selection procedure and training of them.
- To study capital and resources of capital.
- To study inventory control system.
- To study about organization and it's behaviour.

INDUSTRIAL ENGINEERING AND MANAGEMENT

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**PLANT ENGINEERING AND PLANT SAFETY**	**14**
	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.	

II	**WORK STUDY, METHOD STUDY AND WORK MEASUREMENT**	**14**

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).

III	**PRODUCTION PLANNING AND QUALITY CONTROL**	**14**

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.

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.

IV **PRINCIPLES, PERSONNEL MANAGEMENT AND ORGANIZATIOAL BEHAVIOR** **13**

Principles of Management: Definition of management – Administration - Organization – F.W. Taylor's and Henry Fayol's Principles of Management – Functions of Manager – 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 – Strategic management – SWOT Analysis --Business Process Re-engineering (BPR) – Enterprises Resource Planning (ERP) –Supply Chain Management (SCM) – Activity Based Management (ABM) – Global Perspective – Principles and brief description.

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.

Organizational behavior: Definition – organization--Types of Organization – Line, Staff,Taylor's Pure functional types – Line and staff and committee type –Organizational Approaches, individual behavior—causes—Environmental effect—Behavior and Performance, Perception-organizational implications.

V **FINANCIAL AND MATERIAL MANAGEMENT** **13**

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.

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.
3) Herald Koontz and Heinz Weihrich,'Essentials of Management',McGraw Hill Publishing Company,Singapore International Edition.Latest

Reference Books :

1) Management, A global perspective, Heinz Weihrich, Harold Koontz, 10th Edition, McGraw Hill International Edition.Latest.
2) Essentials of Management, 4th Edition, Joseph L.Massie, Prentice-Hall of India, New Delhi 2004.
3) S.Chandran,OrganizationalBehaviours,Vikas Publishing House Pvt. Ltd. Latest
4) M.Govindarajan and S.Natarajan,Principles of Management,Prentce Hall of India Pvt.Ltd.NewDelhi.Latest.

CENTRAL POLYTECHNIC COLLEGE

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 - 2017 onwards

III YEAR

V SEMESTER

ELECTIVE THEORY - I

MEC541 – REFRIGERATION AND AIRCONDITIONING

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC541**

Semester **:** V

Subject Title **:** ÈLECTIVE THEORY - I **REFRIGERATION AND AIR CONDITIONING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
Refrigeration and Air-Conditioning	5	75	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	**Topics**	**Hours**
I	REFRIGERATION SYSTEM AND REFRIGERATION EQUIPMENTS	14
II	VAPOUR COMPRESSION & ABSORPTION REFRIGERATION SYSTEM AND CRYOGENIC REFRIGERATION SYSTEMS	14
III	REFRIGERATION FLOW CONTROLS, REFRIGERANTS AND LUBRICANTS AND APPLICATIONS OF REFRIGERATION	14
IV	PSYCHOMETRICS AND COMFORT AIR CONDITIONING SYSTEMS	14
V	COOLING LOAD CALCULATIONS AND DUCT DESIGN , ENERGY CONSERVATION TECHNIQUES	14
	REVISION AND TEST	5
	Total	**75**

OBJECTIVES:

Students must be able to:

- Explain the working of open and closed air system of refrigeration.
- Describe the working and construction of compressors used for air conditioning.
- Explain the vapour compression refrigeration system.
- Explain the vapour absorption refrigeration system.
- Compare the properties and applications of various refrigerants.
- Define the parameters used in psychrometry.
- Use Psychrometric 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.	14

II	**VAPOUR COMPRESSION REFRIGERATION SYSTEM ,VAPOUR ABSORPTION REFRIGERATION SYSTEM AND CRYOGENIC REFRIGERATION SYSTEMS**	**14**

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--GifferedMcMohan refrigerator- refrigerators for below 2 K - Magnetic refrigeration systems.

III	**REFRIGERATION FLOW CONTROLS, REFRIGERANTS AND LUBRICANTS AND APPLICATIONS OF REFRIGERATION**	**14**

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.

IV	**PSYCHOMETRICS AND COMFORT AIR CONDITIONING SYSTEMS**	**14**

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 .

V COOLING LOAD CALCULATIONS AND DUCT DESIGN , ENERGY CONSERVATION TECHNIQUES **14**

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).

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, 199 Edn.49, West 23rd Street, New York. - 1998
4) Refrigeration and air conditioning, C.P Arora,
5) Cryogenic systems Randell Fd Barron.

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017onwards

III YEAR

V SEMESTER

ELECTIVE THEORY - I

MEC542 – METROLOGY AND QUALITY CONTROL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC542**

Semester **:** V

Subject Title **:** ÈLECTIVE THEORY - I **METROLOGY AND QUALITY CONTROL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Metrology and Quality control	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	5	75	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

TOPICS AND ALLOCATION OF HOURS

Unit	**Topic**	**Hours**
I	INTRODUCTION TO METROLOGY	14
II	SCREW THREAD MEASUREMENTS – GEAR MEASUREMENT AND TESTING	14
III	TESTING TECHNIQUES	14
IV	QUALITY CONTROL	14
V	ELEMENTRY STATISTICS & IT'S APPLICATION IN QUALITY CONTROL	14
	REVISION AND TEST	5
TOTAL		75

OBJECTIVES:

Students will be able to:

- Define accuracy, precision, calibration, sensitivity, repeatability and such relevant terms in metrology.
- Select appropriate instrument/s for specific measurement.
- Analyze and interpret the data obtained from the different measurements processes and present it in the graphical form, statistical form.
- Construct and draw the control charts.
- Understand ISO certification procedure and quality system.

METROLOGY AND QUALITY CONTROL

DETAILED SYLABUS

Unit	Name of the Topic	Hours
I	**INTRODUCTION TO METROLOGY**	**14**

1.1 Metrology Basics-Definition of metrology, Categories of metrology, Scientific metrology, Industrial metrology, Legal metrology, Need of inspection, Precision, Accuracy, Sensitivity, Readability, Calibration, Traceability, Reproducibility, Sources of errors, Factors affecting accuracy, Selection of instrument, Precautions while using an instruments for getting higher precision and accuracy.

1.2 Standards and Comparators- Definition and introduction to line standard, end standard, Wavelength standard, Slip gauge and its Accessories, Length bars. Definition, Requirement of good comparator, Classification, use of comparators, Working principle of comparators, Dial indicator, Sigma comparator, Pneumatic comparator, Electrical, Electronic, Relative advantages and disadvantages.

1.3 Limits, Fits ,Tolerances and Gauges – Concept of Limits, Fits, And Tolerances, Selective Assembly, Interchangeability, Hole And Shaft Basis System, Taylor's Principle, Design of Plug, Ring Gauges, IS919-1993 (Limits, Fits & Tolerances, Gauges) IS 3477-1973, concept of multi gauging and inspection.

1.4 Angular Measurement – Concept, Instruments For Angular, Measurements, Working And Use of Universal Bevel Protractor, Sine

Bar, Spirit Level, Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges).

II Screw thread Measurements – Gear Measurement and Testing **14**

2.1 Screw thread Measurements – ISO grade and fits of thread, Errors in threads, Pitch errors, Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch , Two wire method, Thread gauge micrometer, Working principle of floating carriage dial micrometer.

2.**2 Gear Measurement and Testing** – Analytical and functional inspection, Rolling test, Measurement of tooth thickness (constant chord method), gear tooth vernier, Errors in gears such as backlash, runout, composite .

III Testing Techniques **14**

3.1 Measurement of surface finish – Primary and secondary texture, Sampling length, Lay, terminology as per IS 3o73- 1967, direction of lay, Sources of lay and its significance, CLA, Ra, RMS, Rz values and their interpretation, Symbol for designating surface finish on drawing, Various techniques of qualitative analysis, Working principle of stylus probe type instruments.

3.2Machine tool testing – Parallelism, Straightness, Squareness, Coaxiallity, roundness, run out, alignment testing of machine tools as per IS standard procedure.

IV Quality Control **14**

Quality : Definitions, meaning of quality of product & services, Quality characteristics, Quality of design, Quality of conformance, Quality of performance, Concept of reliability, Cost, Quality assurance, Cost of rework & repair, Quality & Inspection, Inspection stages.

Total Quality Management :

1) Principles of total quantity management.

i) Customer focus.

ii) Commitment by top management.

iii) Continuous improvement – PDCA, Quality Circles.

iv) Employee empowerment (JIDoKA).

2) Quality Audit : Concept of audit practices, lead assessor certification.

3) Six sigma : Statistical meaning, methodology of system Improvement, DMAIC cycle, Yellow belt, Green belt, Black belt certification.

ISO 9000 Series & other standards – Concept , ISO 9000 series quality standards, QS14ooo,Standards in general, Its evaluation & Implications, necessity of ISO certification, other Quality systems

V Elementry Statistics & it's application in quality control **14**

5.1 Statistical quality control – Meaning and importance of SQC, Process capability of machine, determination of statistical limits, different possibilities, Rejection area, Statistically capable and incapable processes, Cp, Cpk.

5.2 Acceptance Sampling – Concept, Comparison with 100% inspection, Different types of sampling plans, with merits and demerits, OC curve, It's importance and significance, Producers risk, Consumer's risk, AQL, AOQL, IQL, LTPD

Learning Resources:

1. Books

SL. No.	Author	Title	Publisher and address
1	R. K. Jain	Engineering metrology	Khanna Publisher, Delhi.
2	J.F.W. Galyer and C. R. Shotbolt	Metrology for Engineers	ELBS
3	K. J. Hume	Engineering Metrology	Kalyani publishers
4	I.C. Gupta	A text book of Engineering metrology	Dhanpat Rai and Sons,
5	M. Adithan and R. Bahn	Metrology Lab. Manual	T.T.T.I. Chandigarh.
6	M. Mahajan	Statistical Quality Control	Dhanpat Rai and Sons ,
7	T.T.T.I. Chennai	Quality control	Tata McGraw Hill,
8	Juran U.M. and Gryna	Quality planning and analysis	Tata McGraw Hill,
9	National productivity council	Inspection and quality control	N.P.C., New Delhi.

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DIPLOMA IN MECHANICAL ENGINEERING

C - SCHEME

2016 -2017 onwards

III YEAR

V SEMESTER

MEC550– HEAT POWER ENGINEERING PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name	**:**	DIPLOMA IN MECHANICAL ENGINEERING
Course Code	**:**	1020
Subject Code	**:**	**MEC550**
Semester	**:**	V
Subject Title	**:**	**HEAT POWER ENGINEERING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
	Hours/ Week	**Hours/ Semester**	**Marks**			**Duration**
Heat Power Engineering Practical	4	60	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

Students must be able to:

- Determine the flash and fire point and viscosity of oil.
- Identify the parts of petrol engine and their functions.
- Identify the parts of diesel engine and their functions.
- Draw the valve timing diagram.
- Draw the port timing diagram.
- 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.

Study Exercise: (Not for examinations)

1. Study of petrol engine and diesel engine and its components.
2. Study of high pressure boiler.
3. Study of boiler mountings and Accessories.

List of Experiments:

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 two stroke engines.
6. Valve time diagram for four stroke engines.
7. Load test (Performance test) on Petrol Engine.
8. Load test (Performance test) on diesel Engine.
9. Morse test on multi Cylinder petrol engine.
10. Heat balance test on IC engine.
11. Volumetric efficiency of Air Compressor.
12. Thermal conductivity measurement by guarded plate.
13. Effectiveness of parallel/ counter flow heat exchangers.

Scheme of Examination:

Two Experiment	: 70 (Each 35 Marks)
Viva Voce	: 05 Marks
Total	: 75 Marks

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DIPLOMA IN MECHANICAL ENGINEERING

C - SCHEME

2016 - 2017 onwards

III YEAR

V SEMESTER

C0001 LIFE AND EMPLOYABILITY SKILLS PRACTICAL**

C – SCHEME

(Implemented from the Academic year 2016 – 2017 onwards)

Course Name : All Branches of Diploma in Engineering

Course Code : 1020

Subject Code : **C0001**

Semester : V

Subject Title : **Life and Employability Skills**

TEACHING AND SCHEME OF EXAMINATION

No. of Weeks per Semester : 15 Weeks

Subject	Instructions		Examination			
Life and Employability Skills Practical	Hours / Week	Hours / Semester	Marks			Duration
	4 Hrs.	60 Hrs.	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours

Unit	Topic	Hours
1	**Part A** Communication	30
2.	**Part B** Entrepreneurship, Project Preparation, Productivity, Occupational Safety, Health Hazard, Life Skills	20
3.	**Part C** Environment, Global Warming, Pollution, Communal Harmony	10
	TOTAL	60

RATIONALE

The present scenario unfolds a series of challenges that require a mastery of life skill. To confront with the challenges in the changing job environment and also to keep up with the rapid pace of modern life, life skills are to be honed and nurtured. Apart from

the good understanding of the subject, the ability to communicate what one has in mind alone can take a student to greater heights. In an attempt to develop the communication skill, thereby, making them employable, the syllabus has been devised and titled as “Life and Employability Skills”. At the end of the course, the students become viable in the job market and with the aid of the life skill they have acquired they can maintain their poise and mental equilibrium even in a stressful work environment.

SPECIFIC INSTRUCTIONAL OBJECTIVES

TO

1. Emphasize and Enhance Speaking Skills
2. Increase Ability to Express Views & Opinions
3. Develop and Enhance Employability Skills
4. Induce Entrepreneurial skills
5. Accentuate Life Skills for Effective Managerial Ability

LIFE AND EMPLOYABILITY SKILLS PRACTICAL SYLLABUS

Unit	Topics	Activity	Hours
I	Communication, Vocabulary Enrichment, Listening, Training, Facing Interviews, Behavioural Skills	_ “Wordsmithy” (Words within a word ,a vocabulary game) -- Visual Description -- FAQs in interviews self- introduction/another higher official in company – describe/explain product – frame questions based on patterns – make sentences based on patterns	**30**
II	Entrepreneurship, Project Preparation	-- prepare an outline of a project to obtain loan from bank in becoming an entrepreneur – prepare a résumé	**10**
III	Productivity – comparison with developed countries, Effective Management, Occupational Accident &First Aid, Labour Welfare Acts & Rights	-- search in the website -- prepare a presentation – discuss & interact	**05**

IV	Interview Techniques, Effective Persuasive Communication, Non verbal Communication, Intercultural Communication, Business Etiquettes	-- search in the website -- prepare a presentation – discuss & interact	**05**
V	Environment, Global Warming, Pollution, Communal Harmony	-- taking down notes / hints – answering questions -- filling the blanks with the exact words heard	**10**

LEARNING STRUCTURE **100 Marks**

-- Focus more on Speaking & Listening Skills

-- Attention less on Reading & Writing Skills

-- Apply the skills in fulfilling the Objectives on Focused Topics

a) Listening **25**

Marks

1. Deductive Reasoning Skills (taking down notes/hints) **10**
2. Cognitive Skills (answering questions) **10**
3. Retention Skills (filling in the blanks with the exact words heard) **05**

b) Speaking Extempore/ Prepared **30**

Marks

1. Expressive Skills (describe/explain things) **10**
2. Interview Skills&Behavioural skills(answering Questions in an interview) **05**
3. Assertive Skills (introducing oneself/others) **05**
4. Fluency/Compatibility Skills (dialogue) **05**
5. Leadership/Team Spirit Skills (group discussion) **05**

c) Writing & Reading **20**

Marks

1. Vocabulary Enrichment **05**

2.a. Creative & Reasoning Skills (frame questions on patterns) **03**

b. Creative & Composing Skills (make sentences on patterns) **02**

3. Attitude & Aim Skills (prepare a résumé) **05**

4. Entrepreneurship Skills (prepare an outline of a project) **05**

d) Continuous Assessment (Internal Marks) 25 Marks

(search,read, write down, speak, listen, interact & discuss)

1. Cognitive Skills (Google search on focused topics)

2. Presentation Skills& Interactive Skills (after listening, discuss)

Note down and present in the Record Note on any 5 topics (Focused Topics) 10 Marks

Other activities recorded in the Record note(All the exercises in the syllabus under Listening, Speaking, Writing & Reading) 10 Marks

Attendance 05 Marks

INTERNAL MARKS 25 MARKS

EXTERNAL MARKS AT THE END EXAMINATION 75 MARKS

MODEL QUESTION

Time: 3 Hours **Maximum Marks: 75**

A. LISTENING **25 Marks**

1. Listen to the content and take down notes/hints 10
2. Listen to the content and answer the following questions. 10
3. Listen to the content and fill in the blanks with the exact words heard. 05

B. SPEAKING **30 Marks**

1. Describe the given picture/illustration in your own words 05
2. Imagine you are in an interview and answer the questions 05
3. Imagine, a consultant has come to your department. Introduce him to your subordinates. 05
4. Speak with your immediate boss about the progress you have made .(Dialogue) 05
5. Discuss within the group on the topic of focus in the syllabus. 10

C. WRITING & READING **20 Marks**

1. Find at least five different words (atleast 4 letters long) within the word ENTERTAINMENT. 05

2.a. Frame THREE new questions from the given pattern by changing sets of words with your own. 03

a.	When	do	you	return?
b.	How	is	his performance?	
c.	Where	has	the manager	gone?

b. Make TWO sentences from the given pattern by changing sets of words with your own. 02

a.	The workers	are	on strike		
b.	The laborers	are paid	well	in this factory.	

3. Imagine you are Selvan S.Mohan of Chennai. Prepare a resume for the post of Department Manager. 05

4. Prepare an outline of a project to obtain a loan. 05

(Provide headings and subheadings)

I. Guidelines for setting the question paper:

A. LISTENING : ONLY TOPICS related to POLLUTION /ENVIRONMENT / GLOBAL WARMING / COMMUNAL HARMONY are to be taken.

These topics are common for all the three types of evaluation.

For 1.& 2. A passage of a minimum of 100 words may be chosen 3. A passage of a minimum of 50 words may be given

B. SPEAKING :

1. A VISUAL / an ILLUSTRATION from the Daily / Magazine can be given.
2. Frequently asked questions in the interviews may be put forth to the students .
3. Questions such as “Introduce yourself as an engineer with Designation” or “Introduce the official visiting your company/department” may be asked.
4. Dialogue must be with someone in the place of work.
5. Group of six/eight, Discuss the focused topic prescribed in syllabus

C. WRITING & READING:

1. Word smithy -Words within a word- a vocabulary game
    a. Words should be at least 4 letters long
    b. Proper nouns do not count
    c. Letters cannot be duplicated.

2. a. & b. provide five (Questions under section A and Statements under section B).different structures. Students are to substitute and make at least 3 questions from a) and two from b) with some other word/words.
3. Provide some post related to industries.
4. Outline of the project (skeleton/structure)

Only the various headings and subheadings are to be provided. Content is not needed

II. Guidelines for recording the material on the Focused Topics in the Record note

Write in the record note, **on any five topics**, from the list of topics given below. **10 Marks**

(5 topics x 10 marks = 50 marks. Thus, the **Average of 5 topics is 10 Marks)**

1. Interview Techniques
2. Effective Persuasive Communication.
3. Non verbal Communication.
4. Intercultural Communication.
5. Business Etiquettes.
6. Entrepreneurship
7. Effective Management
8. Productivity in Industries – Comparison with developed countries
9. Occupational Accident and First Aid
10. Labor Welfare Acts and Rights

LABORATORY REQUIREMENT:

1. An echo-free room
2. Necessary furniture and comfortable chairs
3. A minimum of two Computers with internet access
4. A minimum of two different English dailies
5. A minimum of Three Mikes with and without cords

6. Colour Television (minimum size – 29”)
7. DVD/VCD Player with Home Theatre speakers
8. Smart board
9. Projector

Suggested Reading:

1. Production and Operations Management by S.N. Chary, TMH
2. Essentials of Management by Koontz &Weihrich, TMH
3. Modern Production / Operations Management by E.S. Buffa and R.K. Sarin, John Wiley &
Sons
4. Production Systems: Planning, Analysis and Control by J.L.Riggs, 3rd ed., Wiley.
5. Productions and Operations Management by A.Muhlemann, J.Oakland and K.Lockyer,
Macmillan
6. Operations Research - An Introduction by H.A.Taha, Prentice Hall of India
7. Operations Research by J.K.Sharma, Macmillan
8. Business Correspondence & Report Writing by R.C. Sharma and K.Mohan, TMH
9. How to prepare for Group Discussion & Interview (With Audio Cassette) by Prasad, TMH
10. Spoken English – A self-learning guide to conversation practice (with Cassette)
11. Introduction to Environmental Engineering by Mackenzie, L. Davis and A. David, Cornwell, McgrawHill, 3rd Ed.
12. Environmental Engineering by Peary, Rowe and Tchobanoglous, McgrawHill
13. Total Quality Management – An Introductory Text by Paul James, Prentice Hall
14. Quality Control and Applications by Housen&Ghose
15. Industrial Engineering Management by O.P. Khanna
16. Influence:The Psychology of persuasion by Robert B. Cialdini, Collins.
17. Non verbal communication by Albert Mehrabian, Routledge,2007.
18. Indian Business Etiquette by Raghu palat, JAICO, 2008.
19. Intercultural Communication :The Indian Context by Ramesh N Rao & Avinash Thombre,SAGE India, 2015.

CENTRAL POLYTECHNIC COLLEGE

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 - 2017 onwards

III YEAR

V SEMESTER

ELECTIVE PRACTICAL - I

MEC561 – REFRIGERATION AND AIRCONDITIONING PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC561**

Semester **:** V

Subject Title **:** ÈLECTIVE PRACTICAL - I **REFRIGERATION AND AIR CONDITIONING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Elective Practical – I Refrigeration and Air-Conditioning Practical	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	4	60	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

Students will be able to:

- 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 COP of an air conditioner.
- Determine the capacity of a window air conditioner.
- Describe the wiring of refrigerator and coolers.
- Perform servicing on air conditioning system.

EXERCISES:

1. BASIC REFRIGERATIONWORKSHOP OPERATION:

(a) Copper tubing

To study the various sizes of copper tubing.

To study the various tools used for operations.

To become familiar with various operations on copper 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

4. TEST PROCEDURES

1. To determine the refrigerating effect, C.O.P and the compressor capacity of open type system with
   a. Thermostatic expansion valve
   b. Capillary tube
   c. Automatic expansion valve
2. To determine the C.O.P of sealed system by using electrical measurements
3. To determine the capacity of a window air conditioner.
4. To determine the efficiency of a cooling tower.
5. Wiring of refrigerator, water cooler, desert cooler, room air conditioner - packaged air conditioner,panel board etc.
6. Performance valuation of Thermo electric refrigeration system

7. Performance of Vapour absorption refrigeration system

5.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

Scheme of Examination:

ALLOCATION OF MARKS

1. One Question from Test Procedure	: 50
2. One Question from Service Procedure	: 10
3. One Question from Setting and adjusting methods	: 10
4. Viva - voce	: 05
Total	**: 75**

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 - 2017 onwards

III YEAR

V SEMESTER

ELECTIVE PRACTICAL - I

MEC562 – METROLOGY AND QUALITY CONTROL PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC562**

Semester **:** V

Subject Title **:** ÈLECTIVE PRACTICAL - I **METROLOGY AND QUALITY CONTROL PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Elective Practical – I Metrology and Quality Control Practical	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	4	60	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVE

Students will be able to know:

- Selection of appropriate measuring instrument for the measurement of a given job.
- Handle the measuring instrument to judge the accuracy of the component.
- Take care and maintenance of the measuring instruments.
- Determine the dimensional accuracy of different machine tools.
- Inculcate Quality mindedness at all levels of work.
- Implement the Quality management systems at the work place.

EXERCISES:

Metrology:

1 Study basic measuring instruments: surface plate, angle plate, `V' block, spirit level, combination set, straight edge, filler gauge, screw pitch gauge, radius gauge.

2. Use of vernier caliper & micrometer to measure dimensions of given jobs.
3. Use of Slip Gauges to find the unknown gap.
4 To find unknown angle of component using sine bar.
5. Study and use of optical flat for surface finish measurement.
6. Measurement of screw thread elements by using screw thread micrometer.
7. Measurement of screw thread elements by using floating carriage micrometer.
8. Measurement of screw thread elements by using Toolmaker's microscope.
9. Study and use of mechanical comparator, pneumatic comparators and GO-NO GO gauges.
10. Study & use of coordinate measuring Machine.
11. Measurement of gear tooth elements by using profile projector.
12 Measurement of gear tooth elements using Gear tooth vernier caliper.
13. Inspect metal for surface defects using liquid penetrant test.
14. Inspection of metals for surface defects with magnetic particle test
15. Testing of machine tools for flatness, parallelism, perpendicularity for lathe and drilling machine.

Quality Control:

16. Draw the frequency histogram, frequency polygon & ogive curve using given data.
17. To draw the normal distribution curve, standard deviation, variance for the measured data.
18. To draw & interpret the control charts for variables
19. To draw & interpret the control charts for attributes
20. Study of sampling techniques.

Scheme of Examination:

ALLOCATION OF MARKS

1. Metrology	: 40
2. Quality Control	: 30
3. Viva - voce	: 05

Total	**: 75**

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 –2017onwards

III YEAR

VI SEMESTER

MEC610– COMPUTER AIDED DESIGN AND MANUFACTURING

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC610**

Semester : VI

Subject Title : **COMPUTER AIDED DESIGN AND MANUFACTURING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examination	Total	
Computer Aided Design and Manufacturing	6	90	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit	Topic	Hours
I	COMPUTER AIDED DESIGN AND GEOMETRIC MODELING	17
II	COMPUTER AIDED MANUFACTURING	17
III	CNC MACHINES	17
IV	CNC COMPONENTS AND PART PROGRAMMING	16
V	GT-FMS-CIM-AGV AND ROBOTICS	16
	REVISION AND TEST	7
TOTAL		90

OBJECTIVES:

Students will be able to:

- To learn about the CAD and stages and benefits of CAD
- To learn about the CAM and CAPP its structures
- To learn about the MRP and MRP-II, JIT
- To study about the concept of rapid proto typing
- To know about the sequential engineering and concurrent engineering
- To study about the NC, CNC and DNC
- To learn about the turning centers and machining centers
- To know about CNC EDM, CMM machines
- To learn about the NC part programs using G code and M code
- To study about the concept of group technology, FMS , CIM , AGV and Robots

COMPUTER AIDED DESIGN AND MANUFACTURING

DETAILED SYLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**COMPUTER AIDED DESIGN AND GEOMETRIC MODELING** Introduction – CAD definition – Shigley's design process – CAD activities – benefits of CAD – CAD hardware : Input / Output devices – CRT – raster scan & direct view storage tube – LCD, plasma panel, mouse, digitizer,image scanner, drum plotter, flat bed plotter, laser printer – secondary storage devices : hard disks, floppy disks, CD, DVD, flash memory.Types of CAD system: PC based CAD system – workstation based CAD system – graphics workstation – configuration and typical specification – CAD software packages – AutoCAM – computer networking: purposes – topology – types – OSI networking standards – protocols (description only). Geometric modeling techniques: wire frame, surface, solid modeling – graphics standards: Need, GKS – IGES– DXF.Introduction to finite element methods – procedure of finite element analysis (brief description only).	17

II COMPUTER AIDED MANUFACTURING 17

CAM definition – functions of CAM – benefits of CAM – integrated CAD/CAM organization – process planning – master data – structure of a typical CAPP – types of CAPP : variant type, generative type – advantages of CAPP - aggregate production planning – Master Production Schedule (MPS) – capacity planning – MaterialsRequirement Planning (MRP) – introduction to enterprises resources planning – Manufacturing Resources Planning (MRP-II) – just in time manufacturing philosophy – cost involved in design changes – concept of Design for Excellence (DFX) – guide lines of Design for Manufacture / Assembly (DFM/A). Product Development Cycle – sequential engineering – concurrent engineering .

III CNC MACHINES 17

Numerical control – definition – components of NC systems – development of NC – DNC – CNC and adaptive control systems – working principle of a CNC system – distinguishing features of CNC machines - advantage of CNC machines – difference between NC and CNC – types of turning centre: horizontal, vertical – types of machining centers: horizontal spindle, vertical spindle, universal machines – machine axis conventions – design considerations of NC machine tools. CNC EDM machine – Coordinate measuring machines: construction, working principles and specifications –maintenance of CNC machines.

IV CNC COMPONENTS AND PART PROGRAMMING 16

Drives: spindle drive – hydraulic systems – direct-current motors – stepping motors – servo motors – AC drive spindles - slide ways – linear motion bearings – recirculation ball screw – ATC – tool magazine – feedback devices: encoders – linear and rotary transducers – in-process probing.NC part programming – manual programming – tape format : sequence number, preparatory functions and Gcodes, miscellaneous functions and M codes – CNC program procedure – coordinate system – types of motion control: point-to-point, paraxial and contouring - NC dimensioning – reference points – machine zero, work zero, tool zero and tool offsets.Part Program – tool information – speed – feed data – interpolation – macro – subroutines – canned cycles – mirror images – thread cutting – sample programs for lathe and milling – generating CNC

codes from CAD models – post processing – conversational programming – APT programming.

V GT-FMS-CIM-AGV AND ROBOTICS 16

Group Technology(GT) – concept of part family – parts classification and coding – coding structure – MICLASS – OPITZ – benefits of GT.FMS & CIM – introduction to FMS – types of manufacturing - FMS components – FMS layouts – types of FMS: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machine systems – benefits of FMS - concept of CIM – historical background –- CIM hardware – CIM software – CIM wheel - introduction to intelligent manufacturing system – virtual machining. Integrated material handling – AGV: working principle and benefits – Automatic Storage and Retrieval Systems (ASRS). ROBOT – definition – robot anatomy and classifications – robot configurations – industrial applications:characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection.Rapid prototyping: Classification – subtractive – additive – advantages and applications - materials. Types - Stereo lithography (STL) – Fused deposition model (FDM) – Selective laser sintering SLS) - three dimensional printing (3D) – Rapid tooling.

Text Books:

1. CAD/CAM/CIM, R.Radhakrishnan, S.Subramanian, V.Raju, 2nd, 2003, New Age International Pvt. Ltd.
2. CAD/CAM, MikellP.Groover, Emory Zimmers Jr. Indian Reprint Oct 1993, Prantice Hall of India Pvt., Ltd.
3. S.K.Sinha, NC Programming, I Edition, 2001, Galgotia Publications Pvt. Ltd.

Reference Books

1. Dr.P.N.Rao, CAD/CAM Principles and Applications, 2002, Tata Mc Graw Hill Publishing Company Ltd.
2. Ibrahim Zeid, Mastering CAD/CAM, Special Indian Edition 2007, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Mikell P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, 2nd Edition, Reprint 2002, Pearson Education Asia.
4. YoramKoren, Computer control of manufacturing systems, International

CENTRAL POLYTECHNIC COLLEGE

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 – 2017onwards

III YEAR

VI SEMESTER

MEC620– RENEWABLE ENERGY SOURCES

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC620**

Semester : VI

Subject Title : **RENEWABLE ENERGY SOURCES**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

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

Topics and Allocation of Hours:

Unit	**Topics**	**Hours**
I	FUNDAMENTALS OF ENERGY	14
II	SOLAR ENERGY	14
III	WIND ENERGY	14
IV	BIO-ENERGY	13
V	OCEAN AND GEOTHERMAL ENERGY	13
	REVISION AND TEST	7
	TOTAL	**75**

OBJECTIVES:

Students will be able to:

- To Study about the fundamentals of Energy.
- To Study of construction and principle of Wind energy, Solar energy,
- To know about Tidal energy and Bio energy.
- To Understand the PV design and its components.
- To understand the energy management and auditing techniques.
- To Study the energy conservation process.

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.	14
II	**SOLAR ENERGY** Introduction – Solar radiation at the earth's surface – Solar Radiation measurements – estimation of average solar radiation.	14

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 Collectors – solar thermal electric power plant.

Principles of photovoltaic conversion of solar energy – types of solar cells – solar photo Voltaic applications.

III WIND ENERGY **14**

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.

IV BIO – ENERGY **13**

Introduction – photo synthesis – usable forms of bio mass, their composition and fuel properties – biomass resources – Bio mass conversion technologies – Urban waste to energy conversion - Bio mass gasification – Bio mass liquification – Bio mass to ethanol production - biogas production from waste Bio mass – types of bio gas plants- applications – bio diesel production - Bio mass energy programme in India.

V OCEAN AND GEOTHERMAL ENERGY **13**

Ocean energy resources – principles 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 – geothermal exploration operational and Environmental problems – prospects of geothermal energy in India.

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 – EfnSpon Ltd.,1986.
4) Non – Conventional Energy Resources – B. H. Khan- Tata Mc Graw Hill,2nd Edn,2009.

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 – 2017onwards

III YEAR

VI SEMESTER

ELECTIVE THEORY – II

MEC631 – AUTOMOBILE ENGINEERING

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC631**

Semester **:** VI

Subject Title **:** ÈLECTIVE THEORY– II

AUTOMOBILE ENGINEERING

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Elective Theory-II Automobile Engineering	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	5	75	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	**Topic**	**Hours**
I	AUTOMOTIVE ENGINES	14
II	FUEL AND FUEL FEED SYSTEMS	14
III	TRANSMISSION AND POWER TRAINS	14
IV	AUTOMOTIVE CHASSIS	13
V	AUTOMOBILE ELECTRICAL EQUIPMENT AND POLLUTION CONTROL	13
	REVISION AND TEST	7
	TOTAL	90

OBJECTIVES:

The students must able to:

- Explain about the constructional details of an IC engine including cooling and lubrication system.
- Describe fuel feed systems with all devices involved in it (Both for petrol and diesel engines).
- 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 and brake systems.
- Familiarize electrical and electronic equipments used in automobile.
- Describe the different types of chassis and their functions.
- Appreciate the techniques for automobile pollution control.

AUTOMOBILE ENGINEERING

DETAILED SYLLABUS

Unit	Name of the Topic	Hours
I	**AUTOMOTIVE ENGINES**	14
	Basic Engine Components – Functions , types , materials and construction of – Cylinder block – Cylinder head – Gaskets – Crankcase – oil pan – cylinder liners – Comparison of liners – Piston – Expansion control in pistons – piston rings – types of compression 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 arrangements – LIFT Diesel engine – merits and demerits – Stages of Combustion – Delay period – Variables affecting delay period – Combustion chamber – Methods of generating air swirl in diesel engine combustion chamber – Types of combustion chambers – merits and demerits. Cooling system – purpose – methods – merits and demerits of air and water cooling - pump assisted cooling systems – components – water pump, fan - thermostat – types - radiator – types – pressure cap – Expansion system – merits - vented and pressurised – expansion tank – troubles in cooling system – loss of coolant , overheating and over cooling –	

causes. Lubrication system – purpose – types of lubricants - properties – additives – Service rating of oil – types of lubricating system - types of filters – methods of cylinder and piston lubrication – High pressure system - oil pumps –Troubles in lubrication system – oil leakage , low oil pressure and excessive oil consumption – causes.

II FUEL & FUEL FEED SYSTEMS **14**

Requirements of an ideal petrol – Octane number – detonation – properties of a good diesel fuel – Cetane number – Diesel knock – methods of controling diesel knock – fuel additives – Alternate fuels for petrol and diesel engines – Benzol ,Methenol , Ethanol , Natural gas , LPG , Vegetable oils and Bio – Gas.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 – Carburetor circuits – Solex Carburetor - Construction and operation – petrol injection – necessity – merits and demerits. Layout of diesel fuel feed system – single acting fuel feed pump – injection pumps – Construction and working of distributor type pump – fuel injectors – purpose – types – Single & Multi hole – pintle and pintaux - governors – necessity – types of Governors – Mechanical and Pneumatic - fuel filters – primary and secondary filters – location & importance

III TRANSMISSION AND POWER TRAINS **14**

General arrangement of power transmission system – Arrangement of front engine drive – rear engine rear drive – four wheel drive – applications – clutch – function – Components – Types - Single plate , multiple wet and dry clutches and diaphragm spring clutch – fluid coupling – Clutch troubles and their causes. Gear box – purpose – various resistance to motion – types of gear boxes – sliding mesh , constant mesh and synchro mesh – floor shift and steering column gear change – 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 – Rear axles – Semi floating , three quarter floating and full floating axle – Axle housing – types.

IV AUTOMOTIVE CHASSIS **13**

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, recalculating ball type, Rack and Pinion – Steering troubles and

causes – Power steering – Necessity – types – Layout Suspension system – Functions – Type of springs – Leaf , coil and Torsion bar – Front suspension systems – independent front suspension – merits and de merits – types – rear end suspension – Air suspension (brief description only) - 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.

Wheels – Disc wheel , wire wheel , spilt wheel and light alloy cast or forged wheels – brief description and applications – tyres – function – construction of tyres – cross and radial ply tyres – comparison – properties of tyres – tyre wear and tyre service.

V AUTOMOBILE ELECTRICAL EQUIPMENT & POLLUTION CONTROL **13**

Battery – lead acid battery – Nickel alkaline battery – construction – battery rating – charging - testing – starting system – circuit - construction and operation of starter motor – starting motor drives – over running clutch and Bendix drive – construction and operation – solenoid switch - Charging system – circuit – alternater construction and operation – regulators – Dynamo. Ignition system – Types – battery coil ignition system – circuit –High tension magneto – Principle of operation of fly wheel magneto – electronic ignition – Ignition system troubles and remedies.Lighting system – circuit – Head light – Aiming adjustment – sealed beam head lights – directional signal circuits – Horn circuits –

Wind screen wiper. Pollution – Pollutants – source of pollutants – pollution control techniques for petrol and diesel engines emission – controlling crank case emission (PCV) – controlled evaporative emission (VRS , VSS , VRR , ECS and EES) – Treatment of exhaust gas - Catalytic converter , EGR .

Text Books :

1) Automobile Engineering, G.B.S.Narang, Khanna Publishers, New Delhi.
2) Automotive Mechanics, William H.crouse and Donald .L. Anglin, Tata Mc Graw – Hill Publishing Company Ltd, New Delhi.
3) 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,

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017onwards

III YEAR

VI SEMESTER

ELECTIVE THEORY-II

MEC632 – ROBOTICS

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC632**

Semester : VI

Subject Title **:** ELECTIVE THEORY-II **ROBOTICS**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Elective Theory – II Robotics	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	5	75	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit No	**Topics**	**Hours**
I	FUNDAMENTALS OF ROBOT TECHNOLOGY	14
II	ROBOT CONTROLLER, DRIVE SYSTEMS AND END EFFECTERS	14
III	SENSORS AND MACHINE VISION	14
IV	ROBOT KINEMATICS AND ROBOT PROGRAMMING	13
V	ROBOT APPLICATIONS IN MANUFACTURING	13
	REVISION AND TEST	7
	Total	**90**

OBJECTIVES:

Students must be able to:

- 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

Theory contents:

Unit	Name of the Topic	Hours
I	**FUNDAMENTALS OF ROBOT TECHNOLOGY** Introduction – History of robot - 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 – Effect of structure on Control ,Work envelop and Work volume. Introduction to PUMA robot.	**14**
II	**ROBOT CONTROLLER, DRIVE SYSTEMS AND END EFFECTERS** Robot controller – Configuration - Four types of controls – Open loop and closed loop controls – Speed of response and stability – Precision of movements: Spatial resolutions, accuracy and repeatability. 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.	**14**

III	**SENSORS AND MACHINE VISION**	**14**

Requirements of Sensors – Sensor devices used in robot work cell - 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.

IV	**ROBOT KINEMATICS AND ROBOT PROGRAMMING**	**13**

Forward kinematics, Inverse kinematics and differences – Forward kinematics and Reverse kinematics of manipulators with Two and Three degrees of freedom – Deviations. – Robot dynamics – Static analysis - Robot programming – Teach pendant programming – Lead through programming – Robot programming languages – VAL Programming – Motion commands, Sensor commands, End effecter commands and Simple programs.

V	**ROBOT APPLICATIONS IN MANUFACTURING**	**13**

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 and characteristics task– Economical analysis of robots – Social implications.

Text Books:

1) Industrial Robotics – Technology, Programming and Applications, .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,YoramKoren, McGraw-Hill Book Co., 1992
3) Robotics and Image Processing, Janakiraman.P.A, Tata McGraw-Hill,1995

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017onwards

III YEAR

VI SEMESTER

ELECTIVE PRACTICAL -II

MEC641 AUTOMOBILE ENGINEERING PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC641**

Semester : VI

Subject Title **:** ELECTIVE PRACTICAL – II **AUTOMOBILE ENGINEERING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Elective Practical – II Automobile Engineering Practical	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	4	60	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

To know about in automobile laboratory, the following equipment and tools are generally observed.

1 Diesel / petrol engine
2 Carburettor
3 Fuel injection pump
4 Battery ignition system
5 Gear box
6 Clutch
7 Differential
8 Pollution control testing equipments etc.
9 Suspension systems such as leaf spring, shock absorber
10 Brakes
11 Steering systems
12 Different tools for assembly and dismantling of these systems such as
a. A set of fixed spanner
b. A set of ring & box spanner
c. d. A screw driver set

d. Hammers, nose pliers
e. Special tools like - circlip pliers, ring expanders, torque wrench, etc.

EXERCISES:

Part-A

1. To dismantle and assemble a four stroke multi-cylinder engine.
2. To dismantle and assemble a two stroke petrol engine.
3. To dismantle and assemble variable venturi carburettor.
4. To dismantle and assemble jerk-type fuel injection pump.
5. To study a synchro-mesh gear box by dismantling and assembling.
6. To dismantle and assemble a single plate clutch assembly.
7. To dismantle and assemble a differential unit.

Part-B

8. To study independent and conventional suspension system.
9. To study brake system.
10. To study cut section of lead acid automotive battery (12V).
11. To dismantle and assemble distributor of battery ignition system.
12. To check emission level of an automobile using exhaust gas analyser.
13. To Removing, servicing and replacing of solex carburettor.

Scheme of Examination

Duration: 3hrs Max marks:75

Note*: All the exercises should be given and students are allowed to select an exercise by lot*.

Allocation Marks

Part - A : 35

Part – B : 35

Viva-Voce : 05

Total : 75

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C SCHEME

2016 -2017onwards

III YEAR

VI SEMESTER

ELECTIVE PRACTICAL -II

MEC642 ROBOTICS PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC642**

Semester : VI

Subject Title **:** ELECTIVE PRACTICAL – II **ROBOTICS PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
Elective Practical-II Robotics Practical	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	5	75	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:

Students must able to:

- Study of Robot / Study of robot simulation software
- To study the components required.
- To study the techniques of programming
- Study of machine vision system
- Prepare a record of work done.

Exercises

1. Position recording using Cartesian co-ordinate system - (No. of positions to be specified - 9)
2. Position recording using Polar co-ordinate system - (No. of positions to be specified- 9)
3. Pick and place the objects - No. of objects to be specified- 6)
4. Pick and stack the objects - (No. of objects to be specified- 6)
5. Spray painting practice - (Area to be specified - 300mm x 300mm)
6. Spot welding practice - (No. of spots to be specified - 9)
7. Arc welding practice – (Length of weld to be specified)
8. Assembling practice - (Simple assembling)
9. Profile cutting practice - (Complicated profile – combination of lines and arcs)
10. Machine loading and unloading practice with time delay - (No. of times to be specified- 9)

Scheme of Examination

Duration: 3hrs Max marks:75

Note*: All the exercises should be given and students are allowed to select an exercise by lot*.

Allocation Marks

Procedure / Algorithm:	15
Create and edit the program:	25
Execution:	20
Result / Finish:	10
Viva-Voce:	05
Total	**75**

LIST OF EQUIPMENTS

Computer with Accessories :	15 Nos.
Compatible Software :	Sufficient quantity
Hardware :	6 Axis Robot / Separate device for the individual task. Teach Pendant control or PC based control through Software.

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017 onwards

III YEAR

VI SEMESTER

MEC650– COMPUTER AIDED MANUFACTURING PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC650**

Semester **:** VI

Subject Title : **COMPUTER AIDED MANUFACTURING PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Computer Aided Manufacturing Practical	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

Students must be able to:

- To know about the incremental System with absolute system
- To study about the G codes and M codes
- To know about the part program in CNC lathe.
- To study about the part program in CNC milling machine.
- Produce parts in CNC lathe and milling machine.

CAM Practical

Introductions

1. Study of CNC lathe, milling
2. Study of international standards G-Codes, M-Codes
3. Program writing – Turning simulator – Milling simulator, IS practice – Commands – menus and Exercises

CNC Lathe(SIMULATION only)

1. Write and simulate a part program for step turning component.
2. Write and simulate a part program for taper turning operation.
3. Write and simulate a part program for circular interpolation.
4. Write and simulate a part program for multiple turning operations.
5. Write and simulate a part program for thread cutting, grooving operations.
6. Write and simulate a part program for internal drills, boring operations.

CNC Milling (SIMULATION only)

1. Write and simulate a part program for grooving operation
2. Write and simulate a part program for mirroring with subroutines.
3. Write a part program for drilling (canned cycle) and simulate.
4. Write a part program for rectangular and circular pocketing and Simulate

MANUFACTURING

CNC Lathe

1. Write a part program and produce a step turning component with the given dimensions in XL TURN / CNC PRODUCTION LATHE machine.

2. Write a part program and produce a step turning component (Box Turning) with the given dimensions in XL TURN / CNC PRODUCTION LATHE machine.

3. Write a part program and produce a component using Forming & Grooving operations with the given dimensions in XL TURN / CNC PRODUCTION LATHE machine.

4. Write a part program and produce a Taper Turning component with the given dimensions in XL TURN / CNC PRODUCTION LATHE machine.

CNC Milling

1. Write and produce a component with the given dimensions using grooving operation and linear interpolation method.
2. Write and produce a component with the given dimensions using grooving operation and Circular Interpolation method.
3. Write and produce a component with the given dimensions using grooving operation and Mirroring method.
4. Write and produce a component with the given dimensions using Drilling operation.

SCHEME OF EXAMINATION

Lathe Simulation	- 20
Milling Simulation	- 20
Work piece production (Lathe / milling)	- 30
Viva- Voce	- 05
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	75 marks

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 - 2017 onwards

III YEAR

VI SEMESTER

MEC660 – PROCESS AUTOMATION PRACTICAL

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC660**

Semester **:** VI

Subject Title **:** **PROCESS AUTOMATION PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
PROCESS AUTOMATION PRACTICAL	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	4	60	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			25	75	100	

OBJECTIVES:
Students will be able to:

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

Exercises

Part A

I. Pneumatics Systems:-

1. Study of pneumatic system and its elements.
2. Direct operation of single and double acting cylinder
3. Operation of a single acting cylinder controlled from two different positions using shuttle valve.
4. Operation of double acting cylinder with quick return using quick exhaust valve.
5. Speed control of double acting cylinder using metering-in and metering-out circuits.
6. Controlling the speed of a Double acting cylinder using metering –in and metering -out controls.
7. Automatic operation of a double acting cylinder using limit switch and memory valve.

II. Hydraulics Systems:-

1. Study of hydraulic system and its elements.
2. Direct operation of double acting cylinder.
3. Direct operation of hydraulic motor.
3. Controlling the speed of a double acting cylinder using metering in and metering out type control.
4. Sequencing of two cylinder using Sequence valve.
5. Regenerative circuit.
6. Counter – Balance circuit.

Part B

III. PLC

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 mot or 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-.

SCHEME OF EXAMINATION:

Part A: One question from Pneumatic And Hydraulic Lab (1½ Hrs)	- 35
Part B: One question from PLC lab by lot (1½ Hrs)	- 35
Viva-voce	- 05
Total	**- 75**

PART A: ALLOCATION OF MARKS

(either Hydraulic systems or Pneumatic Systems)

Circuit diagram	:	20
Connection	:	10
Execution	:	5
Total	**:**	**35**

PART B : ALLOCATION OF MARKS

Logic Circuit Diagram	: 15
Entry and Edit of Logic circuit	: 15
Execution of circuit	: 5
Total	**: 35**

LIST OF EQUIPMENTS

1. Pneumatic Trainer Kit

2. Hydraulics Trainer Kit

3. Programmable Logic Controller (PLC) Trainer Kit with 1

a) Solenoid operated DVCs

b) Pneumatic Double Acting cylinders with limit switches Stepper motor

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DIPLOMA IN MECHANICAL ENGINEERING

C SCHEME

2016 -2017 onwards

III YEAR

VI SEMESTER

MEC670– PROJECT WORK

C-SCHEME

(Implements from the Academic year 2016-2017 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : **MEC 670**

Semester : VI

Subject Title : **PROJECT WORK**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	**Instructions**		**Examination**			
PROJECT WORK	**Hours/ Week**	**Hours/ Semester**	**Marks**			**Duration**
	4	60	**Internal Assessment**	**Board Examination**	**Total**	3 Hrs
			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:

Students must be able to:

- 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	6 th week	10
Second review	12 th week	10
Attendance	Entire semester	5
Total		25

Evaluation for Board Examination

Details of Mark allocation	**Max Marks**
Marks for report preparation, Demo, Vivo-voce	65
Marks for answers of 4 questions which is to be set by the external examiner from the given question bank consisting of questions in the following two topics Disaster Management and Environmental Management. Out of four questions two questions to appear from each of the above topics i.e. 2 questions x 2 topics = 4 questions 4 questions x 2 ½ marks = 10 Marks	10
Total	**75**

DETAILED SYLLABUS

ENVIRONMENTAL & DISASTER MANAGEMENT

ENVIRONMENTAL MANAGEMENT

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. 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. Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health. Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management. Noise pollution management – Effects of noise on people – Noise control methods.

DISASTER MANAGEMENT

Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Manmade Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life.. 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. 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. 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?

2. DISASTER MANAGEMENT

1. What is meant by Disaster Management? What are the different stages of Disaster management?

2. Differentiate Natural Disasters and Manmade 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?