SYLLABUS

DIPLOMA IN MECHANICAL ENGINEERING

(FOUNDRY 2021)- SW

II & III YEAR SYLLABUS

2015-2016

M - SCHEME

CURRICULUM DEVELOPMENT CENTRE

DIRECTORATE OF TECHNICAL EDUCATION

GOVERNMENT OF TAMILNADU

Curriculum and Scheme of Examination

Diploma in Mechanical Engineering (Foundry)

M-Scheme (With effect from 2015-2016)

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Mr T.M.ANILKUMAR, M.Tech., Lecturer T. S. Srinivasan Center for Polytechnic College and Advanced Training No.1, TVS School Road,Vanagaram Chennai - 600 095 Tamil Nadu, INDIA	

DIPLOMA COURSES IN ENGINEERING/TECHNOLOGY

(SEMESTER SYSTEM)

(Implemented from 2015- 2016)

M – SCHEME

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

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

1. Description of the Course:

a. Full Time (3 years)

The Course for the full Time Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters* and the First Year is common to all Engineering Branches.

b. Sandwich (3½ years)

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

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

c. Part Time (4 years)

The course for the diploma in Engineering shall extend over a period of 4 academic years containing of 8 semesters*, the subjects of 3 year full time diploma courses being regrouped for academic convenience.

* Each Semester will have 15 weeks duration of study with 35 hrs. /Week for Regular Diploma Programme and 18hrs/ week (21 hrs. / Week I year) for Part-Time Diploma Programmes.

The Curriculum for all the 6 Semesters of Diploma courses (Engineering & Special Diploma Courses viz. Textile Technology, Leather Technology, Printing Technology, Chemical Technology etc.) have been revised and revised curriculum is applicable for the candidates admitted from 2015 – 2016 academic year onwards.

2. Condition for Admission:

Condition for admission to the diploma courses shall be required to have passed in

The S.S.L.C Examination of the Board of Secondary Education, TamilNadu.

(Or)

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

(Or)

The Matriculation Examination of Tamil Nadu.

(Or)

Any other 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	
		Subjects Studied	Subjects Studied	
			Related subjects	Vocational subjects
1.	All the Regular and Sandwich Diploma Courses	Maths, Physics & Chemistry	Maths / Physics / Chemistry	Related Vocational Subjects Theory & Practical
2.	Diploma course in Modern Office Practice	English & Accountancy English & Elements of Economics English & Elements of Commerce	English & Accountancy, English & Elements of Economics, English & Management Principles & Techniques, English & Typewriting	Accountancy & Auditing, Banking, Business Management, Co-operative Management, International Trade, Marketing & Salesmanship, Insurance & Material Management, Office Secretaryship.

- 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.

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

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

4. Age Limit: No Age limit.

5. 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	3½ Years	6½ 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. The curriculum outline is given in Annexure **- I**

8. Examinations:

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The Internal assessment marks for all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for internal assessment and 75 marks are allotted for Board Examination.

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 as per the range given below)

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

ii) Test # **10 Marks**

2 Tests each of 2 hours duration for a total of 50 marks are to be conducted. Out of which the best one will be taken and the marks to be reduced to: 05 marks

The Test – III is to be the Model test covering all the five units and the marks so obtained will be reduced to : 05 marks

Total **10 marks**

TEST	UNITS	WHEN TO CONDUCT	MARKS	DURATION
Test I	Unit – I & II	End of 6th week	50	2 Hrs
Test II	Unit – III & IV	End of 12th week	50	2 Hrs
Test III	**Model Examination** - **Compulsory** Covering all the 5 Units. (Board Examination-question paper-pattern).	End of 15th week	75	3 Hrs

 # - From the Academic year 2015-2016 onwards.

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

With no choice:

PART A type questions:	4 Questions X 2 mark	… … 8 marks
PART B type questions:	4 Questions X 3 marks	… … 12 marks
PART C type questions:	3 Questions X 10 marks	… … 30 marks

	Total	50 marks
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iii) Assignment **10 Marks**

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

All Test Papers and assignment notebooks after getting the signature with date from the students must be kept in the safe custody in the Department for verification and audit. It should be preserved for 2 Semesters and produced to the flying squad and the inspection team at the time of inspection/verification.

B. For Practical Subjects:

The internal assessment mark for a total of 25 marks which are to be distributed as follows:-

a)	Attendance (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 board examinations.*
- The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 for each exercise as per the above allocation.
- At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks and the marks awarded for attendance is to be added to arrive at the internal assessment mark for Practical. (20+5=25 marks)
- The students have to submit the duly signed bonafide record note book/file during the Practical Board Examinations.

- *All the marks awarded for assignment, Test 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 Skill 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 the students:

Internal assessment Mark ….. **25 Marks**

11. Project Work:

The students of all the Diploma Programmes **(except Diploma in Modern Office Practice)** have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamilnadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. **The Project work must be reviewed twice in the same semester.**

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

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

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

b) Allocation of Mark for Project Work & Viva Voce in Board Examination:

Viva Voce	…	**30 marks**
Marks for Report Preparation, Demo	…	**35 marks**
Total		**65 marks**

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

i) Environment Management	2 questions X 2 ½ marks	**= 5 marks**
iI) Disaster Management	2 questions X 2 ½ marks	**= 5 marks**
		10marks

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

No choice need be given to the candidates.

Project Work & Viva Voce in Board Examination	--	**65 Marks**
Written Test Mark (from 2 topics for 30 minutes duration)	--	**10 Marks**
TOTAL	--	**75 Marks**

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

12. Scheme of Examinations:

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

13. Criteria for Pass:

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the 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 subject* out of the total prescribed maximum marks including both the internal assessment and the Board Examination marks put together, subject to the condition that he/she secures at least a minimum of *30 marks out of 75 marks in the Board's Theory examinations and a minimum of 35 marks out of 75 marks in the Board Practical Examinations.*

14. Classification of successful candidates:

Classification of candidates who will pass out the final examinations from April 2018 onwards (Joined in first year in 2015-2016) 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/ 3½/ 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 of marks in all the

semesters put together and passes all the semesters except the I and II semesters in the first appearance itself and passes all the subjects within the stipulated period of study 3/ 3½/ 4 years (Full Time/Sandwich/Part Time) without any break in study.

First Class:

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

Second Class:

All other successful candidates will be declared to have passed in **Second Class.**

The above mentioned classifications are also applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2018 /April 2019 onwards (both joined in First Year in 2015-2016)

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

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

16. Seminar:

For seminar the total seminar 15 hours(15 weeks x 1hour) 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 member, 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 inspection/verification.

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Diploma in Mechanical Engineering (FOUNDRY) **(SW) - M-Scheme**
List of Equivalent Subjects for L - Scheme to M - Scheme
III SEMESTER W. E. F OCT '16

Sl No	**Subject Code**	**L-SCHEME**	**Subject Code**	**M-SCHEME**
01	22031	Strength of Materials*	39231	Solid Mechanics and Fluid Power
02	29232	Industrial Hydraulics And Pneumatics	39231	Solid Mechanics and Fluid Power
03	22033	Renewable Energy Sources*	39252	Thermal and Renewable Energy
04	22034	Machine Drawing*	32033	Machine Drawing *
05	22035	Mechanical Testing & Quality Control Practical *	32045	Strength of Materials and Fluid Mechanics Practical *
06	22036	Fluid Power Practical *	32045	Strength of Materials and Fluid Mechanics Practical *
07	20001	Computer Applications Practical*	32034	Computer Applications and CAD Practical *

IV SEMESTER W.E.F APR '17

Sl No	**Subject Code**	**L-SCHEME**	**Subject Code**	**M-SCHEME**
01	22041	Manufacturing Technology –I*	39232	Industrial Production Technology – I
02	22045	Manufacturing Technology - I Practical*	32036	Lathe and Drilling Practical *
03	29191	Industrial Training – I (Report Writing & Viva Voce)	39191	Industrial Training – I (Report Writing & Viva Voce)

V SEMESTER W. E.F OCT '17

Sl No	Subject Code	L-SCHEME	Subject Code	M-SCHEME
01	29251	Thermal Equipments And Energy Conservation #	39252	Thermal and Renewable Energy #
02	22043	Electrical Drives & Control*	32044	Electrical Drives & Control *
03	29153	Foundry Technology – I	39153	Moulding Materials And Processes
04	29154	Metallurgy	39133	Physical Metallurgy
05	22044	Computer Aided Machine Drawing Practical *	32034	Computer Applications and CAD Practical *
06	29256	Thermal Equipments Performance Practical #	39258	Thermal Equipments Performance Practical #
07	29157	Sand Testing And Metallurgy practical	39168	Sand Testing And Metallurgy practical
08	22047	Electrical Drives and control practical*	32047	Electrical Drives & Control Practical *

VI SEMESTER W. E. F. APR '18

Sl No	Subject Code	L-SCHEME	Subject Code	M-SCHEME
01	22052	Manufacturing Technology - II*	39251	Industrial Production Technology - II
02	29162	Metal Forming Process	39164	Metal Forming Technology
03	22061	Industrial Engineering and Management*	39265	Engineering Management
04	22062	Computer Integrated Manufacturing *	32062	Computer Aided Design and Manufacturing *
05	29165	Foundry Technology- II	39163	Foundry Mechanization And Fettling
06	22056	Manufacturing Technology – II Practical*	32046	Special Machines Practical*
07	22064	Computer Integrated Manufacturing Practical *	32064	Computer Aided Design and Manufacturing Practical *
08	20002	Communication & Life Skills Practical *	30002	Life and Employability Skill Practical *

VII SEMESTER W. E.F OCT ' 18

Sl No	**Subject Code**	**L-SCHEME**	**Subject Code**	**M-SCHEME**
01	29171	Foundry Technology Practical	39171	Foundry Technology Practical
02	22065	Process Automation Practical*	32055	Process Automation Practical*
03	29173	Project Work	39173	Project Work
04	29192	Industrial Training – II (Report Writing & Viva Voce)	39192	Industrial Training – II (Report Writing & Viva Voce)

M SCHEME

Implemented from 2015 – 2016

CURRICULUM OUTLINE

2021: DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (sandwich)

III SEMESTER

Subject code	Subject	Hours per week			
		Theory	Tutorial /Drawing	Practical	Total
39231	Solid Mechanics and Fluid Power #	6	-	-	6
39232	Industrial Production Technology – I #	5	-	-	5
39133	Physical Metallurgy	5	-	-	5
32033	Machine Drawing*	-	4	-	4
32034	Computer Application & CAD Practical*	-	-	6	6
32036	Lathe and Drilling Practice*	-	-	4	4
32045	Strength of Material and Fluid Mechanics Practical*	-	-	4	4
	Seminar	1	-	-	1
Total		**17**	**4**	**14**	**35**

IV SEMESTER (Inplant Training period)

S.No	Subject	Hours per week			
		Theory	Tutorial /Drawing	Practical	Total
32037	Metrology and Metallography Practical *	-	-	4	4
32034	Foundry and Welding Practical*	-	-	3	3
39191	Industrial Training – I (Report Writing & Viva Voce)	-	-		NA

V SEMESTER

Sl No	Subject	Hours per week			
		Theory	Tutorial/ Drawing	Practical	Total
39251	Industrial Production Technology – II #	4	-	-	4
39252	Thermal and Renewable Energy #	4	-	-	4
39153	Moulding Materials And Processes	4	-	-	4
39154	Melting Practice And Heat Treatment	4	-	-	4
32044	Electrical Drives and Control*	6	-	-	6
32046	Special Machine Practice *	-	-	4	4
32047	Electrical Drives and Control Practical *	-	-	4	4
39258	Thermal Equipment Performance Practical #	-	-	4	4
	Seminar	1	-	-	1
Total		**23**	**-**	**12**	**35**

VI SEMESTER

S.No	Subject	Hours per week			
		Theory	Tutorial /Drawing	Practical	Total
39261	Industrial Automation #	5	-	-	5
39162	Casting Technology And Inspection	5	-	-	5
39163	Foundry Mechanization And Fettling	4	-	-	4
39164	Metal Forming Technology	4	-	-	4
39265	Engineering Management #	4	-	-	4
39266	CNC Programming and Simulation Lab #	-	-	4	4
39167	Sand Testing And Metallurgy Practical	-	-	4	4
30002	Life and Employability Skills practical*	-	-	4	4
	Seminar	1	-	-	1
Total		**23**	**-**	**12**	**35**

VII SEMESTER

S.No	Subject	Hours per week			
		Theory	Tutorial /Drawing	Practical	Total
39171	Foundry Technology Practical	-	-	4	4
32055	Process Automation Practical *	-	-	4	4
39173	Project Work*	-	-	4	4
39192	Industrial Training –II (Report Writing & Viva Voce)	-	-	-	NA

* Common with DME

Common with DME(MTMR)

M SCHEME

Implemented from 2015 - 2016

2022: DIPLOMA IN MECHANICAL ENGINEERING (Machine Tool Maintenance and Repairs (sandwich)
Scheme of Examination

III SEMESTER

S.No	Subject	Examination Marks			Minimum For pass	Duration of Examination hours
		Internal Assessment Marks	Board Exam Marks	Total marks		
39231	Solid Mechanics and Fluid Power #	25	75	100	40	3
39232	Industrial Production Technology – I #	25	75	100	40	3
39133	Physical Metallurgy	25	75	100	40	3
32033	Machine Drawing*	25	75	100	40	3
32034	Computer Application & CAD Practical*	25	75	100	50	3
32036	Lathe and Drilling Practical *	25	75	100	50	3
32045	Strength of Material and Fluid Mechanics Practical*	25	75	100	50	3
Total		**175**	**525**	**700**		

IV SEMESTER

S.No	Subject	Examination Marks			Minimum For pass	Duration of Examination hours
		Internal Assessment Marks	Board Exam Marks	Total marks		
32037	Metrology and Metallography Practical *	25	75	100	50	3
32035	Foundry and Welding Practical*	25	75	100	50	3
39191	Industrial Training – I (Report Writing & Viva Voce)	25	75	100	50	3
Total		**75**	**225**	**300**		

V SEMESTER

S.No	Subject	Examination Marks			Minimum For pass	Duration of Examination hours
		Internal Assessment Marks	Board Exam Marks	Total marks		
39251	Industrial Production Technology – II #	25	75	100	40	3
39252	Thermal and Renewable Energy #	25	75	100	40	3
39153	Moulding Materials And Processes	25	75	100	40	3
39154	Melting Practice And Heat Treatment	25	75	100	40	3
32044	Electrical Drives and Control*	25	75	100	40	3
32046	Special Machine Practice *	25	75	100	50	3
32047	Electrical Drives and Control Practical *	25	75	100	50	3
39258	Thermal Equipment Performance Practical #	25	75	100	50	3
Total		**200**	**600**	**800**		

VI SEMESTER

S.No	Subject	Examination Marks			Minimum For pass	Duration of Examination hours
		Internal Assessment Marks	Board Exam Marks	Total marks		
39261	Industrial Automation #	25	75	100	40	3
39162	Casting Technology And Inspection	25	75	100	40	3
39163	Foundry Mechanization And Fettling	25	75	100	40	3
39164	Metal Forming Technology	25	75	100	40	3
39265	Engineering Management #	25	75	100	40	3
39266	CNC Programming and Simulation Lab #	25	75	100	50	3
39167	Sand Testing And Metallurgy Practical	25	75	100	50	3
30002	Life and Employability Skills practical**	25	75	100	50	3
Total		**200**	**600**	**800**		

VII SEMESTER

S.No	Subject	Examination Marks			Minimum For pass	Duration of Examination hours
		Internal Assessment Marks	Board Exam Marks	Total marks		
39171	Foundry Technology Practical	25	75	100	50	3
32055	Process Automation Practical *	25	75	100	50	3
39173	Project Work*	25	75	100	50	3
39192	Industrial Training –II (Report Writing & Viva Voce)	25	75	100	50	3
Total		**100**	**300**	**400**		

* Common with DME

Common with DME(MTMR)

** Common to all branches

Board Examination - Question paper pattern

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

PART A ***- (1 to 8) 5 Questions are to be answered out of 8 questions for 2 marks each.*** **(Question No. 8 will be the compulsory question and** ***can be asked from any one of the units)(From each unit maximum of two 2 marks questions alone can be asked)***

PART B ***- (9 to 16)5 Questions are to be answered out of 8 questions for 3 marks each.*** **(Question No. 16 will be the compulsory question and** ***can be asked from any one of the units) (From each unit maximum of two 3 marks questions alone can be asked)***

PART C ***- (17 to 21) Five Questions will be in the Either OR Pattern. Students have to answer these five questions. Each question carries 10 marks. (Based on the discretion of the question setter, he/she can ask two five mark questions (with sub division A & sub division B) instead of one ten marks question if required)***

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

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

II YEAR

M – SCHEME

III SEMESTER

2015 -2016 onwards

39231 SOLID MECHANICS AND FLUID POWER

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (**(FOUNDRY)**)

Course Code: 2021

Subject Code: 39231

Semester: III

Subject Title: SOLID MECHANICS & FLUID POWER

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
SOLID MECHANICS & FLUID POWER	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

S.No	Topic	Hours
1	Deformation of Metals	17
2	Torsion And Springs	17
3	Properties of Fluids, Elements of Hydraulic Systems, Pumps And Valves	17
4	Hydraulic Cylinders, Intensifiers, Hydraulic Motors, Accumulators And Hydraulic System Design	17
5	Pneumatic Power Unit, Cylinders And Motors, Pneumatic Valves, Basic Pneumatic Circuits	17
	Test and Revision	5
	Total	**90**

Rational:

Hydraulics plays an important role in the automatic machine circuit. Further the student should have knowledge about deformation of metals with the application of force. Hence this paper is introduced.

Objective:

- To know about Deformation of Metals
- To know about Torsion And Springs
- To know Properties of Fluids, Elements of Hydraulic Systems, Pumps And Valves
- To know about Hydraulic Cylinders, Intensifiers, Hydraulic Motors, Accumulators And Hydraulic System Design
- To know about Pneumatic Power Unit, Cylinders And Motors, Pneumatic Valves, Basic Pneumatic Circuits

SOLID MECHANICS & FLUID POWER
Detailed Syllabus

Unit	Name of the Topic	Hours
I	**DEFORMATION OF METALS** **Mechanical properties of materials:** Engineering materials – Ferrous and non ferrous materials **-**Definition of mechanical properties such as strength – elasticity, plasticity, ductility, malleability, stiffness, toughness, brittleness, hardness, wear resistance, machenability, castability and weldability - Alloying elements-effect of alloying element - Fatigue, fatigue strength, creep – temperature creep – cyclic loading and repeated loading – endurance limit. **Simple stresses and strains:** Definition – Load, stress and strain – Classification of force systems – tensile, compressive and shear force systems – Behavior 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	17
II	**TORSION AND SPRINGS** Theory of torsion – Assumptions – torsion equation – strength of solid and hollow shafts – power transmitted – Definition –	17

	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	
III	**PROPERTIES OF FLUIDS, ELEMENTS OF HYDRAULIC SYSTEMS, PUMPS AND VALVES** **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. **Introduction** – elements of a hydraulic system – advantages of hydraulics systems – disadvantages – qualities of a good hydraulic fluid – hydraulic symbols. **Hydraulic pumps and control valves:** Principles of operation of non positive displacement pumps –centrifugal pumps – volute – diffuser – propeller pumps – mixed flow pumps – principles of operation of positive displacement pumps – rotary pumps – gear – lobe - vane – piston – reciprocating pumps. **Control valves:** Introduction to valves – types – pressure control valves - relief valve – pressure reducing valve – sequence valves – pressure switches – directional control valves– types only – solenoid controlled –– check valves – foot valve	17
IV	**HYDRAULIC CYLINDERS, INTENSIFIERS, HYDRAULIC MOTORS, ACCUMULATORS AND HYDRAULIC SYSTEM DESIGN**	17

	Hydraulic cylinders: Non-rotating type – single acting, double acting – rotating type – description - applications. **Intensifiers:** Type – single acting – double acting – purpose – construction and its uses. **Accumulators:** Types – dead weight, spring loaded, air or gas operated – purpose construction and its uses **Hydraulic motors:** Types – gear – lobe – vane – purpose – construction and its uses. **Hydraulic system design:** Hydraulic circuits applications – automatic systems – machine tools –shaping machine, milling machine, grinding machine – trouble shooting and maintenance and safety	
V	**PNEUMATIC POWER UNIT, CYLINDERS AND MOTORS, PNEUMATIC VALVES, BASIC PNEUMATIC CIRCUITS** **Pneumatic power unit:** Construction and principles of operation of the compressor – reciprocating, rotary, centrifugal and axial flow – air tank construction pressure switch control – FRL unit. **Pneumatic cylinders:** Types of air cylinders – single acting, double acting – construction – cushion assembly – piston and piston seals – applications **Air motor:** Vane types – construction – application. **Pneumatic valves:** Pneumatic controls – directional control valves – basic construction of valves –control – impulse valve – speed regulators – quick exhaust value – time deeply valve – logic functions– shuttle valve – twin pressure valve - solenoid operated valve **Basic pneumatic circuits:** Symbols – basic pneumatic circuits – impulse operation – speed control sequencing of motion	17

Text 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,

Reference Books:

1. Hydraulics & Pneumatics Power for production Harry L Stewart – Industrial Press Inc, New York - 1977

2. Pneumatic circuit by Harry L. Stewart – Audel Series – 1976

3. Fundamentals of pneumatic control Engg – Text book By Festo Company -1985

4. Introduction to Pneumatics – Text Book by Festo Company - 1983

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

II YEAR

M – SCHEME

III SEMESTER

2015 -2016 onwards

39232 INDUSTRIAL PRODUCTION TECHNOLOGY – I

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING **(FOUNDRY)**

Course Code: 2021

Subject Code: 39232

Semester: III

Subject Title: INDUSTRIAL PRODUCTION TECHNOLOGY – I

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
Industrial Production Technology – I	5	75	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

S.No	Topic	Hours
1	Foundry and Welding	14
2	Forging and Press Working	14
3	Powder Metallurgy And Heat Treatment	14
4	Lathe and Work Holding Devices	14
5	Semi-Automatic Lathes And Automatic Lathes	14
6	Test and Revision	5
	Total	**75**

Rational:
The students studying maintenance course should have a fundamental knowledge manufacturing process like forging, welding, foundry and machines like lathe. Further they should have knowledge about heat treatment process.

Objectives:

- To know about Foundry and Welding
- To know Forging and Press Working
- To know Powder Metallurgy And Heat Treatment
- To know Lathe and Work Holding Devices
- To know Semi-Automatic Lathes And Automatic Lathes

Industrial Production Technology – I

Detailed Syllabus

Unit	Name of the Topic	Hours
I	**FOUNDRY and WELDING** Foundry: Pattern – Pattern Materials – types – single piece (solid) and split type only – allowances – moulding – moulding tools and boxes – moulding sands – classifications and properties – green sand moulding – dry sand moulding – casting – sand casting using green and dry sand moulds – cleaning of casting and safety practices in foundry Welding: - Arc welding definition – arc welding equipment – arc welding methods – carbon arc, metal arc, metal inert gas (MIG), tungsten inert gas (TIG). Gas welding: definition – oxy-acetylene welding – resistance welding – definition – classification of resistance welding – butt – spot – seam projection welding – safety practices in welding	14
II	**FORGING AND PRESS WORKING** Forging: Hot working, advantages of hot working – hot working operations – rolling – forging – hammer or smith forging, drop forging, upset forging, press forging – roll forging 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.	14

III	**POWDER METALLURGY AND HEAT TREATMENT** 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 rule for the powder metallurgy process Heat Treatment: Purpose – procedures – applications of various heat treatment process – Iron carbide equilibrium diagram – full annealing – process annealing – stress relief annealing – spherodise annealing – isothermal annealing – normalizing – hardening – tempering – quenching medium – different types of quenching medium – case hardening – pack hardening – carburizing – cyaniding – nit riding – induction Hardening – flame hardening	14
IV	**LATHE AND WORK HOLDING DEVICES** LATHE: Definition – specifications – simple sketches – principle parts – headstock – back geared type – all geared type – tumbler gear mechanism – quick change gear box – apron – mechanism – carriage – cross slide – automatic, longitudinal and cross feed mechanism – tailstock and its functions- machining operation done on lathe – straight turning – step turning – taper turning – thread cutting – knurling – facing – boring – chamfering – cutting feed – depth of cut. WORK HOLDING DEVICES: Face plate – three jaw chuck – four jaw chuck – catch plate and carrier – types of centre's.	14
V	**SEMI AUTOMATIC LATHES AND AUTOMATIC LATHES** SEMIAUTOMATIC LATHES: Types of semi automatic lathes – capstan and turret lathes – difference between turret and capstan – tool and work holding devices – self opening die head – collapsible taps AUTOMATIC LATHES: Automatic lathe – classification of single spindle automatic lathe – principle of automatic lathes –	14

	automatic screw cutting machines – multi spindle automatic lathes	

.

Text Books:

1) Elements of workshop Technology Volume I & II – Hajra Chowdry & Bhattacharaya - IIth Edition - Media Promoters & Publishers Pvt. Ltd., Seewai Building `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.

2) A Text book of workshop Technology - R.S.Khurmi & J. K. Gupta - 2nd Edition,

S.Chand & Co., Ram Nagar, New Delhi – 2002.

Reference Books:

1) Manufacturing process – Begeman - 5th Edition -McGraw Hill, New Delhi 1981.

2) Workshop Technology- WAJ Chapman - Volume I, II, & III – Vima Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.

3) Workshop Technology – Raghuwanshi - Khanna Publishers. Jain & Gupta, Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi 110 006 - 2006

4) Production Technology - P. C. SHARMA - Edn. X - S.Chand & Co. Ltd., Ram Nagar, New Delhi 110 055 - 2006

5) Production Technology – HMT- Edn. 18 - published by Tata McGraw Hill publishing Co. Ltd., 7 West Patel nagar, New Delhi 110 008. – 2001.

6) Manufacturing Engineering & Technology - Kalpakjian,

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

II YEAR

M – SCHEME

III SEMESTER

2015 -2016 onwards

39133 PHYSICAL METALLURGY

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY)

Course Code: 2021

Subject Code: 39133

Semester: III

Subject Title: PHYSICAL METALLURGY

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

Topics and Allocation of Hours:

S No	Topic	Time (Hours)
1	ENGINEERING MATERIALS AND STRUCTURE	14
2	PHASE DIAGRAM	14
3	IRON CARBON SYSTEM	14
4	SOLIDIFICATION AND METALLOGRAPHY	14
5	FERROUS METALS	14
6	TEST & REVISION	5
	TOTAL	75

RATIONALE:

Enable to understand principles, facts, concepts, and experimental determination of values Structure of materials, Selection of materials,phase diagram,iron carbon system and to apply the acquired knowledge and skill to identify, interpret and analyse various practical field roblems in different fields of engineering

.**Objectives:**

- To know about the engineering materials and structure
- To know about the phase diagram
- To know about the iron carbon system
- To know about the solidification and metallography
- To know about the ferrous metals

PHYSICAL METALLURGY
Detailed Syllabus

Unit	Name of the Topic	Hours
I	ENGINEERING MATERIALS AND STRUCTURE : MATERIAL STRUCTURE : Introduction – Classification of Engineering Materials -Selection of materials – factors affecting the selection of materials for engineering purposes-Atomic Structure -Unit cell –Crystal Structure – FCC – BCC – HCP Structure. CRYSTALS DEFECTS : Imperfection in crystal – Types of Imperfection – point Imperfection –– vacancies – Interstitials – Composition defects – Line imperfections – Edge Dislocation – Screw Dislocation – Surface imperfection –Grain boundaries-Tilt Boundaries – Twin Boundaries.	**14**
II	PHASE DIAGRAM Solid solution : Introduction -Solid phases – Alloys -solid solutions Interstitial solid solution – substitutional solid solution -phase rule –– cooling curves for pure metal and alloys- Construction of phase diagram- Lever rule. Phase diagram : Unary phase diagram- binary phase diagram -Isomorphous systems-Copper Nickel equilibrium diagram-eutectic system – Cadmium bismuth equilibrium diagram- eutectoid system - peritectic and peritectoid system.	**14**
III	IRON CARBON SYSTEM MICROSTRUCTURE : Introduction –Allotropy of iron – Cooling curve for pure iron – austenite ferrite -cementite – ledeburite -pearlite – bainite – martensite – troosite- sorbite EQUILIBRIUM DIAGRAM : Iron Carbon Equilibrium Diagram –-TTT diagram (Time – Temperature Transformation diagram)-difference between Iron Carbon Equilibrium Diagram and TTT diagram -critical cooling rate -Factors governing the grain size-effect of microstructure	**14**

	on properties.	
IV	SOLIDIFICATION AND METALLOGRAPHY SOLIDIFICATION : Introduction- Concept of solidification of metals-Solidification of pure metal-Nucleation-Homogeneous nucleation-Heterogeneous nucleation-Growth-Solidification of alloys-Segregation -Types- Micro Segregation- Macro Segregation. METALLOGRAPHY: Introduction – Metallurgical Microscope – preparation of specimen – Micro and Macro examination – Electron Microscope.	**14**
V	FERROUS METALS CAST IRON Cast Iron – classification and microstructure-Grey Cast Iron – White Cast Iron – Malleable Cast Iron – Nodular Cast Iron – Chilled Cast Iron –Microstructure Characteristics and Applications. STEELS Steels -carbon steels -alloy steels -tool steels -stainless steels high speed steels –microstructure of plain carbon steel-mild steel-medium carbon steel-high carbon steel - Characteristics and Applications.	**14**

Text Books :

1. Material Science and Metallurgy -O.P. Khanna -S. Chand –1998
2. Material Science and Process -S.K. Hajra Chowdry-Indian Distributing C0, Calcutta,

I998

Reference Books :

1. Mechanical Metallurgy – Dieter – McGraw Hill – 1986
2. ASM Metal Hand Book

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

[FOUNDRY]

M SCHEME

2015 -2016 onwards

II YEAR

III SEMESTER

32033 – MACHINE DRAWING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY]

Course Code : 2021

Subject Code : 32033

Semester : III

Subject Title : **MACHINE DRAWING**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours /Week	Hours/ Semester	Marks			Duration
Machine Drawing	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

RATIONALE:

Manufacturing of various parts start from the basic drawing of components. The assembly of components is also carried out from the drawing. So drawing is an important subject to be studied by the students to carry and complete the production and assembly process successfully.

OBJECTIVES:

- 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: 40 Marks (Either A or B.)

Answer any one question by selecting either A or B.

9. A. Assemble and Draw any two views and bill of materials.

(OR)

B. Assemble and Draw any two views and bill of material

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

II YEAR

III SEMESTER

32034 – COMPUTER APPLICATIONS AND CAD PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY]

Course Code : 2021

Subject Code : 32034

Semester : III

Subject Title : COMPUTER APPLICATIONS AND CAD PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	Instructions		Examination			
Computer Applications and CAD 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
- Practice on CADD commands in making 2D Drawings.
- Draw assembled drawings using CADD.
- Draw sectional views using different types of sections.

PART – A: COMPUTER APPLICATIONS (30 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: CAD (60 Hrs)

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 – 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.

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

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.

Board 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		**:**	**25 marks**
	Editing / Creation -	10	
	Formatting -	10	
	Printout -	5	
PART - B		**:**	**45 marks**
	Drafting -	20	
	Assembly -	10	
	Dimensioning -	10	
	Printout -	5	
Viva-voce		**:**	**05 marks**
Total		**:**	**75 marks**

LIST OF EQUIPMENT

1. Personal computer – 30 Nos.
2. Printer – 1 No.
3. Required Softwares : Office Package, CAD Package – Sufficient to the strength.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

II YEAR

III SEMESTER

32036 – LATHE AND DRILLING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY]

Course Code : 2021

Subject Code : 32036

Semester : III

Subject Title : Lathe and Drilling Practical

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Lathe and Drilling Practical	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.

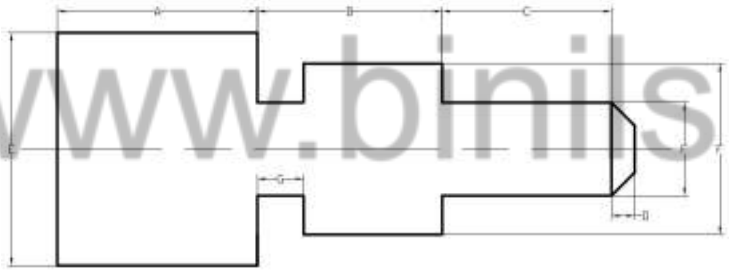
Exercises:

Make the following jobs in the lathe. Raw material 32 mm M.S. Rod

1. Facing, Step turning & Chamfering

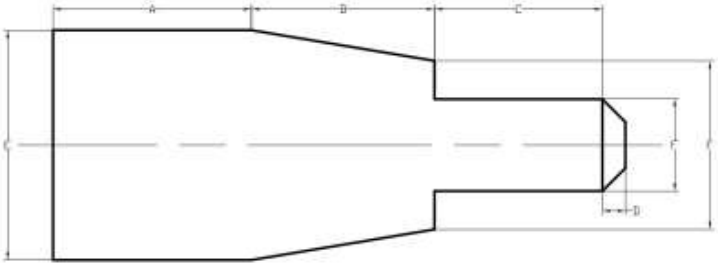
Dimensions			
Sl.No	Part Name	Actual	Obtained

2. Step turning & Groove cutting



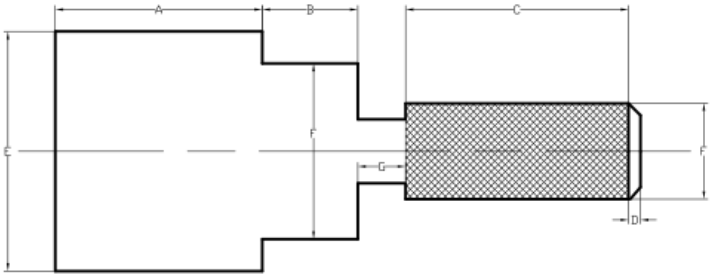
Dimensions			
Sl.No	Part Name	Actual	Obtained

3. Step turning & Taper turning



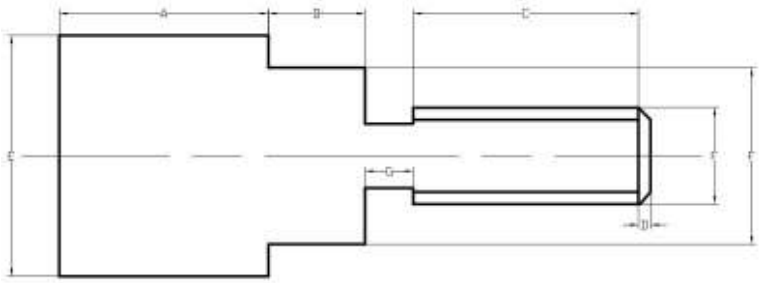
Dimensions			
Sl.No	Part Name	Actual	Obtained

4. Step turning & Knurling



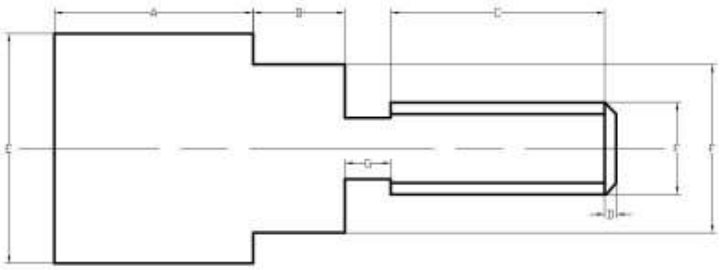
Dimensions			
Sl.No	Part Name	Actual	Obtained

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



Dimensions			
Sl.No	Part Name	Actual	Obtained

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

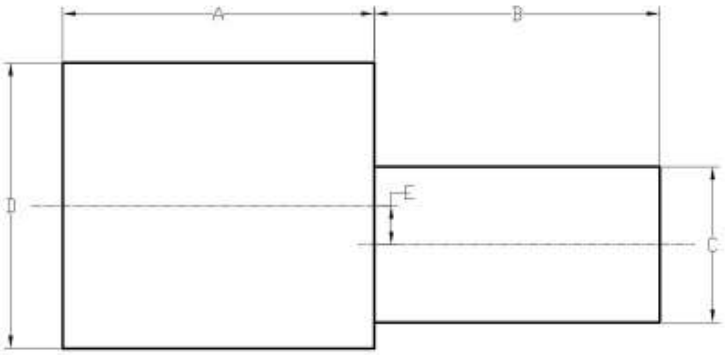


Dimensions			
Sl.No	Part Name	Actual	Obtained

7. Bush: Turning & Drilling

Dimensions			
Sl.No	Part Name	Actual	Obtained

8. Eccentric turning



Dimensions			
Sl.No	Part Name	Actual	Obtained

Drilling section:

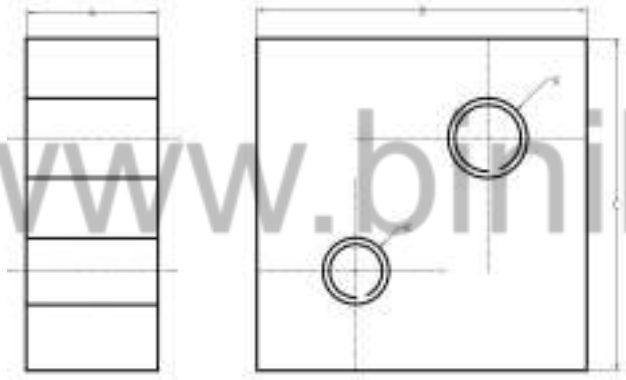
1. Introduction of safety in operating machines.
2. Study of drilling machines and its parts.
3. Study the types of tools used.
4. Study of work holding devices and tool holding devices.
5. Setting of work and tools.
6. Operation and practice.
7. Types of measuring instruments and their uses.

Exercises:

Make the following jobs in the drilling machine.

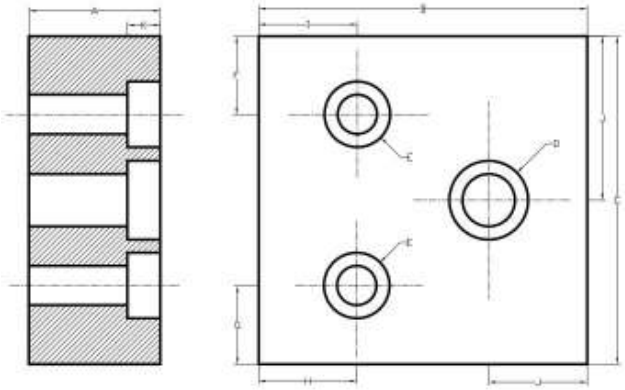
Raw material 50mm X 50mm X 20 mm thick M.S. Flat

1. Drilling & Tapping



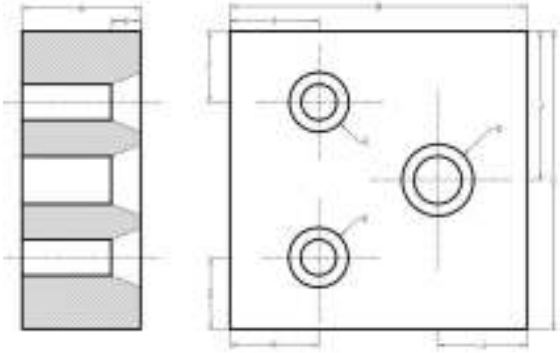
Dimensions			
Sl.No	Part Name	Actual	Obtained

2. Drilling & Counter boring



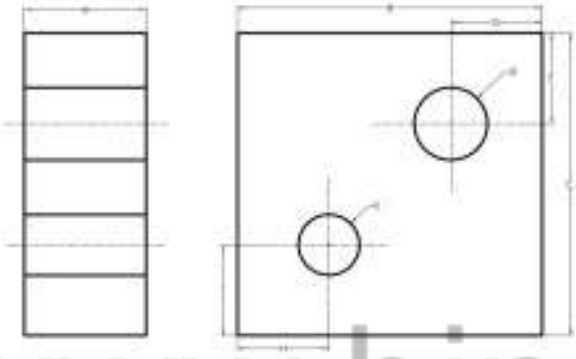
Dimensions			
Sl.No	Part Name	Actual	Obtained

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**

LIST OF EQUIPMENT

Lathe Section

1. Lathe (Minimum 4 ½')	-	13 Nos.
2. All geared lathe	-	2 Nos.
3. 4 Jaw / 3 Jaw Chucks	-	Required Numbers
4. Chuck key	-	Required Numbers
5. Spanner	-	Sufficient quantity
6. Cutting Tools	-	Sufficient quantity
7. Pitch gauge	-	5 Nos.
8. Thread gauge	-	5 Nos.
9. Vernier Caliper	-	5 Nos.
10. Snap gauges	-	Sufficient quantity
11. Steel Rule (0-150)	-	Sufficient quantity
12. Calipers (Inside / Outside / Jenny)	-	Sufficient quantity
13. Dial Gauge with Magnetic Stand	-	Sufficient quantity
14. Marking Gauge	-	Sufficient quantity
15. Safety Glass	-	15 Nos.

Drilling Section

1. Upright drilling machine	-	2 Nos.
2. Radial drilling machine	-	1 No.
3. Drill bit & Tap set	-	Sufficient quantity
4. Reaming bit	-	Sufficient quantity
5. Counter sinking bit	-	Sufficient quantity
6. Counter boring bit	-	Sufficient quantity
7. Plug gauges	-	Sufficient quantity
8. Vernier Height Gauge	-	1 No.
9. Surface plate	-	2 Nos.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

II YEAR

III SEMESTER

32045 – STRENGTH OF MATERIALS AND FLUID MECHANICS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY]

Course Code : 2021

Subject Code : 32045

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
			Internal Assessment	Board Examination	Total	
Strength of Materials and Fluid Mechanics Practical	4	90	25	75	100	3 Hrs

OBJECTIVES:

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

Strength of Materials Laboratory

Exercises

1.Test on Ductile Materials:

Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel.

2. Hardness Test:

Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminium.

3. Torsion test:

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

4. Impact test:

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

5. Tests on springs of circular section:

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

6. Shear test:

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

Fluid Mechanics Laboratory

Exercises

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

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.

Detailed allocation

Strength of material lab			
Part A	**-**		**35 marks**
Observation	-	10	
Tabulation / Calculation	-	20	
Result / Graph	-	5	
Fluid mechanics lab			
Part B	**-**		**35 marks**
Observation	-	10	
Tabulation / Calculation	-	20	
Result / Graph	-	5	
Viva-voce	**-**		**05 marks**
Total	**-**		**75 marks**

LIST OF EQUIPMENTS

1. UTM 01
2. Rockwell's Hardness Testing Machine 01
3. Torsion testing machine 01
4. Impact testing machine 01
5. Spring testing arrangements 01
6. Shear testing machine 01
7. Vernier calliper 02
8. The Bernoulli's Apparatus 01
9. An Open tank fitted with a small orifice / an external mouth piece and a collecting tank with Piezometer 01
10. A Centrifugal pump having the discharge line with venturimeter / orifice meter arrangement 01
11. An arrangement to find friction factor of pipe 01
12. A reciprocating pump with an arrangement for collecting data to find out the efficiency and plot the characteristics curves. 01
13. A centrifugal pump with an arrangement for collecting tank to find out the efficiency and plot the characteristics curves. 01
14. A impulse turbine with an arrangement for calculating data to find out the efficiency 01
15. A reaction turbine with an arrangement for collecting data to find out the efficiency 01

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

[FOUNDRY]

M SCHEME

2015 -2016 onwards

II YEAR

IV SEMESTER

32037 – METROLOGY AND METALLOGRAPHY PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY]

Course Code : 2021

Subject Code : 32037

Semester : IV

Subject Title : METROLOGY & METALLOGRAPHY PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Metrology & Metallography Practical	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

- Familiarize about measuring techniques of Metrology instruments.
- Select the range of measuring tools.
- Obtain accurate measurements.
- Determine the least count of measuring instruments.
- Study the working principle of Microscope.
- Specimen preparation of ferrous and non-ferrous metals.
- Grinding, polishing and mounting of specimen.
- Non-destructive testing of metals for cracks.
- Crack detection – Visual inspection, Die penetration method
- Prepare the record of work for the exercises.

METROLOGY SECTION:

- Introduction to linear measurement.
- Introduction to angular measurement.

- Introduction to geometric measurements.
- Study of Least Count of measuring instruments.
- Study of accuracy of instruments and calibration of instruments.
- Study of Linear Measuring Instruments: Vernier Caliper, Micrometer, Inside Micrometer, Vernier Height gauge, Depth Gauge and Slip Gauge.
- Study of Angular Measuring Instruments – Universal Bevel Protractor, Sine Bar.
- Study of Geometric measurement - Gear tooth Vernier, Thread Micrometer.

Exercises:

1. Measure the dimensions of ground MS flat / cylindrical bush using Vernier Caliper compare with Digital / Dial Vernier Caliper.
2. Measure the diameter of a wire using micrometer and compare the result with digital micrometer
3. Measure the thickness of ground MS plates using slip gauges
4. Measure the angle of a V-block / Taper Shank of Drill / Dovetail using universal bevel protractor.
5. Measure the angle of the machined surface using sine bar with slip gauges.
6. Measure the geometrical dimensions of V-Thread using thread Vernier gauge.
7. Measure the geometrical dimensions of spur gear.

METALLOGRAPHY SECTION:

- To study the micro structure of the metals using Metallurgical Microscope.
- Determine the micro structure of the ferrous and nonferrous metals.
- Prepare the specimen to study the microstructure.
- Conduct the liquid penetration test to find the crack.
- Conduct magnetic particle test to find cracks.

Exercises:

1. Find the grain structure of the given specimen using the Metallurgical Microscope.
2. Prepare a specimen to examine the micro structure of the Ferrous and Non-ferrous metal.
3. Detect the cracks in the specimen using Visual Inspection and ring test.
4. Detect of cracks in specimen using Die penetration test.
5. Detect the cracks in specimen using Magnetic particle test.

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.

Detailed allocation

Metrology Section		**45**
Procedure / Least Count	15	
Reading / Calculation	20	
Result	10	
Matallography Section		**25**
Procedure	10	
Preparation and observation	10	
Result	5	
Viva voce		**5**
Total		**75**

LIST OF EQUIPMENTS

1.	Vernier Caliper	-	2 Nos.
2.	Digital Vernier Caliper.	-	2 Nos.
3.	Dial Vernier Caliper.	-	2 Nos.
4.	Micrometer	-	2 Nos.
5.	Digital Micrometer	-	2 Nos.
6.	Slip gauges	-	2 Nos.
7.	Universal bevel protractor.	-	2 Nos.
8.	Sine bar	-	2 Nos.
9.	Thread micrometer	-	2 Nos.
10.	Surface plate	-	2 Nos.
11.	Vernier height gauge	-	1No.
12.	Metallurgical Microscope.	-	2 Nos.
13.	Die penetration	-	2 Nos.
14.	Magnetic particle test	-	1 No.
15.	Abrasive belt grinder	-	1 No.
16.	Polishing machine	-	1 No.
17.	Mounting machine	-	1 No.
18.	Specimen (Ferrous / Non-ferrous metals)	-	Sufficient quantity
19.	Consumable	-	Sufficient quantity

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

[FOUNDRY]

M SCHEME

2015 -2016 onwards

II YEAR

IV SEMESTER

32035 – FOUNDRY AND WELDING PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY]

Course Code : 2021

Subject Code : 32035

Semester : IV

Subject Title : FOUNDRY AND WELDING PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Foundry and Welding Practical	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

- 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

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.

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. Draw spike	-	15 Nos.
15. Gate cutter	-	15 Nos.
16. Runner & riser	-	15 Nos. each
17. Patterns	-	Sufficient quantity

39291 - Industrial Training – I (Report Writing & Viva Voce)

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

V SEMESTER

2015 -2016 onwards

39251 INDUSTRIAL PRODUCTION TECHNOLOGY – II

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code: 39251

Semester: V

Subject Title: INDUSTRIAL PRODUCTION TECHNOLOGY – II

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
INDUSTRIAL PRODUCTION TECHNOLOGY – II	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

S.No	Topic	Hours
1	Theory of Metal cutting, Drilling machines and Boring Machines	11
2	Reciprocating Machines	11
3	Milling machines and gear generating processes	11
4	Abrasive Process and Broaching	11
5	Jigs & Fixtures & Non-Conventional Machining	11
6	Test and Revision	5
	Total	**60**

Rational :

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

Objectives:

- To know the Theory of Metal cutting, Drilling machines and Boring Machines
- To know about Reciprocating Machines
- To know about Milling machines and gear generating processes
- To know about Abrasive Process and Broaching
- To know about Jigs & Fixtures & Non-Conventional Machining

INDUSTRIAL PRODUCTION TECHNOLOGY – II
Detailed Syllabus

Unit	Name of the Topic	Hours
I	**THEORY OF METAL CUTTING, DRILLING MACHINES AND BORING MACHINES** **Theory of Metal Cutting:** Cutting tool material-High carbon Steel-High Speed Steel-Stellites-Cemented carbides-ceramics-Composition and applications for the above. **Drilling Machines:** Drills-flat drills-twist drills-types of drilling machines-bench type-floor type-radial type-gang drill-multi spindle type-principle of operation in drilling-speeds and feeds for various materials-drilling holes-methods of holding drill bit-drill chucks-socket and sleeve-drilling-operation-reaming-counter sinking-counter boring-spot facing-tapping-deep hole drilling. **Boring Machines:** Boring machines-horizontal and vertical types-fine boring machines-boring tools	11
II	**RECIPROCATING MACHINES** **Planer:** Types of planers-description of double housing planer specifications- principles of operation-drives-quick return mechanism-feed mechanism- work holding devices and special fixtures-types of tools various operation. **Shaper:** Types of shapers-specifications-standard-plain-universal principles of operations-drives-quick return mechanism-crank and slotted link-feed mechanism-work holding devices-Special fixture-various operations. **Slotter:** Types of slotters-specifications-method of operation-Whitworth quick return Mechanism-feed mechanism-work holding devices-types of tools.	11
III	**MILLING MACHINES AND GEAR GENERATING PROCESSES** **Milling Machines:** Types-column and knee type-plain-universal	11

	milling machine-vertical milling machine-specification of milling machines principles of operation-work and tool holding devices-arbor-stub arbor spring collect-adapter-milling cutters-cylindrical milling cutter-slitting cutter side milling cutter-angle milling cutter-T-slot milling cutter-woodruff milling cutter-fly cutter-milling process conventional milling-climb milling-milling operations-straddle milling-gang milling-vertical milling attachment. **Generating Process:** gear shaper - gear hobbing - principle of operation only - gear finishing processes-burnishing-shaving-grinding and lapping gear materials - cast iron, steel, alloy steels, brass, bronze, aluminum and nylon.	
IV	**ABRASIVE PROCESS AND BROACHING** **Abrasive Process:** Types and classification-specifications-rough grinding – pedestal grinders- portable grinders- belt grinders-precision grinding cylindrical grinder- center less grinders – surface grinder- tool and cutter grinder - planetory grinders-principles of operations-grinding wheels abrasives-natural and artificial diamond wheels -mounting of grinding wheels-Dressing and Truing of wheels-Balancing of grinding wheels. **Broaching:** Types of broaching machine - horizontal, vertical and continuous broaching - principles of operation - types of broaches classification - broach tool nomenclature - broaching operations - simple examples	**11**
V	**JIGS & FIXTURES& NON-CONVENTIONAL MACHINING** **Jigs And Fixtures:** Definitions and concept of Jig and fixture-Advantages of jigs and fixtures-elements of jigs and fixtures-locating devices-'V' locators-fixed stop locators-adjustable stop locators-clamping devices strap clamp, screw clamp-cam action clamp-types of jigs-box drill jig indexing drill jig-types of fixtures-keyway milling fixture-string milling fixture. **Non-Conventional Machining Processes:** Construction,	**11**

	working and applications of Ultrasonic machining-chemical machining-electro chemical grinding-electrical discharge machining-plasma arc machining-LASER machining-Advantages – Disadvantages.	

Text Book :1) Elements of Workshop Technology- Vol. I & II, HajraChoudry&Battacharya, ,Edn. 11, published by Media Promoters and Publishers Pvt. Ltd., Seervai Buildings `B', 20-G, NoshirBharuchaMarg, 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.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

V SEMESTER

2015 -2016 onwards

39252 THERMAL AND RENEWABLE ENERGY

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code: 39252

Semester: V

Subject Title: Thermal and Renewable Energy

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
Thermal and Renewable Energy	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

S.No	Topic	Hours
1	Basics of Thermodynamics and IC Engines	11
2	Steam Boilers, Boiler Mountings, Boiler Accessories, Thermal Power Plants	11
3	Refrigeration, Psychrometry, Air Conditioning	11
4	Fundamentals of Energy, Solar Energy	11
5	Wind Energy, Bio – Energy	11
6	Test	5
	Total	**60**

RATIONALE: The exponential growth of engineering industries has made a vide scope for maintenance engineering. The student studying maintenance should have a thorough knowledge in various aspects of Thermal Equipment and Energy Conservation.

Objectives :

- To know about Basics of Thermodynamics and IC Engines
- To know about Steam Boilers, Boiler Mountings, Boiler Accessories, Thermal Power Plants
- To know about Refrigeration, Psychrometry, Air Conditioning
- To know about Fundamentals of Energy, Solar Energy
- To know about Wind Energy, Bio – Energy

Thermal and Renewable Energy

Detailed Syllabus

Unit	Name of the Topic	Hours
I	**Basics of Thermodynamics and IC Engines** Introduction – definition and units of mass, weight, volume, density, specific weight – gravity – pressure – units - atmospheric, gauge, vacuum and absolute pressure - temperature - Celsius and absolute temperature - S.T.P and N.T.P conditions - heat - specific heat capacity at constant volume and at constant pressure - work - power - energy - types - thermodynamic system - types -properties and state of system - intensive and extensive properties -thermodynamic process - cycle - point and path function - law of conservation of energy - equilibrium - thermodynamic - zeroth , first and second law of thermodynamics- Perfect gases - law of perfect gases - Boyle's, Charles',Joule's, Regnault's and Avagadro's law - characteristic gas equation – relation between specific heats and gas constant - universal gas constant . Introduction - classifications -four stroke cycle petrol and diesel engines -merits and demerits - two stroke cycle petrol and diesel engines – comparison constructional details of I.C.engine -components of engines – cylinder block, crankcase, cylinder head, liners, oil pan, piston, piston rings, connecting rod,crank shaft, cam shaft, valve and valve train - material and manufacturing methods - valve timing diagram for four stroke petrol and diesel engines – porttiming for four stroke petrol and diesel engines Layout of fuel supply system in petrol engines	11
II	**Steam Boilers, Boiler Mountings, Boiler Accessories, Thermal Power Plants** Introduction – formation of steam – condition of steam – wet, dry and superheated steam – dryness fraction – classification of boilers – high pressure boilers – lamont and BHEL high	11

	pressure boilers – advantages of high pressure boilers – boilers mountings – function – construction and working – boilers accessories – function – construction and working comparison of mountingsand accessories 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 – selection site for thermal power plant – air pollution by thermal power plant – pollutants and effect of pollution – pollution control.	
III	**Refrigeration, Psychrometry, Air Conditioning** Refrigeration – refrigerators – types and application of refrigeration – vapour compression refrigeration system – vapourabsorption system – comparison – refrigerating effect – capacity of refrigerating unit – COP – actual COP – power required – no problems. Air-conditioning – psychometric properties – dry air – moist air – water vapour –saturated air – dry bulb temperature – wet bulb temperature – wet bulb depression – dew point temperature – humidity – specific and relative humidity –psychometric chart – psychometric process – sensible heating and cooling – humidification- dehumidification – cooling and dehumidification	**11**
IV	**FUNDAMENTALS OF ENERGY, SOLAR 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 **SOLAR ENERGY** Introduction – Solar radiation at the earth's surface-Solar Radiation measurements-Estimation of average solar Radiation. Solar energy collectors- Classifications-Flat plate collectors-Concentrating collectors-Comparison. Solar water heaters-Solar industrial heating system Principles of photovoltaic conversion of solar energy – types of solar cells –	**11**

	solar Photo Voltaic applications	
V	**WIND ENERGY, BIO – ENERGY** Introduction-Basic principles of wind energy conversion:-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. Introduction – usable forms of bio mass, their composition and fuel properties-Biomass resources– Biogas production from waste Biomass – types of bio gas plants - applications – Biomass energy programmed in India.	**11**

Text Book :

1. A Textbook Of Thermal Engineering by R.S Kurmi -- S. Chand, 01-2008

2. Non-conventional energy sources – G.D.Rai - Khanna, 1997

3) Non Conventional Energy Sources and Utilisation - R.K. Rajput - S.Chand& Company Ltd., 2012.

Reference Books

1) Renewable Energy Sources - Twidell, J.W. and Weir, A. - EFN Spon Ltd., 1986.

2) "Non-Conventional Energy Resources - B.H.Khan - Tata McGraw Hill, 2nd Edn, 2009.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

V SEMESTER

2015 -2016 onwards

39153 MOULDING MATERIALS AND PROCESSES

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code: 39153

Semester: V

Subject Title: MOULDING MATERIALS AND PROCESSES

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
Moulding materials and processes	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

S NO	Topic	Hours
1	PATTERN AND PATTERN MAKING	11
2	SAND AND SAND CONTROL TESTS	11
3	MOLDS AND MOLDS MAKING	11
4	CORE AND CORE MAKING	11
5	PRINCIPLES OF GATING AND PRINCIPLES OF RISERING	11
6	TEST & REVISION	5
	TOTAL	60

RATIONALE:

Enable to understand principles, facts, concepts, and experimental determination of function and selection of a pattern, pattern making tools, sand control tests, molding methods and to apply the acquired knowledge and skill to identify, interpret and analyse various practical field problems in different fields of engineering

Objectives:

- To know about the pattern and pattern making

- To know about the sand and sand control tests
- To know about the molds and molds making
- To know about the core and core making
- To know about the principles of gating and principles of risering

Moulding materials and processes

Detailed Syllabus

Unit	Name of the Topic	Hours
I	PATTERN AND PATTERN MAKING: PATTERNS : Casting- Sand Casting -Steps involved in Making a Sand Casting-Pattern-Function of a pattern – pattern material – selection of pattern material -pattern – types of pattern – solid – split – loose piece – match plate – cope and drag – sweep – gated – skeleton –segmental – follow board pattern – pattern design consideration – pattern allowances – shrinkage – machining – draft – distortion – shake. PATTERN MAKING : Pattern making – pattern making tools– pattern making machine – wood turning lathe – circular saw – band saw – jig saw – jointer –drill press – mortise– pattern layout – pattern construction –finishing the pattern – pattern colours – storing of pattern.	**11**
II	SAND AND SAND CONTROL TESTS : SAND MATERIAL : Mold material – refractory sands – molding sands -natural sands – synthetic sands – loam sands – grain size – grain shape – molding sand binders -additives – facing materials-special additives – properties of molding sands – types of sand used in molds – core sands – properties –– selection of core materials. SAND PREPARATION : Sand preparation-functions-sand preparation steps – muller-sand reclamation-advantages-types-dry reclamation-wet reclamation-thermal reclamation-combined wet reclamation plus thermal reclamation. SAND TESTING : Sand control tests-moisture content test-clay content test-grain fineness test-permeability test-compression strength test-hot strength test-refractoriness test-hardness test.	**11**

III	MOLDS AND MOLDS MAKING MOLDS : Mold characteristics-Types of Molds – Green Sand Mould- Dry Sand Mould- Skin dried mold- Air dried mold-Core sand mold-Loam mold- Cement bonded mold-ceramic mold-Graphite mold- molding methods-bench molding-floor molding-pit molding-machine moulding-green sand molding-open sand bedded-in -turn over methods-dry sand mould -molding boxes Box flask- Snap flask- Wooden molding box- steps involved in making a mould.-Venting of mold. MOULDING MACHINES : Molding machines-hand molding machines-plain stripper type machine –pin lift machine-roll over machine-Power operated molding machine-squeeze machine-jolt machine-jolt squeeze machnine –jolt squeeze roll over pattern draw moulding machine-sand slinger.	**11**
IV	CORE AND CORE MAKING : TYPES OF CORE : Introduction – functions of cores – characteristics of cores – core making procedure –core boxes-types of core boxes –Half core box-slab core box-split core box-left and right hand core box strickle core box-gang core box-loose piece core box-core prints – core making machine –jolt machine-sand slinger-core extrusion machine-core blowing machine-core venting. CORE MAKING PROCESS : Baking the cores – equipment used for the baking the cores – core ovens-dielectric bakers-radiant bakers-finishing the cores – types of cores –green sand cores-dry sand cores-oil bonded cores-resin bonded cores-shell cores-sodium silicate cores-horizontal core-vertical core-hanging core-balanced core-stop off core-ram-up core-kiss core -core application.	**11**
V	PRINCIPLES OF GATING AND PRINCIPLES OF RISERING:	**11**

	PRINCIPLES OF GATING : Gating system-Directional Solidification-Functions of gating system-Pouring cups – pouring basins-Sprues- - Types of Gates- Types- Top gates-Bottom gate-Parting line side gate-Top gates-Open pour –Edge gate – Pencil or Pop gate-Gate with strainer core-Wedge gate-Finger gate-Ring gate-Bottom gate-Simple bottom gate –Horn gate- Bottom core gate-Gate with a skim bob-Draw-in bottom gate-Parting line side gate-Simple line parting gate – Gate with skim bob and choke- Gate with strainer core- Gate with shrink bob- Branch gate- Swirl gate- Parting line gate fed into the riser- Multiple gate System. PRINCIPLES OF RISERING: Introduction-Functions of a Riser-Types of Riser-Open Riser-Blind Riser-Increasing riser efficiency- methods -Insulating Materials-Exothermic materials-Chills-Padding-Mold Materials of Different Chill Capacities-Topping up-Electric arc feeding-Factors in riser design-Riser location and riser feeding distance	

Text Books :

1.Foundry Technology -O.P. Khanna --S. Chand –1986
2.Foundry Technology-Dr Dharmendra Kumar , Dr S.K.Jain ,CBS Publishers&Distributors-1994

Reference Books :

1.Foundry Engineering – R. B. Gupta --S. Chand --1989
2.Principles of Metal casting – Richard W Heine, Philip C Rosenthal -McGraw-Hill, 1997

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

V SEMESTER

2015 -2016 onwards

39154 MELTING PRACTICE AND HEAT TREATMENT

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code: 39154

Semester: V

Subject Title: MELTING PRACTICE AND HEAT TREATMENT

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
Melting Practice And Heat Treatment	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topic	Hours
1	CUPOLA AND CRUCIBLE FURNACES	11
2	ELECTRIC FURNACES AND STEEL MAKING PROCESSES	11
3	LADLE METALLURGY	11
4	NON FERROUS MELTING , HEAT TREATENT	11
5	TEMPERING AND CASE HARDENING	11
6	TEST & REVISION	5
	TOTAL	60

RATIONALE:

Enable to understand principles, facts, concepts, and experimental determination of function of furnaces, melting and heat treatment and to apply the acquired knowledge and skill to identify, interpret and analyse various practical field problems in different fields of engineering

Objectives:

- To about the cupola and crucible furnaces
- To about the electric furnaces and steel making processes
- To about the ladle metallurgy
- To about the non ferrous melting , heat treatent
- To about the tempering and case hardening

Melting Practice and Heat Treatment

Detailed Syllabus

Unit	Name of the Topic	Hours
I	CUPOLA AND CRUCIBLE FURNACES CUPOLA FURNACES : Introduction-Selection of furnace-Furnaces for melting- Pig Iron-Blast Furnace-Cupola-Cupola Construction-Cupola operation-Preparation of cupola-lighting the fire-charging the cupola-Meting in cupola- Slagging and metal tapping in cupola-dropping down the bottom in cupola- Zones of cupola-Heat balance in cupola(theory only)- Efficiency of cupola-Metallurgical control of the cupola-Advantages of cupola-Limitations of cupola-Trends in cupola melting -Effect of alloying elements in production of cast iron - Air furnace-Construction-operation -Applications-Rotary melting furnace-Construction-operation -Application CRUCIBLES : Crucibles-Advantages-Pit crucible furnace-Crucible furnace of bale out type-Crucible furnace of tilting type-Stationary gas or oil fired furnace- Stationary coke fired furnace-Pot furnaces-Applications	11
II	ELECTRIC FURNACES AND STEEL MAKING PROCESSES : ELECTRIC FURNACES : Introduction-Types-Direct Arc furnace –Construction-operation-Advantages-Indirect arc furnace- Construction-operation-Advantages-Coreless type or High frequency Induction furnace Construction-operation-Advantages-Limitations-Applications- Core type or low frequency Induction furnace Construction-operation-Advantages- Limitations-Applications- Trends in electric induction melting-Batch melting-Computer integrated melting-Medium frequency induction furnaces-Line frequency melting. STEEL MAKING PROCESSES : Steel Making Processes -Open hearth furnace- Acid open hearth furnace- Basic open hearth furnace- -Convertor-	11

	Bessemer convertor-Side blown convertor- L-D Steel Making Process-LDAC Process – the Kaldo Process –-AOD Process-Duplexing processes-Triplexing processes.	
III	LADLE METALLURGY: LADLE METALLURGY : Introduction –refining – oxidation – de oxidation – gases in metals – degassing techniques-Vacuum degassing- Static bath degassing- Induction degassing- Fraction degassing- Stream droplet degassing- Gas scavenging- desulphurization – inoculation- ladle practice achievements METAL POURING : Introduction – pouring temperature – pouring equipments – pouring ladles –Large reservoir or holding handle- Crane or Monorail ladles-Lip pouring ladles- Teapot ladle-Bottom pour ladle – Pouring practice- automatic pouring Introduction-Benefits of automatic pouring- pouring technique-Automatic pouring technology-High tech sensors-Automatic stopper rod systems-Data check list For Automatic pouring. TEMPERATURE MEASUREMENT : Introduction – necessity – pyrometer – types of pyrometer – thermo couple pyrometer – optical pyrometer – radiation pyrometer – infra red thermograph	**11**
IV	NON FERROUS MELTING , HEAT TREATENT : NON FERROUS: Aluminum-Copper-Magnesium-Zinc- Characteristics – Applications and Brief Melting Practice . HEAT TREATMENT: Purpose of Heat Treatment-Annealing-Types-stress relieving annealing-process annealing-spheroidise annealing-full annealing-Normalising – hardening -quenching medium-Water-Oil-Air-Brine-factors controlling quenching characteristics.	**11**
V	TEMPERING AND CASE HARDENING : TEMPERING: Tempering-stages of tempering-types -Low temperature tempering – Medium temperature tempering-High temperature tempering –Martempering – Austempering -Hardenability - Factors affecting hardenability -Methods to determine hardenability – jominy end quench test . CASE HARDENING :	**11**

	Introduction-Carburising-definition-process-characteristics-uses -pack Carburising – gas Carburising – liquid Carburising – Adavntages – disadvantages – applications -heat treatment after carburizing -nitriding – definition – process – characteristics – uses – cyaniding – definition –process – characteristics -uses -carbonitriding -flame hardening induction hardening.	

Text Books :

1. Material Science and Metallurgy -O.P. Khanna -S. Chand –1986

2. Foundry Technology-Dr Dharmendra Kumar , Dr S.K.Jain ,CBS Publishers&Distributors-1994

3.Foundry Technology -O.P. Khanna --S. Chand –1986

Reference Books :

1. Foundry Engineering – R. B. Gupta --S. Chand –1986

2.Principles of Metal casting – Richard W Heine, Philip C Rosenthal -McGraw-Hill, 1967

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

[FOUNDRY]

M SCHEME

2015 -2016 onwards

III YEAR

V SEMESTER

32044 – ELECTRICAL DRIVES AND CONTROL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY] [MTMR]

Course Code : 2021

Subject Code : 32044

Semester : V

Subject Title : ELECTRICAL DRIVES AND CONTROL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours /Week	Hours/ Semester	Marks			Duration
			Internal Assessment	Board Examination	Total	
Electrical Drives and Control	6	90	25	75	100	3 Hrs

Topics and Allocation of Hours:

Unit	Topics	Hours
I	DC CIRCUITS AND DC MACHINES	17
II	AC CIRCUITS AND AC MACHINES	17
III	STEPPER AND SERVO MOTORS & DRIVES	17
IV	POWER SUPPLIES AND LOGIC GATES	16
V	CONTROL ELEMENTS AND PLC	16
	TEST AND REVISION	7
	Total	**90**

RATIONALE:

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

OBJECTIVES:

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

ELECTRICAL DRIVES & CONTROL

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**DC CIRCUITS AND DC MACHINES**	17
	Definition- Electric current, voltage and resistance -Ohm's law and Kirchoff's law. Resistance in series and parallel and series, parallel – simple problems electromagnetism(definitions only) – magnetic flux, flux density magnetic field intensity, MMF, permeability, reluctance, Faraday's law of electromagnetic induction, electrical and mechanical units	

DC generators – construction, principle of operation, types and application.

DC motors: - construction, principle of operation, types and application.

Necessity of starters: Three point, four point starters.

II AC CIRCUITS AND AC MACHINES **17**

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: **17**

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 **16**

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 **16**

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.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

[FOUNDRY]

M SCHEME

2015 -2016 onwards

II YEAR

IV SEMESTER

32046 – SPECIAL MACHINES PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY]

Course Code : 2021

Subject Code : 32046

Semester : V

Subject Title : **SPECIAL MACHINES PRACTICAL**

TEACHING AND SCHEME OF EXAMINATIONS:

No. of weeks per semester: 15 Weeks

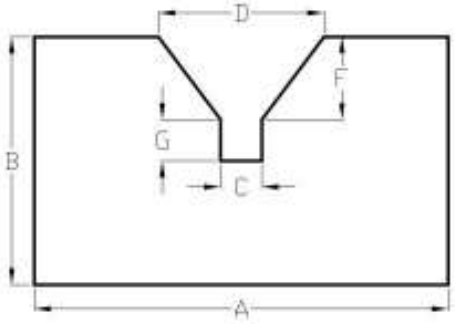
Subject	Instructions		Examination			
	Hours /Week	Hours/ Semester	Marks			Duration
Special Machines Practical	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

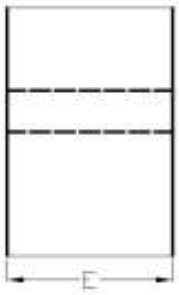
OBJECTIVES:

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

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

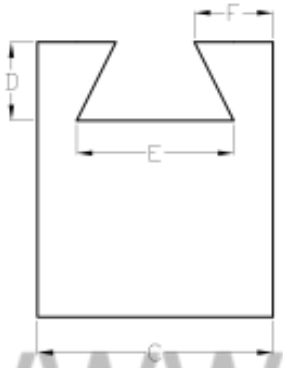
1. Make 'V' Block using shaping machine

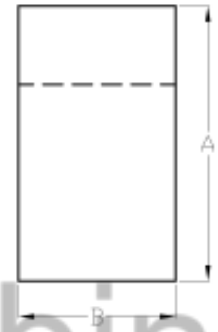




Dimensions			
Sl.No	Part Name	Actual	Obtained

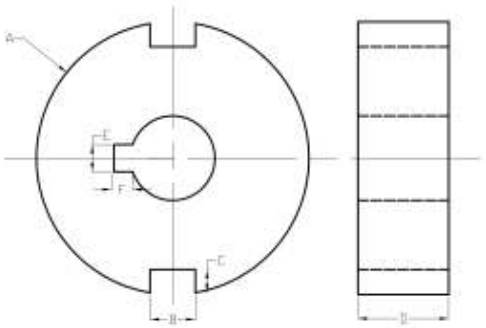
2. Make dovetail using shaping machine





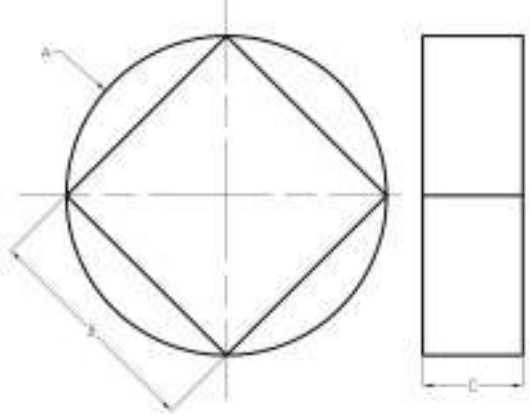
Dimensions			
Sl.No	Part Name	Actual	Obtained

3. Make groove cut using slotting machine



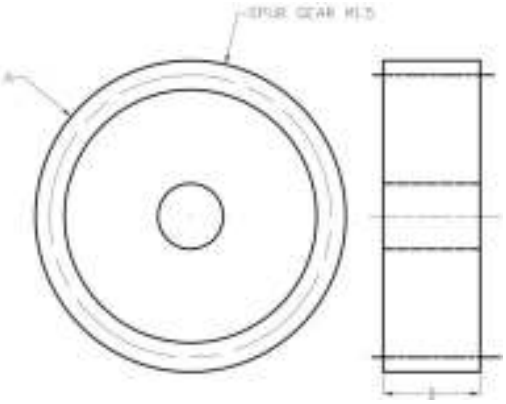
Dimensions			
Sl.No	Part Name	Actual	Obtained

4. Make round to square in milling machine.



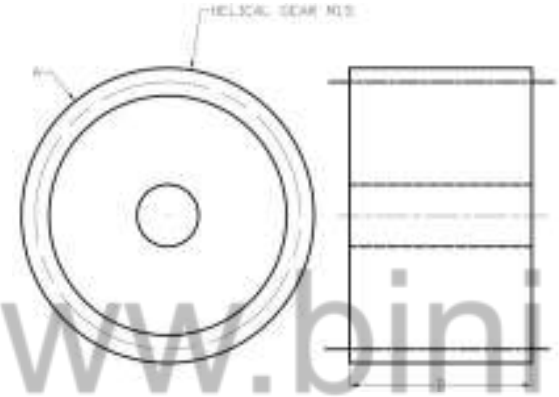
Dimensions			
Sl.No	Part Name	Actual	Obtained

5. Make Spur Gear using milling machine by Differential Indexing.



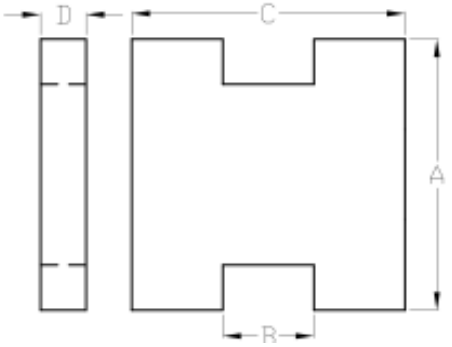
Dimensions			
Sl.No	Part Name	Actual	Obtained

6. Make Helical Gear using milling machine



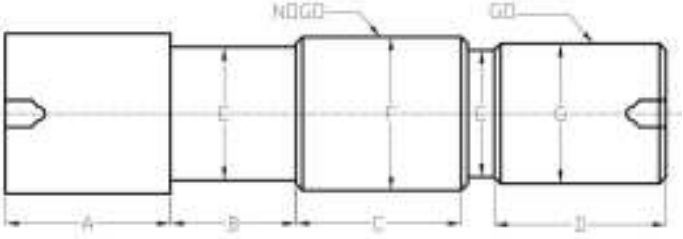
Dimensions			
Sl.No	Part Name	Actual	Obtained

7. Make slot cut using milling machine.



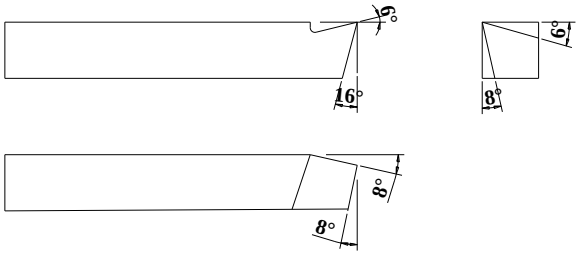
Dimensions			
Sl.No	Part Name	Actual	Obtained

8. Make Progressive type Plug gauge using Cylindrical Grinding machine



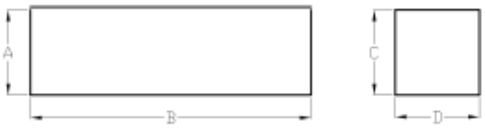
Dimensions			
Sl.No	Part Name	Actual	Obtained

9. Make a turning tool using Tool and Cutter Grinder



Dimensions			
Sl.No	Part Name	Actual	Obtained

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



Dimensions			
Sl.No	Part Name	Actual	Obtained

BOARD EXAMINATION

Note: All the exercises should be given in the question paper and students are allowed to select by a lot. Record note book must be submitted for the examination.

ALLOCATION OF MARKS

Job preparation / Marking	15
Setting / Operations	30
Dimensions / Surface Finish	25
Viva voce	5
Total	**75**

LIST OF EQUIPMENTS

1. Vertical milling machine / Vertical attachment	-	2 Nos.
2. Universal Milling Machine	-	2 Nos.
3. Surface Grinding Machine	-	1 No.
4. Cylindrical Grinding Machine	-	1 No.
5. Tool and Cutter Grinder	-	1 No.
6. Shaping Machine	-	2 Nos.
7. Slotting Machine	-	1 No.
8. Tools and Measuring instruments	-	Sufficient quantity.
9. Consumables	-	Sufficient quantity

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

III YEAR

V SEMESTER

32047 – ELECTRICAL DRIVES AND CONTROL

PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY] [MTMR]

Course Code : 2021

Subject Code : 32047

Semester : V

Subject Title : ELECTRICAL DRIVES AND CONTROL PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

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

OBJECTIVES:

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

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

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

V SEMESTER

2015 -2016 onwards

39258 THERMAL EQUIPMENTS PERFORMANCE PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code : 2021

Subject Code : 39258

Semester : V

Subject Title : **THERMAL EQUIPMENTS PERFORMANCE PRACTICAL**

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
THERMAL EQUIPMENTS PERFORMANCE PRACTICAL	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Rational :

The students studying maintenance should knowledge of lubricants, components of engines, tools which they suppose to handle and fundamentals wiring diagrams

Objectives :

- To know the properties lubricants
- To components of engines
- To know the tools
- To know the wiring diagram
- To about the Flash and fire points oil
- To about the Valve timing diagram and Port timing diagram of petrol engines
- To about the Valve timing diagram and Port timing diagram of diesel engines
- To about the Components like of automobile
- To about the Wiring diagram

THERMAL EQUIPMENTS PERFORMANCE PRACTICAL

Exercises

1. Determining flash and fire points of the given oil using open cup apparatus
2. Determining flash and fire points of the given oil using close cup apparatus.
3. Valve timing diagram and Port timing diagram of petrol engines
4. Valve timing diagram and Port timing diagram of diesel engines
5. Removing, charging and replacing the BATTERY from a car.
6. Identification of various components of Ignition system.
7. Dismantling and Overhauling of a Distributor, Setting Contact Breaker Points
8. Servicing of Spark Plugs.
9. Measurement of voltage, current and resistance by using multimeter (both analog and digital) in all ranges.
10. Study of R&AC tools
11.Wiring diagram of Refrigerator
12. Performance test of evaporator
13. Performance test of condenser
14. Determination of COP of vapour compression system
15 Determination of various air conditioning processes by using air washer

BOARD EXAMINATION

Note: All the exercises in both sections have to be completed.

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

Procedure	**-**	**10 Marks**
Drawing	**-**	**20 Marks**
Tabulation	**-**	**10 Marks**
Observation and Calculation	**-**	**25 Marks**
Viva-voce	**-**	**05 marks**
Result	**-**	**05 Marks**
Total	**-**	**75 marks**

List of Equipments **Batch Size : 30**

S No	Name Of The Equipment / Tools	Quantity
1	Open Cup Apparatus	1
2	Close Cup Apparatus	1
3	Cut Section Petrol Engine	1
4	Cut Section Diesel Engine	1
5	Evaporator (Window Air Conditioner or Split Air Conditioner)	1
6	Condenser (Window Air Conditioner or Split Air Conditioner)	1
7	Air washer	1

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015 -2016 onwards

39261 INDUSTRIAL AUTOMATION

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code: 39261

Semester: VI

Subject Title: INDUSTRIAL AUTOMATION

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

Topics and Allocation of Hours:

S.No	Topic	Hours
1	Introduction To CNC And Types CNC Machines	14
2	Components Of CNC Machine	14
3	Part Programming	14
4	FMS, Integrated Material Handing And Robot	14
5	Maintenance Of CNC Machines	14
6	Test and Revision	5
	Total	**75**

RATIONALE:

As per the latest requirements in the Industries this enables to learn the assistance of computer in the field of design and manufacturing areas. It's able to learn the latest manufacturing concepts of in the shop floors and manufacturing methods like RPT. They are able to know about the working of principles of CNC machines and programming techniques are included. The application of material handling equipments and robots are learnt based on the automation in the industries.

Objectives:

- To about the CNC And Types CNC Machines
- To about the Components Of CNC Machine
- To about the Part Programming
- To about the FMS, Integrated Material Handing And Robot
- To about the Maintenance Of CNC Machines

INDUSTRIAL AUTOMATION

Detailed Syllabus

Unit	Name of the Topic	Hours
I	**INTRODUCTION TO CNC And TYPES CNC MACHINES** INTRODUCTIN TO CNC : Numerical Control – definition – components of NC machines – development of NC – DNC – Working of CNC System – Features of CNC machines – advantages of CNC machines – Difference between NC and CNC TYPES OF CNC MACHINES: construction and Working Principle of turning centre – construction and working principle of machining centers- Machine axes conventions for turning centre and machining centers – design consideration of NC machine tools – CNC EDM machine – working principle of die sinking and wire EDM machines – Coordinate Measuring Machines – construction and working principles.	14
II	**COMPONENTS OF CNC MACHINE** Drives: Spindle Drive – DC Motor – Feed Drives – DC Servo Motor and Stepper Motor – hydraulic System – Slide ways requirement – types – friction slide ways and antifriction slide ways – linear motion bearings – recirculation ball screw – Automatic tool changing – Tool Magazines – feedback devices – linear and rotary transducers – encoders – in process probing	14
III	**PART PROGRAMMING** NC Part programming – methods – manual programming – conversational programming- APT Programming – format – sequential and word address formats – sequence number – coordinate system – types of motion control: point to point, paraxial and contouring – Datum points, machine zero, work zero, tool zero. NC dimensioning – preparatory functions and G Codes, M Codes – interpolation, linear program and circular interpolation – CNC program procedure: Part program –	14

	subprogram – macro program – canned cycles: sample programs for lathe – linear and circular interpolation – stock removal turning – peck drilling thread cutting and sample programs for milling: Linear and circular interpolation.	
IV	**FMS, INTEGRATED MATERIAL HANDING AND ROBOT** Types of Manufacturing: Introduction to FMS – FMS Components – FMS Layout – Types of FMS – flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible manufacturing system – benefits of FMS – Computer Integrated Material Handling – AGV working principle – types – benefits – Automatic Storage and Retrieval System (ASRS) ROBOT: Definition – robot configurations – basic robot motion – robot programming method – robotic sensors – industrial applications: Characteristics, material transfer, machine loading, welding, spray painting, assembly and inspection.	**14**
V	**V MAINTENANCE OF CNC MACHINES** Introduction – objective – Documentation of maintenance program – spare parts – preventive maintenance – periodic inspection of parts – relays – servomotor bearing – servomotor oil rings – V rings – Replacing Drive units – Replacement procedure – Replacing battery – Replacing procedure – replacing the fuse – Servo system maintenance – Spindle system maintenance – Drive unit maintenance – Maintenance schedule – Daily – Monthly – Every three months – Every six months	**14**

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Text Books :

1) CAD/CAM/CIM , R.Radhakrishnan, S.Subramanian, New Age International Pvt. Ltd.

2) CAD/CAM , Mikell P.Groover, Emory Zimmers, Jr.Prentice Hall of India Pvt., Ltd.

3) NC Programming, S.K.Sinha, Galgotia Publications Pvt. Ltd.

Reference Books :

1) CAD/CAM Principles and Applications, Dr.P.N.Rao, Tata Mc Graw Hill Publishing Company Ltd.

2) CAD/CAM, Ibrahim Zeid, Mastering Tata McGraw-Hill Publishing Company Ltd., New Delhi.

3) Automation, Production Systems, and Computer-Integrated Manufacturing, Mikell P. Groover, Pearson Education Asia.

4) Computer control of manufacturing systems, Yoram Koren, McGraw Hill Book

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015 -2016 onwards

39162 CASTING TECHNOLOGY AND INSPECTION

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY)

Course Code: 2021

Subject Code: 39162

Semester: VI

Subject Title: **CASTING TECHNOLOGY AND INSPECTION**

Subject	**Instructions**		**Examination**			
	Hours / Week	**Hours /Semester**	**Marks**			**Duration**
CASTING TECHNOLOGY AND INSPECTION	**5**	**75**	**Internal Assessment**	**Board Examination**	**Total**	**3 Hrs**
			25	**75**	**100**	

Topics and Allocation of Hours:

Unit	**Topic**	**Hours**
1	Design of castings	14
2	Iron castings production and heat treatment	14
3	Special casting techniques	14
4	Inspection and testing	14
5	Foundry environment, dust measurement and maintenance	14
6	Test and Revision	5
	Total	**75**

RATIONALE:

Enable to understand principles, facts, concepts, and experimental determination of design of castings, iron castings production special casting techniques, inspection and testing and to apply the acquired knowledge and skill toidentify, interpret and analyse various practical field problems in different fields of engineering

Objectives:

- To know about the design of castings
- To know about the iron castings production and heat treatment
- To know about the special casting techniques
- To know about the inspection and testing
- To know about the foundry environment, dust measurement and maintenance

CASTING TECHNOLOGY AND INSPECTION

Detailed Syllabus

Unit	Name of the Topic	Hours
I	DESIGN OF CASTINGS : DESIGN OF CASTINGS: Introduction-Casting design considerations-Design for minimum casting stresses-Design for directional solidification-Design for metal flow-cast weld design-Design for minimum costing-Functional design. SOFTWARE PACKAGE: Design of a new casting-Steps Involved in design of a new casting-Modules in the software package-flow chart for alloy and casting process selection-Casting weight calculation-Parting line analysis-Pattern withdrawal simulation-Heat centre analysis-Feeder head design-gating design-Pattern plate layout.	**14**
II	IRON CASTINGS PRODUCTION AND HEAT TREATMENT: IRON CASTINGS MELTING PRACTICE: Gray iron castings-Malleable Iron castings-Blackheart malleable iron castings-Whiteheart malleable iron castings-Pearlitic malleable iron-Melting practice HEAT TREATMENT OF CASTINGS: Iron Carbon Equilibrium Diagram-Effect of Alloying elements on casting and other properties of steel-Heat treatment of ferrous castings-Stress relief of castings-Stress relieving in steel castings-Stress relieving in gray iron castings-Other heat treatment processes applicable to castings-Heat treatment of Non ferrous castings	**154**
III	SPECIAL CASTING TECHNIQUES: DIE CASTING TECHNIQUES : Introduction – classification of special casting techniques – gravity die or permanent mold casting -pressure die casting -die casting dies – hot chamber die casting –gooseneck injection type-submerged plunger type-cold camber die casting – Advantages of die casting-limitations of die casting.	**14**

	CENTRIFUGAL CASTING: Centrifugal casting methods – true centrifugal casting –De lavaud process-advantages-disadvantages-applications-semi centrifugal casting – centrifuge casting –advantages of centrifugal casting methods OTHER SPECIAL CASTING TECHNIQUES: carbon di oxide molding – investment mold casting – shell molding – plaster mold casting – Antioch process – slush casting – continuous casting – squeeze casting.	
IV	INSPECTION AND TESTING 4.1 INSPECTION Introduction – Inspection and testing – inspection procedure – visual inspection – dimensional inspection – coordinate measuring machine – testing, casting soundness – pressure testing / leak testing – chemical analysis. 4.2 TESTING Non destructive testing – X Ray radiography – magnetic particle inspection –– liquid dye penetrate test fluorescent dye penetrate test– ultrasonic inspection. Destructive Testing – Tensile Test – Brinell Hardness Test – Rockwell Hardness Test – Vickers harness test – Impact test – Fatigue test.	**14**
V	FOUNDRY ENVIRONMENT, DUST MEASUREMENT AND MAINTENANCE: SAFETY: Introduction – hazardous waste –waste water treatment – hearing-head eye-face -hand– foot protection – protective clothing, atmosphere supplying respirator DUST MEASUREMENT: Dust problem in foundries -Introduction – dust measurement and sampling-thermal precipitator Owen's jet counterkonimeter-hexhlet sampler-tyndall beam method -dust control and duct extraction in foundries – dust collection equipment – dust disposal method. MAINTENANCE: Preventive maintenance in foundries -Introduction – objectives – elements-Returning sick foundry to profitability-Application of computer in foundry industry.	**14**

Text Books :

1. Foundry Technology -O.P. Khanna -S. Chand –1996
2. Principles of Metal casting – Richard W Heine, Philip C Rosenthal -McGraw-Hill, 1967

Reference Books :

1) Foundry Engineering – R. B. Gupta --S. Chand –1986

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015 -2016 onwards

39163 FOUNDRY MECHANIZATION AND FETTLING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code : 39163

Semester : VI

Subject Title : FOUNDRY MECHANIZATION AND FETTLING

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
FOUNDRY MECHANIZATION AND FETTLING	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topic	Hours
1	Foundry mechanization and material handling	11
2	Material handling equipments	11
3	Fettling	11
4	Dressing, salvaging and surface treatment of castings	11
5	Defects in castings and quality control	11
6	Test and Revision	5
	Total	**60**

RATIONALE:

Enable to understand principles, facts, concepts, and experimental determination of mechanization , Material handling equipments , fettling and finishing of castings , Salvage of defective castings, Quality control in foundries operation of and to apply the acquired knowledge and skill to identify, interpret and analyse various practical field problems in different fields of engineering

Objectives:

- To know about the Foundry mechanization and material handling
- To know about the Material handling equipments
- To know about the Fettling
- To know about the Dressing, salvaging and surface treatment of castings

- To know about the Defects in castings and quality control

FOUNDRY MECHANIZATION AND FETTLING

Detailed Syllabus

Unit	Name of the Topic	Hours
I	FOUNDRY MECHANIZATION AND MATERIAL HANDLING: MECHANIZATION : Introduction – Foundry Industry-Types-Different sections of a foundry- Foundry layout- layout of a Manual foundry- Layout of a Mechanized Foundry-mechanization – modernization - mechanization advantages – disadvantages – Disamatic - mechanized foundry –processing steps in mechanized foundry –flow chart for sand circulation. ROBOTS IN FOUNDRY : Automatic guided vehicles-use of robots in foundries-Robots in metal casting – Robots in Dicasting - Robots in Sand mold castings- Robotics payback- Manipulator control-Working arm attachements -Steps for implementing a foundry robot project-Benefits of robots in metal casting- dedicated machines	**11**
II	MATERIAL HANDLING EQUIPMENTS: TRUCKS AND CRANES : Introduction –Classification of Material handling equipments-Industrial trucks-Manual wheeled type- Powered type-Platform type- pallet lift- forklift truck- Cranes-Over head bridge crane-Jib crane -Gantry crane- Hoists- Chain type manual-Pneumatic –Electrical-Working – applications. CONVEYORS, SLIDES AND CHUTES: Belt conveyor- Roller conveyor-Bucket conveyor-Chain conveyor-Apron conveyor-Flight conveyor-Pallet conveyor-Working – applications- Slides and chutes- Working – applications.	**11**
III	FETTLING: FETTLING : Shakeout/Cleaning/Finishing –modern developments – fettling and finishing of castings – removal cores – cleaning of casting surface – hand method – mechanical equipment methods-tumbling– blast cleaning – air blasting – mechanical blast cleaning – hydro blasting – safety consideration during blast cleaning -chemical cleaning – removal gates and risers – removal of fins and other unwanted projections from castings– finishing the casting.	**11**

	MODERN DEVELOPMENTS: Punchout machines-Shakeout tables and decks-High frequency shakeouts-Vibrating shakeout Conveyors Rotary separators-Robot sand manipulators.	
IV	DRESSING, SALVAGING AND SURFACE TREATMENT OF CASTINGS: DRESSING OF CASTINGS: Introduction-Methods of dressing castings-Grinding-Flash removal-Special operations-Ancillaries-Equipment used to dress castings-High frequency electrical hand grinders-Pneumatic grinders-stationary pedestal grinders-Abrasive used in dressing castings SALVAGING: Salvage of defective castings-Introduction – factors affecting salvage of casting – salvage techniques – repair of gray iron castings – repair of S.G. cast iron – repair of steel castings – repair of aluminum alloy castings – repair of copper alloy castings SURFACE TREATMENT OF CASTINGS: Painting-Enamelling-Electroplating-galvanising-Polishing-Anodising-pickilng (Basics only)	**11**
V	DEFECTS IN CASTINGS AND QUALITY CONTROL: DEFECTS IN CASTING : Defect in Casting: Introduction – classification of defects – defects caused by patterns and molding box equipments – defects due to improper molding and core making materials – defects due to improper sand mixing and distribution – defects caused by molding, core, gating -defects due to improper mold drying and core baking – defects occurring while closing and poring the mold – defects caused molten metal – defects occurring during fettling – defects due to faulty heat treatment – defect due to cast metal -warpage – main types of defects their causes and remedies. QUALITY CONTROL: Quality control in foundries-quality control in pattern and mould making-quality control in melting-quality control in heat treatment-quality control in fettling and cleaning-quality control in final inspection.	**11**

Text Books :

1. Foundry Technology -O.P. Khanna -S. Chand –1996

2. Principles of Metal casting – Richard W Heine, Philip C Rosenthal -McGraw-Hill, 1967

Reference Book :

1. Foundry Engineering – R. B. Gupta --S. Chand –1986

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015 -2016 onwards

39164 METAL FORMING TECHNOLOGY

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code: 39164

Semester : VI

Subject Title : **METAL FORMING TECHNOLOGY**

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

Topics and Allocation of Hours:

Unit	Topic	Hours
1	Plastics , refractories and composite materials	11
2	Powder metallurgy , hot working and cold working	11
3	Extrusion and drawing	11
4	Rolling and forging	11
5	Deep drawing and forming process	11
6	Test and Revision	5
	Total	**60**

RATIONALE:

Enable to understand principles, facts, concepts, and experimental determination of values Properties of plastics, Composite material ,Refractory, Inspection , Destructive and Non Destructive Testing, Principle of Extrusion, Rolling of metals , Forging & Cold working operation of and to apply the acquired knowledge and skill to identify, interpret and analyse various practical field problems in different fields of engineering

Objectives :

- To know about the plastics , refractories and composite materials
- To know about the powder metallurgy , hot working and cold working

- To know about extrusion and drawing
- To know about rolling and forging
- To know about deep drawing and forming process

METAL FORMING TECHNOLOGY
Detailed Syllabus

Unit	Name of the Topic	Hours
I	PLASTICS , REFRACTORIES AND COMPOSITE MATERIALS: PLASTICS : Introduction – Properties of plastics-Applications of plastics-Types of -Plastics Molding process – Compression molding – Transfer molding –Injection Molding – Blow molding -Extrusion molding –Thermoformingcasting. REFRACTORIES : Refractories – properties – classifications -Refractoriness – Refractory metals – Super Refractory – general method of manufacture of refractory -flow chart for manufacture of refractories – selection of refractory COMPOSITE MATERIAL: Introduction -Composite material – Applications -Classification of composite material	**11**
II	POWDER METALLURGY , HOT WORKING AND COLD WORKING: POWDER METALLURGY : Introduction – advantages – Limitations – applications - characteristics of metal powder – Production of metal powders - Atomising Process-Gaseous Reduction-Electrolysis Process-Carbonyl Process-Stamp and Ball mills-Granulation Process=Mechanical Alloying-Vapour condensation – Compacting – die pressing – roll compacting – extrusion method –sintering – Secondary Operations. Hot working – cold working –recovery- recrystallization and grain growth-Comparision Of Hot Working over Coldworking.	**11**
III	EXTRUSION AND DRAWING: EXTRUSION : Introduction-Extrusion products– Principle – Direct extrusion-Indirect Extrusion – Pneumatic accumulator – Hydrostatic extrusion – extrusion of ubes from hollow billet-extrusion of tubes from solid billets-Portable die for extrusion of tubes-defects of extruded sections – Extrusion of lead cable sheathing –Extrusion forging – impact extrusion – production of	**11**

	collapsible tubes – Hooker process. DRAWING : Rod drawing – pointing the rod-wire drawing – bull block for drawing wire– multiple die wire drawing machine – Wire drawing die – Tube drawing – Drawing without a mandrel – Drawing with a Fixed mandrel – Drawing with a Floating mandrel -Drawing with a moving mandrel-Principle of reeling	
IV	ROLLING AND FORGING: ROLLING : Rolling of metals – Rolling process – Applications -Hot rolling – Cold rolling – Rolling operation – Two roll – Three high roll – Four high roll – Cluster roll.Tube making process involving rolling operation – Manesmann and rotary piercing processes – Pilger process – Plug Rolling process – push bench process – Transverse rolling -three roll profile shaft rolling. FORGING : Forging –applications-Types of forging hammer & Press – Double acting – Steam hammer – Board drop hammer – hydraulic press – smith forging – closed die forging – upset forging – forging defects	**11**
V	DEEP DRAWING AND FORMING PROCESS: DRAWING : Deep drawing – Applications-Redrawing – Single acting press with combination tool -double acting press with combination tool -defects in deep drawing process -Erichsen cupping machine – marforming –hydro forming FORMING : Cold working process – shearing operations – Bending operations – squeezing -peening -sizing -coining -hobbing -rubber pressing – spinning -flow turning – stretch forming – coining – Embossing – high energy rate forming – Explosive forming – Electro Hydraulic forming-electromagnetic forming	**11**

Text Books:

1.Material Science and Metallurgy -O.P. Khanna -S. Chand –1986
2.Material Science and Process -S.K. Hajra Chowdry-Indian Book Distributing C0, Calcutta, I998
3.Engineering metallurgy – Raymond A.Higgins.-Krieger Publishing Company-1993

Reference Books :

1. Mechanical Metallurgy – Dieter – McGraw Hill – 1986
2. ASM Metal Hand Book
3. Introduction to Physical Metallurgy – Avener – McGraw Hill – 1989

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015 -2016 onwards

39265 ENGINEERING MANAGEMENT

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code : 2021

Subject Code : 39265

Semester : VI

Subject Title **: ENGINEERING MANAGEMENT**

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

Topics and Allocation of Hours:

S.No	Topic	Hours
1	Plant Engineering And Plant Safety	11
2	Work Study, Method Study And Work Measurement	11
3	Production Planning And Quality Control	11
4	Principles Of Management And Personnel Management	11
5	Maintenance Management And Material Management	11
6	Test and Revision	5
	Total	**60**

RATIONALE:

In the Indian Economy, Industries and enterprises always find prominent place. After globalization, the government of India has announced liberalization policy of starting an enterprise which resulted in the mushroom growth of industries. The present day students should be trained not only in manufacturing processes but also in managing activities of industries. Training must be imparted to students not only to shape them as technicians but also as good managers. The knowledge about plant, safety, work study techniques, personnel management will definitely mould the students as managers to suit the industries. Due to the presence of such personalities the industries will leap for better prosperity and development

Objectives :

- To know about Plant Engineering And Plant Safety
- To know about Work Study, Method Study And Work Measurement
- To know about Production Planning And Quality Control
- To know about Principles Of Management And Personnel Management
- To know about Maintenance Management And Material Management

ENGINEERING MANAGEMENT
Detailed Syllabus

Unit	Name of the Topic	Hours
I	**PLANT ENGINEERING AND PLANT SAFETY** **Plant Engineering :**Plant – Selection of site of industry – Plant layout –Principles of a good layout – types – process, product and fixed position –techniques to improve layout – Principles of material handling equipment **Plant 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	11
II	**WORK STUDY, METHOD STUDY AND WORK MEASUREMENT** **Work Study:** Productivity – Standard of living – method of improving productivity– Objectives – Importance of good working conditions. Method Study: Definition – Objectives – Selection of a job for method study –Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart. .**Work Measurement:** Definition – Basic procedure in making a time study –Employees rating factor – Application of time	11

	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.	
III	**PRODUCTION PLANNING AND QUALITY CONTROL** **Production Planning and Control:** Introduction – Major functions of production planning and control – Pre planning – Methods of forecasting – Routing and scheduling – Dispatching and controlling – Concept of Critical Path Method(CPM)-Description only. Production – types-Mass production, batch production and job order production- Characteristics – Economic Batch Quantity (EBQ) –Principles of product and process planning – make or buy decision. **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– Concept of ISO 9001:2008 Quality Management System Registration / Certification procedure – Benefits of ISO to the organization.	**11**
IV	**PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT** **Principles of Management:** Definition of management – Administration -Organization – F.W. Taylor's and Henry Fayal's Principles of Management –Functions of Manager – Types of Organization – Line, Staff, Taylor's Pure functional types – Line and staff and committee type – Directing – Leadership - Styles of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation **Personnel Management:** Responsibility of human resource management –Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school	**11**

	training – Job evaluation and merit rating –objectives and importance – wages and salary administration – Components of wages – Wage fixation – Type of wage payment	
V	**V MAINTENANCE MANAGEMENT AND MATERIAL MANAGEMENT** Maintenance Management - types of maintenance strategies, Planned and unplanned maintenance, breakdown, preventive & predictive maintenance. Their comparison, advantages disadvantages. Limitations , computer aided maintenance, maintenance scheduling, spare part Management, inventory control, organization of maintenance department. **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.	**11**

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. – 2001, New Delhi.

3)Maintenance& Spare parts Management Gopal Krishnan

4) Industrial Maintenance Management S.K. Shrivastava

Reference Books :

1) Management, A global perspective, Heinz Weihrich, Harold Koontz, 10th Edition, McGraw Hill International Edition 1994.

2) Essentials of Management, 4th Edition, Joseph L.Massie, Prentice-Hall of India,New Delhi 2004.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015 -2016 onwards

39266 CNC PROGRAMMING AND SIMULATION LAB

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code: 39266

Semester : VI

Subject Title: CNC Programming and Simulation Lab

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
CNC Programming and Simulation Lab	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Rational :

The CNC Programming and Simulation Lab will give the students studying maintenance

Course a overview of CNC lathe, milling machine, international standard G Codes and M codes and incremental system and absolute systems.

Objectives :

1. Study of CNC lathe, milling machine
2. Study of international standard G Codes and M codes
3. Study of incremental system and absolute system
4. Study of part program format
5. Study of canned cycles for lathe and milling
6. Program writing – turning simulator – milling simulator, IS practice – commands – menus

Exercise

CNC TURNING

Writing program using g01, g02 & g03

1. Step turning
2. Taper turning
3. Circular interpolation

writing program using canned cycle

4. Step turning
5. Taper turning
6. Circular interpolation
7. Multiple turning
8. Thread cutting and grooving
9. Internal drilling and boring

CNC milling

10. Linear interpolation
11. Circular interpolation
12. Linear and circular interpolation
13. Drilling and counter sinking
14. Mirroring
15. Pocketing

BOARD EXAMINATION

Note: All the exercises in both sections have to be completed.

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

Program writing	**-**	**40 Marks**
Simulation	**-**	**30 Marks**
Viva-voce	**-**	**05 marks**
Total	**-**	**75 marks**

Equipment requirement:

Minimum Facilities required for 60 intakes.

1. Personal computer (Pentium processor) – 15 Nos.
2. Off line CNC Lathe and Milling simulation software – 15 users.
3. Laser Printer – 1 No.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

III YEAR

M – SCHEME

VI SEMESTER

2015 -2016 onwards

39167 SAND TESTING AND METALLURGY PRACTICAL

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CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code: 39167

Semester: VI

Subject Title: SAND TESTING AND METALLURGY PRACTICAL

Subject	Instructions		Examination			
	Hours / Week	Hours /Semester	Marks			Duration
SAND TESTING AND METALLURGY PRACTICAL	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

RATIONALE:

In Diploma level Engineering education skill development plays a vital role. The skill development can be achieved by on hand experience in handling various tools, material, specimen and equipment. This is accomplished by doing sand testing and metallurgy related experiments in practical classes in various laboratories.

OBJECTIVES:

- Specimen preparation for microscopic study
- To study the microstructure of Low carbon steel (Mild steel) ,medium carbon, high carbon steel, Hardened carbon steel (Martensite), Gray Cast Iron , Spheroid Graphite iron, Aluminium Alloy , Copper Alloys and Brass metal.
- To study the Permeability number of the sand
- To study the Compressibility of the sand
- To study the AFS number of the sand using shieve analysis
- To study the Dry Compression Strength of the sand

- To study the Green Compression Strength of the sand
- To study the Moisture content of the sand
- To study the clay content of the sand.

Exercises:

LIST OF EXPERIMENTS :

METALLURGY LAB (PART A)

1. Specimen preparation for microscopic study
2. Identification of Low carbon steel (Mild steel) from the microstructure
3. Identification of medium carbon steel from the microstructure.
4. Identification of high carbon steel from the microstructure
5. Identification of Hardened carbon steel (Martensite) from the microstructure.
6. Identification of Gray Cast Iron from the microstructure.
7. Identification of Spheroid Graphite iron from the microstructure.
8. Identification of Aluminium Alloy from the microstructure.
9. Identification of Copper Alloys from the microstructure.
10 Identification of Brass metal from the microstructure

SAND TESTING LAB: (PART B)

11. Determination of Permeability number of the sand
12. Determination of Compressibility of the sand
13. Determination of AFS number of the sand using shieve analysis
14. Determination of Dry Compression Strength of the sand
15. Determination of Green Compression Strength of the sand
16. Determination of Moisture content of the sand
17. Determination of clay content of the sand.

BOARD EXAMINATION

Note: All the exercises in both sections have to be completed.
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

METALLURGY LAB (PART A)

Aim, procedure and result	10 marks
Identification of specimen	10 marks
Microstructure	15 marks

SAND TESTING LAB: (PART B)

Procedure	10 marks
Observation and Tabulation	20 marks
Result	05 marks
Viva voce	05 marks
	Total 75 Marks

Equipment required

Batch Size: 30 students

METALLURGY LAB (PART A) :		
S No	Equpiment / Tools Required	Quantity
1	Metallurgical microscope	1
2	Specimen	1 for each structure
3	Specimen polishing machine	1

SAND TESTING LAB (PART B):		
S No	Equpiment / Tools Required	Quantity
1	Permeability Meter	1
2	Compression Strength Testing Machine	1
3	Grain Fineness Tester	1
4	Sand Specimen Rammer	1
5	Hot Air Oven	1
6	Digital Weighing Machine	1
7	Weighing Scale	1

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

III YEAR

VI SEMESTER

30002 – LIFE AND EMPLOYABILITY SKILLS PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING – SYLLABUS – M Scheme

(Being implemented from the Academic Year 2016-2017 onwards)

Course Name : **All Branches of Diploma in Engineering and Technology and Special Programmes**

Subject Code : **30002**

Semester : **VI**

Subject Title : **LIFE AND EMPLOYABILITY SKILLS PRACTICAL**

Teaching and Scheme of Examination: **No. of Weeks per Semester: 15 Weeks**

Subject	Instruction		Examination			
			Marks			
	Hours/ Week	Hours/ Semester	Internal assessment	Board Examination	Total	Duration
Life and Employability Skills	4 Hours	60 Hours	25	75	100	3 Hours

Topics and Allocation of Hours:

Sl. No.	Section	No. of Hours
1	**Part – A** Communication	**30**
2	**Part – B** Entrepreneurship, Project Preparation, Productivity,	**20**

	Occupational Safety, Health, Hazard, Quality Tools& Labour Welfare	
3	**Part – C** Environment, Global Warming, Pollution	**10**
TOTAL		**60**

RATIONALE

Against the backdrop of the needs of the Industries, as wells as based on fulfilling the expectations of the Industries, the Diploma Level students have to be trained directly and indirectly in toning up their competency levels. Proficiency in Communication only, equips them with confidence and capacity to cope with the employment. Hence, there is a necessity to focus on these in the curriculum. At the end of the Course, the student is better equipped to express himself in oral and written communication effectively.

SPECIFIC INSTRUCTIONAL OBJECTIVES

1. Emphasize and Enhance Speaking Skills

2. Increase Ability to Express Views & Opinions

3. Develop and Enhance Employability Skills

4. Induce Entrepreneurship and Plan for the Future

5. Expose & Induce Life Skills for Effective Managerial Ability

LIFE AND EMPLOYABILITY SKILLS PRACTICAL

SYLLABUS

Unit	Topics	Activity	Hours
I	**Communication, Listening, Training, Facing Interviews, Behavioural Skills**	-- instant sentence making – say expressions/phrases-- 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, Marketing Analysis, Support & Procurement**	-- prepare an outline of a project to obtain loan from bank in becoming an entrepreneur – prepare a resume	**10**
III	**Productivity – comparison with developed countries, Quality Tools, Circles, Consciousness, Management, House Keeping**	-- search in the website -- prepare a presentation – discuss & interact	**05**
IV	**Occupational Safety, Health Hazard, Accident & Safety, First-Aid,Labour Welfare Legislation, Welfare Acts**	-- search in the website -- prepare a presentation – discuss & interact	**05**

V	**Environment, Global Warming, Pollution**	-- taking down notes / hints – answering questions -- fill in blanks 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 blanks with exact words heard) **05**

b) Speaking Extempore/ Prepared **30 Marks**

1. Personality/Psychological Skills (instant sentence making) **05**
2. Pleasing & Amiable Skills (say in phrases/expressions) **05**
3. Assertive Skills (introducing oneself/others) **05**
4. Expressive Skills (describe/explain things) **05**
5. Fluency/Compatibility Skills (dialogue) **05**
6. Leadership/Team Spirit Skills (group discussion) **05**

c) Writing & Reading **20 Marks**

1. Creative & Reasoning Skills (frame questions on patterns) **05**
2. Creative & Composing Skills (make sentences on patterns) **05**
3. Attitude & Aim Skills (prepare resume) **05**
4. Entrepreneurship Skills (prepare 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 **10 Marks**
Other activities recorded in the Record note **10 Marks**
Attendance **05 Marks**

INTERNAL MARKS **25 MARKS**

EXTERNAL MARKS AT 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 the exact words heard. 05

B. SPEAKING **30 Marks**

1. Say in a sentence instantly on hearing the word(5 words, one after another). 05
2. Say any five expressions commonly used in communication. 05
3. Imagine, a consultant has come to your department.
   Introduce him to your subordinates. 05
4. Explain/describe the product you are about to launch in the market. 05
5. Speak with your immediate boss about the progress you have made. 05
6. Discuss within the group on the topic of focus in the syllabus. 05

C. WRITING & READING **20 Marks**

1. Frame new questions from the pattern given by changing sets of words with your own. 05

a.	When	do	you	return?
b.	How	is	his performance?	
c.	Where	has	the manager	gone?
d.	What	is	the progress	today?
e.	Why	are	the machines	not functioning?

2. Make sentences from the pattern given by changing sets of words with your own. 05

a.	The workers	are	on strike		
b.	The labourers	are paid	well	in this factory	
c.	There	is	a rest room	for the workers	

d.	These	are	the new products	launched	by our company
e.	Almost everyone	come	to the company	on motorbikes	

3. Prepare a resume for the post of Department Manager. 05

4. Prepare an outline of a project to obtain a loan. (Provide headings and subheadings) 05

I. Guidelines for setting the question paper:

A. LISTENING :

ONLY TOPICS related to
POLLUTION /
ENVIRONMENT /
GLOBAL WARMING are to be taken.
These topics are common for all the three types of evaluation.

B. SPEAKING :

1. WORDS of common usage
2. Fragments – expression of politeness, courtesy, cordiality
3. Introduce yourself as an engineer with designation or
   Introduce the official visiting your company/department

4. Describe/Explain the product/machine/department
5. Dialogue must be with someone in the place of work.
6. Group of six/eight
   Discuss the focused topic prescribed in syllabus

C. WRITING & READING:

1. Provide five different structures.
   Students are to substitute at least one with some other word/words
2. Provide five different structures.
   Students are to substitute at least one 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
   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. Productivity in Industries – Comparison with developed countries
2. Quality Tools, Quality Circles and Quality Consciousness
3. Effective Management
4. House Keeping in Industries
5. Occupational Safety and Hazard
6. Occupational Accident and First Aid
7. Labour Welfare Legislations
8. Labour Welfare Acts and Rights
9. Entrepreneurship
10. Marketing Analysis, Support and Procurement

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

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING (FOUNDRY) (SANDWICH)

M – SCHEME

VII SEMESTER

2015 -2016 onwards

39171 FOUNDRY TECHNOLOGY PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name: DIPLOMA IN MECHANICAL ENGINEERING (Foundry)

Course Code: 2021

Subject Code: 39171

Semester: VII

Subject Title: FOUNDRY TECHNOLOGY PRACTICAL

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

RATIONALE:

In Diploma level Engineering education skill development plays a vital role. The skill development can be achieved by on hand experience in handling various tools, material, specimen and equipment. This is accomplished by doing various types of molds and castings in practical classes in various laboratories.

Objectives :

- To study the Foundry tools and equipments
- To study the patterns and cores
- To know about Preparation of Mould using Cube (Single piece pattern) , Flange in box moulding using a pattern,Pipe with the use of split pattern and core box ,T – Pipe split pattern and core box , Gear wheel and core box , Grooved pulley using draw back method,Loose piece pattern, Sweep pattern ,Gated Pattern ,Skeleton pattern ,Segmental pattern ,Follow board pattern, Match plate pattern ,
- To know about Preparation of Core making .
- To study Melting Practice equipments

EXPERIMENTS :
Preparation of Mould and Cores:
1. Cube (Single piece pattern)
2. Flange in box moulding using a pattern
3. Pipe with the use of split pattern and core box
4. T – Pipe split pattern and core box
5. Gear wheel and core box
6. Grooved pulley using draw back method
7. Loose piece pattern
8. Sweep pattern
9. Gated Pattern
10. Skeleton pattern
11. Segmental pattern
12. Follow board pattern
13. Match plate pattern
14. Core making.

Melting Practice :
(only for demonstration in practical classes not to be included in board examinations)
Making of Aluminium Castings by using oil fired crucible furnace
Effect of quenching media of hardness.

BOARD EXAMINATION

Note: All the exercises in both sections have to be completed.

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 technology lab

Sand preparation	15 marks
Mold/Core preparation	35 marks
Finishing	20 marks
Viva voce	05 marks
Total	75 Marks

EQUIPMENT REQUIRED :
Batch Size : 30 students

S No	Equpiment / Tools Required	Quantity
1	Cube (Single piece pattern)	6
2	Flange in box moulding using a pattern	2
3	Pipe with the use of split pattern and core box	2
4	T – Pipe split pattern and core box	2
5	Gear wheel and core box	2
6	Grooved pulley using draw back method	2
7	Loose piece pattern	2
8	Sweep pattern	2
9	Gated Pattern	2
10	Skeleton pattern	2
11	Segmental pattern	2
12	Follow board pattern	2
13	Match plate	2
14	Core Making Tools	5
15	Mould Making Tools	40
16	Moulding Box	40
17	Crucible furnace	1

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

[FOUNDRY]

M SCHEME

2015 -2016 onwards

VII SEMESTER

32055 – PROCESS AUTOMATION PRACTICAL

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY]

Course Code : 2021

Subject Code : 32055

Semester : VII

Subject Title : PROCESS AUTOMATION PRACTICAL

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Process Automation Practical	4	60	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

OBJECTIVES:

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

Exercises

Pneumatics Lab.

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

Hydraulics Lab.

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

PLC Lab.

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

Board of Examination

Note: All the exercises have to be completed. Two exercises will be given for examination by selecting one exercise from Pneumatics Lab. or Hydraulics lab. and one from PLC lab.

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: Pneumatics/Hydraulics lab by lot	- 35 marks
Part B: One question from PLC lab.	- 35 marks
Viva-voce	- 05 marks
Total	**- 75 marks**

LIST OF EQUIPMENTS

1. Pneumatic Trainer Kit – 2Nos
   (All Cylinders, Control Valves, Limit switches and other accessories)
2. Hydraulics Trainer Kit – 1No.
   (All Cylinders, Control Valves, Limit switches and other accessories)
3. PLC kit. – 2 Nos.
4. Computer with software – 5 Nos.

DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

VII SEMESTER

32067 – PROJECT WORK

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING [FOUNDRY] [MTMR]

Course Code : 2021

Subject Code : 39173

Semester : VII

Subject Title : Project Work

.**TEACHING AND SCHEME OF EXAMINATIONS:**

No. of Weeks per Semester: 15 Weeks

Subject	Instruction		Examination		
	Hours/ Week	Hours/ Semester	Assessment Marks		
			Internal	Board Exam	Total
PROJECT WORK	4	60	25	75	100

Minimum Marks for Pass is 50 out of which minimum 35 marks should be obtained out of 75 marks in the board Examination alone.

OBJECTIVES:

- Implement the theoretical and practical knowledge gained through the curriculum into an application suitable for a real practical working environment preferably in an industrial environment
- Get exposure on industrial environment and its work ethics.
- Understand what entrepreneurship is and how to become an entrepreneur.
- Learn and understand the gap between the technological knowledge acquired through curriculum and the actual industrial need and to compensate it by acquiring additional knowledge as required.
- Carry out cooperative learning through synchronous guided discussions within the class in key dates, asynchronous document sharing and discussions, as well as to prepare collaborative edition of the final project report.
- Understand the facts and importance of environmental management.

- Understand and gain knowledge about disaster management

INTERNAL ASSESSMENT:

The internal assessment should be calculated based on the review of the progress of the work done by the student periodically as follows.

Detail of assessment	Period of assessment	Max. Marks
First Review	6th week	10
Second Review	12th week	10
Attendance	Entire semester	5
Total		**25**

EVALUATION FOR BOARD EXAMINATION:

Details of Mark allocation	Max Marks
Marks for Report Preparation, Demo, Viva-voce	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

1. 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.

2. DISASTER MANAGEMENT

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

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 Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes? How they are measured? Which parts of India are more vulnerable for frequent earthquakes?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie: (a) Chennai (b) Nagapattinam (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.

15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter ? When and where it is provided ? What are its requirements ?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river ?
18. What are the causes for fire accidents ? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings ? What are its requirements ?
20. How the imamates of a multistory building are to be evacuted in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding ?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?
28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation ?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearly lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?

37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?
41. Explain the legal / financial problems the management has to face if safely measures taken by them are found to be in adequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?
44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants?

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SANDWICH DIPLOMA COURSE-INDUSTRIAL TRAINING

39191 Industrial Training I (Report writing & Viva Voce)

39192 Industrial Training II (Report writing & Viva Voce)

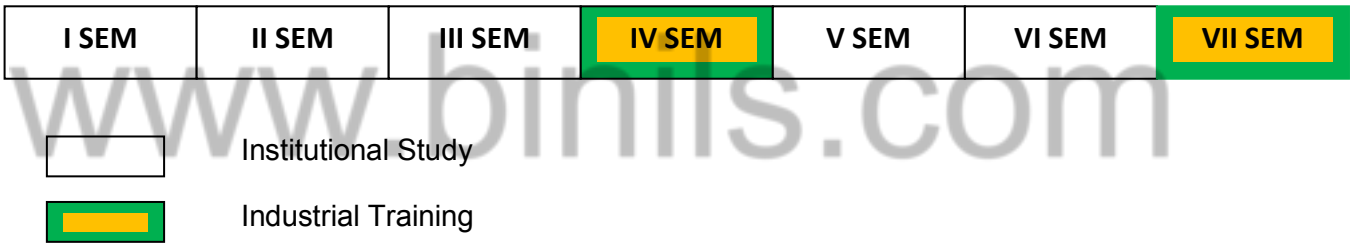
1. Introduction

The main objective of the sandwich Diploma course is to mould a well rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 Semesters of 3 ½ years duration, the subjects of 3years-Full Time Diploma Course being regrouped for academic convenience.

While in the 4th semester students under Industrial Training for 6 months(December through May). They also do course work in the institution for one day in a week, While in the 7th semester they undergo another spell of 6 months (June through November) Industrial training.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.



2. Attendance Certification

Every month students have to get their attendance certified by industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the Internal Assessment mark.

3. Training Reports

The students have to prepare two types of reports:

- Weekly report in the form of diary to be submitted to the concerned staff in-charge of the institution. This will be reviewed while awarding Internal Assessment marks.
- Comprehensive report at the end of each spell which will be used for Board Examination.

3.1 Industrial Training Diary

Students are required to maintain the record of day-to-day work done. Such record is called Industrial training Diary. Students have to write this report regularly. All days for the week

should be accounted for clearly giving attendance particulars (Presence, absence, Leave, Holidays etc). The concern Industrial supervisor is to check periodically these progress reports.

3.2 Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant/product/process/construction along with intensive in-depth study on any one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc should be incorporated with the consent of the Organisation.

a. Scheme of Evaluation

1.1 Internal Assessment Marks

First Review (during 3rd month)	: 10 marks
Second Review (during 5th month)	: 10 marks
Attendance *	: 05 marks (Awarded same as in Theory)
Total	: 25 marks

1.2 Board Examination

Presentation about Industrial Training	: 20 marks
Comprehensive Training Report	: 30 marks
Viva-voce	: 25 marks
Total	: 75 marks

*** For awarding marks to attendance, the Industrial Training attendance has to be considered.**