DIRECTORATE OF TECHNICAL EDUCATION, KAHILIPARA, GUWAHATI-19

DIPLOMA PROGRAMME IN

INDUSTRIAL PRODUCTION ENGINEERING

NEW SYLLABUS

DEPARTMENT OF INDUSTRIAL PRODUCTION ENGINEERING

UNDER

DIRCTORATE OF TECHNICAL EDUCATION, ASSMM

PROGRAMME OUTCOMES (PO)

After the completion of the three-year diploma programme, the diploma holders will have:

PO1. **Basic Knowledge**: Apply knowledge of basic mathematics, sciences and basic engineering to solve the broad-based Industrial and production engineering problems.

PO2. **Discipline knowledge**: Apply Industrial and production engineering knowledge to solve industial and production related problems.

PO3. **Experiments and practice**: Plan to perform experiments and practices to use the results to solve industrial and production engineering problems.

PO4. **Engineering tools**: Apply relevant industrial and production technologies and tools with an understanding of the limitations.

PO5. **The engineer and society**: Assess societal, health, legal and cultural issues and the consequent responsibilities relevant to practice in the field of industrial and production engineering.

PO6. **Environment and sustainability**: Apply industrial and production engineering solutions also for sustainable development practices in societal and environmental contexts.

PO7. **Ethics**: Apply ethical principles for commitment to professional ethics, responsibilities and norms of the practice also in the field of industrial and production engineering.

PO8. **Individual and team work**: Function effectively as a leader and team member in diverse/multidisciplinary teams.

PO9. **Communication**: Communicate effectively in oral and written form.

PO10. **Lifelong-learning**: Engage in independent and life-long learning activities in the context of technological changes also in the industrial and production engineering and allied industry.

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PROGRAMME SPECIFIC OUTCOME (PSO)

After the completion of the three-year diploma programme in Civil Engineering, the diploma holders will:

PSO1   Develop, improve, implement and evaluate the integrated systems of people, money, knowledge, information, equipment, energy, material and as a whole the industrial process.

PSO2   Plan, measure and control all activities within the industrial organization.

PSO3   Apply engineering procedures in manufacturing processes and production methods.

PSO4. Maintain various types of mechanical and electrical machines and equipments

For 3RD Semester all the courses remain common as the courses offered to Mechanical Engg. that are clearly mentioned in the curriculum structure.

For 4TH Semester all the courses remain common as the courses offered to Mechanical Engg. except ELECTRICAL TECHNOLOGY, that are clearly mentioned in the curriculum structure.

For 5TH Semester the courses ADVANCE WORKSHOP PRACTICE AND CNC MACHINES, AUTOMOBILE ENGINEERING and NON CONVENTIONAL ENERGY remain common as the courses offered to Mechanical Engg. that are clearly mentioned in the curriculum structure.

For 6TH Semester the courses INDUSTRIAL MANAGEMENT AND ENTREPRENEURSHIP, ADVANCE MACHINING METHOD, METROLOGY and DRAWING ESTIMATING AND COSTING remain common as the courses offered to Mechanical Engg. that are clearly mentioned in the curriculum structure.

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THIRD SEMESTER
INDUSTRIAL PRODUCTION ENGINEERING

COURSE STRUCTURE OF INDUSTRIAL PRODUCTION ENGINEERING (3RD SEMESTER)

COURSE STRUCTURE OF 3rd. SEMESTER (INDUSTRIAL PRODUCTION ENGINEERING)

Sl. No.	Code No.	Subject Name	Study Scheme Contact hours/week			Evaluation Scheme									Total Marks (Theory+ Practical)	Credit
						Theory					Practical				
							Sessional(SS)			Pass (ESE+SS)	Practical Test(PT)	Practical Assessment(PA)	Pass (PT+PA)		
			L	T	P	ESE	TA	HA	Total (TA+HA)						
1	Co-301	Computer Application and Programming	3		3	70	10	20	30	33/100	25	25	17/50	150	4
2	Hu-302	Engineering Economics & Accountancy	3			70	10	20	30	33/100				100	3
3	Me/Ch-301	Enviornmental Education	3			70	10	20	30	33/100				100	3
4	Me-302	Fluid Mechanics & Fluid machines	3	1	3	70	10	20	30	33/100	25	25	17/50	150	5
5	Me-303	Manufacturing Technology-I	3		3	70	10	20	30	33/100	25	25	17/50	150	4
6	EI/Et-304	Fundamentals of Electrical and Electronics Engineering	3		3	70	10	20	30	33/100	25	25	17/50	150	4
7	Me-310	Professional Practice-I	1		2						25	25	17/50	50	2
TOTAL			19	1	14									850	25
			34												

1:   Course Title – Computer Application & Programming (All Branches)

1:   Course Code – Co-301

2:   Semester- 3rd

3:   Aim of the Course :

- To give basic concepts related to organisation of a computer
- To give fundamental terminologies in networking
- To develop simple programs in C.

4:   Course Outcome:

On completion of the course students will be able to:

- Explain the basics of a computer hardware and software
- Solve problems related to number systems
- Define basics of Operating System
- Familiarize with networking components
- Write simple C programs

5:   Prerequisites for the Course: Have basic idea about a computer and its functions.

6:   Teaching Scheme (in hours):

Teaching Scheme			
L	T	P	Total hours per week
3	0	3	6

7:   Examination Scheme :

	Theory (T)	Sessional (TS)	Practical (P)	Practical Sessional (PS)
Full Marks	70	30	25	25
Pass Marks	33		17	

8: Detailed Course Content:

Unit	Topic/Sub-Topics	Intended Learning Outcome	Hours
1	**Computer Architecture:** Brief history, Charles Babbage Machine, Von Neuman Architecture, block diagram, memory & it's different types, I/O devices, Role of O.S., computer languages, translator software, editor. Data, different types of data, information and its characteristics	1. Define a computer and identify its parts. 2. Define computer memory & describe its different types. 3. Define computer languages & translators. 4. Describe the characteristics of information.	8
2	**Number System and codes:** Different number system- decimal, binary, octal, hexadecimal number system, their conversion, 1's and 2's Complement, subtraction using complements. Different codes- ASCII, BCD, Ex-3, Gray. Conversion from Gray to binary and vice-versa, BCD addition.	5. Define decimal, binary, octal & hexadecimal number systems. 6. Convert between different number systems. 7. Define 1's & 2's complements. 8. Subtract using 1's & 2's complements. 9. Describe some different codes.	8
3	**Introduction to Operating System:** Definition, single user and multi-user OS, different function performs by OS, various popular OS like DOS, Windows, UNIX/LINUX. DOS and UNIX commands.	10. Define operating system. 11. Operate different commands of DOS, Windows & UNIX/ LINUX.	5
4	**Computer Network and the Internet:** Definition, necessity of network, different types of network-LAN, MAN, WAN, network	12. Define network.	6

	topology, transmission media, different network devices like NIC, hub, bridge, switch, gateway. Introduction to the internet, Internet services, browser, search engine.	13. Describe different types of network. 14. Define network topology. 15. Describe different network devices. 16. Define internet & describe different internet services. 17. Explain use of different browsers & search engines.	
5	**Introduction to C programming:** Fundamentals of programming-Algorithm & Flowchart, source code and object code, Basic structure of C programs, Executing a C program, Constants, Variables, and data types. Operators and expression, Input Output function like printf, scanf, getchar, putchar, gets, puts, Decision making and branching using IF..Else, Switch, looping using for, while, and do-while, array.	18. Write algorithm and flow charts for simple programs. 19. Define basic terminology of C language. 20. Write small program using C language. 21. Write diversified solutions using C language. 22. Differentiate between IF..Else and Switch statement.	15
	Internal Assessment		3

Intellectual Skills :

- Logical reasoning
- Relating programming concepts in problem solving

Motor Skills :

- Learn to use and handle a computer and its peripherals.

List of Lab Exercises :

I. **Basic commands for computer system maintenance.**

II. **Preparation of Documents**

Introduction to Word processing, Opening a document, preparing documents, inserting diagrams and tables, Editing document- (a) Character, word and line editing, (b) Margin Setting, Paragraph alignment, (c) Block Operations, (d) Spell Checker, (e) Saving a document, (f) Mailmerge.

III. **Information Presentation through Spread Sheet**

Application of Spread Sheet, Structure of spreadsheets, Preparing table for simple data and numeric operations, Using formulae and functions in excel operations, Creation of graphs, Pie charts, bar charts.

IV. **Preparation of presentation**

Creation of electronic slides on any topic, Practice of animation effect, presentation of slides.

V. **Programming in C**

Editing a C program, defining variables and assigning values to variables

Arithmetic and relational operators, arithmetic expressions and their evaluation

Practice on input/output function like getchar, putchar, gets, puts, scanf, printf etc.

Programming exercise on simple if statement, If..else statement, switch statement

Programming exercise on looping with do-while, while, for loop and array.

9:   Distribution of Marks:

Unit	Topic	Type of Question			Total
		Objective	Short	Descriptive	Marks
1	Computer Architecture	6	5	5	16
2	Number System and codes	4	2	8	14
3	Introduction to Operating System	4	2	4	10
4	Computer Network and the Internet	5	3	6	14
5	Introduction to C programming	6	3	7	16
		25	15	30	70

10: Table of specification :

Unit	Topics (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Computer Architecture	8	19	✓			
2	Number Systems & Codes	8	19	✓		✓	
3	Introduction to Operating Systems	5	12	✓			
4	Computer Network & the Internet	6	15	✓		✓	
5	Introduction to C Programming	15	35	✓		✓	
	Total	Σ b=42	100				

K = Knowledge   C = Comprehension   A =Application

HA = Higher Than Application   (Analysis, Synthesis, Evaluation) $c = \frac{b}{\Sigma b} * 100$

Detailed Table Of Specifications

Unit	Topics	Objective				Short					Descriptive				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Computer Architecture	7			7	5				5	4				4
2	Number Systems & Codes	4			4	2				2	4		4		8
3	Introduction to Operating Systems	4			4	2				2	4				4
4	Computer Network & the Internet	5			5	3				3	3		4		7
5	Introduction to C Programming	5			5	3				3	3		4		7
	Total	25			25	15				15	18		12		30

K   = Knowledge C   = Comprehension A = Application

 HA = Higher Than Application T   =   Total

12:   Suggested Implementation Strategies:

1: As the subject is taught to the students of all branches, basic knowledge required to
understand the computer hardware and software needs to be emphasised.

2: Too much of hardware details could be avoided.

3: Programming section theory could be taught side by side in the lab.

13:   Suggested Learning Resources :

1.   Fundamentals of Computer, Rajaraman, PHI

2.   It Tools and Applications, DOEACC "O" Level, Firewall Media

3.   Let us C by Y. Kanetkar, BPB

4.   Programming in ANSI C / E. Balagurusamy / Tata McGraw-Hill

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2: Course Title : ENGINEERING ECONOMICS AND ACCOUNTANCY

1.Course Title : ENGINEERING ECONOMICS AND ACCOUNTANCY

2.Course Code: **Hu – 302**

3.Semester: 3rd

4.Aim of the Course:

1. To introduce the students to some important economic and accounting terms.

2. To acquaint the students with some economic laws and with the functions of money, bank etc.

3. To make the students capable of recording business transaction under double entry system.

4. To introduce the students about financial statements.

5.   Course Outcomes:

On completion of the course on EEA, students will be able to

➢ CO $_1$ =   Define some important economic and accounting terms.

➢ CO $_2$ =   explain some basic economic laws.

➢ CO $_3$ =   Describe overall economic environment.

➢ CO $_4$ =   explain double entry system of book keeping.

➢ CO $_5$ =   record business transactions under double entry system of book keeping

➢ CO $_6$ =   define financial statements.

6. Teaching Scheme (in hours)

Lecture	Tutorial	Practical	Total
42 hrs	**3 hrs**	**--**	**45 rs**

7.Examination Scheme:

Theory				Practical				Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination		Sessional		
70	30	100	33	--	--	--	--	100

8.Detailed Course Content:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
Part – A : Engineering Economics				**21 hrs**
1.0	Introduction to Economics :	i) Definition of Economics, its utility and scope of study ii) Definition of Engineering Economics ii) Meaning and concepts of Utility, Consumption, Value, Price, Goods and National Income, inflation iii) Wants – Definition and characteristics iv) Wealth & Welfare– Definition, meaning and types	i) explain core economic terms concepts and theories	5
2.0	**Demand and Supply :**	i) Meaning and types of Demand ii) The Law of Demand, its limitations iii) Preparation of Demand Schedule iv) Meaning of Supply ii) The Law of Supply, its limitations iii) Preparation of Supply Schedule	Define the Laws of Demand and Supply	4
3.0	**Production :**	i) Meaning and factors of production ii)Factors determining efficiency of labour	i) Define factors of production	5

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
		iii) Savings, investment and capital formation iv)Meaning of production function	ii) Explain formation of capital	
4.0	**Money:**	i) Meaning of money ii) Types of money iii) Functions of money	i) Understand meaning and functions of money	2
Chapter No.	**Chapter Title**	Content	Intended Learning Outcomes	Duration (in hours)
5.0	**Banking Organisation :**	i) Central Bank – its functions ii) Commercial banks – its functions	i) Distinguish the functions of different banks	3
6.0	Pricing	i) Objectives of pricing policy ii) price determinants iii) Price discrimination	i) explain pricing policy	2
Part – B : Accountancy				**21 hrs**
7.0 (A)	**Introduction to Book-Keeping and Accounting:**	i) Definition & objectives of Book-keeping ii) Need and advantages of Book-keeping iii) Definition of Accounting iv) Difference between Book-keeping and Accounting v) Double Entry System – main features vi) Advantages and disadvantages of Double Entry System	i) Define Double Entry System of Book Keeping ii) State its objectives, features merits and demerits	3
(B)	**Introduction to Computerised**	i) Components of Computerised Accounting Software	i) Identify components of	2

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
	Accounting System:	ii) Need for Computerised Accounting iii) Difference between Manual Accounting and Computerised Accounting	computerized accounting software	
8.0	**Transaction:**	i) Definition ii) Meaning of Account iii) Classification of Accounts: Traditional Approach Modern Approach iv) Meaning of Debit and Credit v) Rules of Debit and Credit	i) State the meaning and rules of Debit and Credit	2
Chapter No.	**Chapter Title**	Content	Intended Learning Outcomes	Duration (in hours)
9.0	**Journal and Ledger**	i) Meaning Journal ii) Recording of Transactions in Journal iii) Meaning of Ledger iv) Objectives and utility of Ledger v) Posting and balancing of Ledger vi) Distinction between Journal and Ledger vii) Names of different Books of Accounts	i) Record business transactions under double entry system in books of accounts	4
10.0	**Cash Book:**	i) Meaning and importance of Cash Book ii) Characteristics and advantages of Cash Book iii) Discount – Trade Discount and Cash Discount	i) Differentiate different types of Cash Book ii) Record transactions in Cash Book	4

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
		iv) Different types of Cash Book: Single Column Cash Book Double Column Cash Book Triple Column Cash Book v) Bank Reconciliation Statement – Basic idea		
11.0	**Trial Balance & Errors in Accounting:**	i) Meaning and objects of Trial Balance ii) Main features and advantages of Trial Balance iii) Preparation of Trial Balance iv) Types of errors in Accounting	i) Explain meaning and features of Trial balance	3
Chapter No.	**Chapter Title**	Content	Intended Learning Outcomes	Duration (in hours)
12.0	**Components of Final Accounts:**	i) Meaning and objectives of Trading Account ii) Contents of Trading Account iii) Meaning and objectives of Profit and Loss Account iv) Contents of Profit and Loss Account v) Meaning of depreciation, revenue expenditure and capital expenditure vi) Contents of Balance Sheet	i) Identify different components of Financial Statements	3
	Class Test			3 hrs
	Total			**45 hrs**

9 . TABLE OF SPECIFICATIONS for Engineering Economics & Accountancy

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Comprehension	Application	HA
1	Introduction to Economics	5	12	5	3	0	0
2	Demand & Supply	4	9	2	4	0	0
3	Production	5	12	6	2	0	0
4	Money	2	5	4	0	0	0
5	Banking Organisation	3	7	3	2	0	0
6	Pricing	2	5	2	2	0	0
Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Compre-hension	Application	HA
7	(A) Introduction to Book-Keeping	3	7	5	0	0	0
	(B) Introduction to Computerised Accounting System	2	5	3	0	0	0
8	Transaction	2	5	2	1	0	0
9	Journal & Ledger	4	9.5	2	2	3	0
10	Cash Book	4	9.5	0	5	2	0

11	Trial Balance & Errors in Accy	3	7	5	0	0	0
12	Components of Final Accounts	3	7	2	3	0	0
Total		**42 hrs**	**100**	**41**	**24**	**5**	**0**

K = Knowledge   C = Comprehension A = Application   A = Higher than Application (Analysis, Synthesis, Evaluation)

$$C = \frac{b}{\sum b} \times 100$$

10   Distribution of Marks:

DETAILED TABLE OF SPECIFICATIONS FOR EEA

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	Total
1	Introduc	3	1	0	4	2	2	0	0	4	0	0	0	0	0	8
2	Demand & Suppl	0	0	0	0	0	0	0	0	0	2	4	0	0	6	6
3	Production	1	0	0	1	2	0	0	0	2	3	2	0	0	5	8
4	Money	2	0	0	2	2	0	0	0	2	0	0	0	0	0	4
5	Banking Organis	1	0	0	1	0	0	0	0	0	2	2	0	0	4	5
6	Pricing	2	2	0	4	0	0	0	0	0	0	0	0	0	0	4
7	Introdu to B K	2	0	0	2	3	0	0	0	3	0	0	0	0	0	5
	Introduc to Comput	3	0	0	3	0	0	0	0	0	0	0	0	0	0	3
8	Transact	2	0	0	2	0	1	0	0	1	0	0	0	0	0	3
9	Journal & Ledge	1	0	0	1	0	0	0	0	0	1	2	3	0	6	7

10	Cash Book	0	2	0	2	0	0	0	0	0	0	3	2	0	5	7
11	Trial Balance	3	0	0	3	2	0	0	0	2	0	0	0	0	0	5
12	Componts F/Ac	0	0	0	0	0	0	0	0	0	2	3	0	0	5	5
	Total	20	5	0	25	11	3	0	0	14	10	16	5	0	31	70

K = Knowledge   C = Comprehension A =   Application

HA = Higher Than Application **Higher than Application (Analysis, Synthesis, Evaluation)**

T = Total

11 Suggested implementation Strategies: Modified syllabus may be implemented with effect from July, 2018 (Starting with the present batch (2018) of 2nd Semester students)

12 **Suggested learning Resource**: Book list

Sl. No.	Title of Book	Name of Author(s)	Publisher
1	Introductory Micro Economics	Sandeep Garg	Dhanpat Rai Publication Pvt. Ltd. New Delhi
2	Introductory Macro Economics	Sandeep Garg	Dhanpat Rai Publication Pvt. Ltd. New Delhi
3	Theory and Practice of Accountancy	B. B. Dam R. A. Sarda R. Barman B. Kalita	Capital Publishing Company, Guwahati – 5
4	Book-Keeping & Accountancy	Juneja, Chawla & Saksena	Kalyani Publisher, New Delhi - 110002
5	Tally. ERP 9 For Beginners	Tally Solutions Pvt. Ltd.	Sahaj Enterprises, Bangalore

b.List of Journals

c.Manuals

d.Others

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3   Course Title– Environmental Education

ENVIRONMENTAL EDUCATION

Subject Title	:ENVIRONMENTAL EDUCATION	
Subject Code	:	Me/Ch-301
Hours Per Week	:	03
Hours Per Semester	:	45
Class Test hrs	:	03
Total hrs	:	48
Full marks(Theory)	:	70
Sessional Marks	:	30
Class hours	L	T	P
	3	0	0

Pre requisite : None

Aim of the subject : The aim of the subject is to let the students know about the environment its importance of study, different types of pollution , its effect on environment.

CO------Course Outcome of the subject.(Outcome based Objective)

After studying the course the students will be able to

1) Know the need of the environmental study
2) Know the importance of ecology
3) Identify the different type of pollution and its impact on the environment
4) Know about the environmental sanitation process
5) Appreciate the resource conservation like conservation of land forest and timber, wild life, minerals
6) Know about the pollution control strategies

COURSE CONTENTS

1.0   **General concept**

    1.1   Nature and scope of environmental problems, definition.

    1.2   Interaction of system.

    1.3   Environmental disturbances.

    1.4   Public awareness and action.

    1.6   Population and economic growth.

1.7   Impact of industrialization and urbanization on environment.

2.0   Elements of ecology

2.1   Concept of ecosystem

2.2   Concept of biosphere and its components.

2.3   Energy flow in ecosystem.

2.4   Food chain in ecosystem.

3.0   Environmental Pollution

3.1   Water pollution types, source and their effects, natural recovery of water bodies, BOD, COD, DO sag curve

3.2   Air pollution definition, types, sources and it's effects. Air quality standards. Acid rain, Ozone hole depletion, Green house gases and their effects, Global warming. Vehicular pollution and prevention.

3.3   Land pollution, it's types, sources and their effects.

3.4   Noise pollution, sources, measurements and it's effects.

3.5   Radioactive pollution, types, sources and their effects.

4.0   Environmental Sanitation

4.1   Epidemiology- infectious diseases, factors and transmission of diseases.

4.2   Sanitary protection.

4.3   Occupational health hazards

4.4   Solid waste, sources, disposal methods.

5.0   Resource Conservation

5.1   Conservation of land, forest and timber, wildlife, minerals

5.2   Environmental Management.

5.3   Pollution control strategies.

5.4   Environmental ethics.

REFERENCES

1.   Environmental Education by Alan Reid

2.   An Introduction to Environmental Education by Ezaza & Otienda   Atman

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4. Course Title: Fluid Mechanics & Fluid Machines

Fluid Mechanics & Fluid Machines

Subject Title	**:FLUID MECHANICS & FLUID MACHINES**	
Subject Code	:	**Me-302**
Hours Per Week	:	**03**
Hours Per Semester	:	**45**
Class Test hrs	:	**03**
Total hrs	:	**48**
Full marks(Theory)	:	**70**
Sessional Marks	:	**30**

Class hours	L	T	P
	3	1	3

Pre requisite : Applied Physics, Applied Chemistry, Mathematics, Engineering Mechanics

Aim of the subject : The aim of the subject is to let the students know

1) about the different properties of the fluid ,
2) how the fluid particles behaves during statical pressure,
3) how the fluid particles behaves during flow,
4) how the different types of pump behaves with the fluid

CO--------Course Outcome of the subject.(Outcome based Objective)

After studying the course the students will be able to

1. Know the different properties of fluids
2. Calculate fluid pressureusing manometer
3. Appreciate the Archimedes' Principle of a floating object
4. Apply Bernoulli's theorem for solving problems on discharge
5. Calculate the Coefficient of discharge of a Venturimeter and a notch
6. Solve problems on head loss for both pipe flow and open channel flow
7. Identify the components of pumps and hydraulic turbines
8. Solve small problems on hydraulic turbines and pump.

1 **INTRODUCTION**

1.1 Introduction of fluid mechanics

1.2 Definition _solid, liquid & gas

1.3 Classification of Fluid: Ideal & real fluids

1.4 Units & dimensions

2   PHYSICAL PROPERTIES OF FLUIDS

2.1 Specific weight, mass density, specific gravity, compressibility

2.2 Viscosity, Newton's law of viscosity, kinematic viscosity, dimensional formula and units of viscosity

2.3 Surface tension, cohesion & adhesion

2.4 Newtonian& Non Newtonian fluid

2.5 Problems related to 2.1 & 2.2

3   FLUID STATICS

3.1   Pressure(atmospheric, absolute & gauge)

3.2   Transmission of pressure (Pascal's law & its application)

3.3   Hydrostatic law (Pressure, specific weight & height relationship)

3.4   Force & centre of pressure on a horizontal , vertical & inclined submerged surface with deduction

3.5   Archimedes' principle, stability of immersed & floating bodies, metacentre & determination of   metacentric

height   (Simple problems related to 3.2,3.4 to 3.5)

4   FLUID KINEMATICS

4.1 Classifications of fluid flow (laminar & turbulent), steady & unsteady, uniform & non uniform, compressible

& non compressible, rotational &irrotational

4.2 Flow rate & Continuity equation

4.3   Bernoulli's equation including its modification

4.4 Total Energy & Hydraulic gradient (simple problems related to 4.2 & 4.3)

5   FLUID MEASUREMENTS

5.1 Piezometer

5.2 Description & working principle of simple Tube manometer, differential manometer

5.3 Definition & relation of co efficient of contraction, coefficient of velocity & co efficient of discharge & vena

contracta

5.4   Working principle & use – Venturimeter, Orificemeter& Pitot tube

5.5   (Simple problems on 5.2, 5.3,5.4)

6   PIPE & OPEN CHANNEL FLOW

6.1   Flow losses in pipes (at entrance,exit, contraction, expansion & bending) only empirical formula

6.2   Laws of fluid friction

6.3   Darcy's equation for head loss due to pipe friction   (Simple problems on 6.2 & 6.3)

6.4 Chezy's&Manning's formula (No deductions & problems only) .

7   FLUID MACHINES : IMPACT OF JET

7.1 Direct impact of a jet on a stationary flat plate

7.2 Direct impact of a jet on an inclined fixed plate

7.3 Impact of a jet on a moving plate

7.4 Impact of a jet on a series of flat vanes mounted on the periphery of a large wheel

7.5 All related problems.

8   HYDRAULIC TURBINES

8.1 Classification – Impulse & Reaction

8.2 Pelton wheel – components , working principle, velocity diagrams, work done, power,efficiency.

8.3 Francis turbine – components, working principle, velocity diagrams, work done, power, efficiency. (PROBLEMS)

8.4 Kaplan turbine- components

8.5 Governing of an impulse turbine (Pelton wheel)

8.6 Difference between impulse & reaction turbine

9   PUMPS

9.1 Classification of pumps

9.2 Reciprocating pump – Types

9.3 Working principle (single acting & double acting), discharge, slip, pump work, power required, indicator diagram (Simple related problems)

9.4 Use of air vessels

9.5 Advantages & disadvantages of reciprocating pump over centrifugal pump

9.6 Centrifugal pump – types

9.7 Working of the pump, methods of converting the K.E of water leaving the impeller into pr. Energy, guide blades, priming

9.8 Work done by the impeller, the manometric head, the manometric efficiency., impeller power, the mechanical efficiency., the overall efficiency.,

9.9 Multistage centrifugal pumps ,specific speed of centrifugal pumps

9.10 Problems on

9.11 Books and References:

1.   Hydraulics by R H Khurmi

2.   Fluid Mechanics by Jain

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4.   Course Title: Fluid Mechanics & Fluid Machines Laboratory

Fluid Mechanics &Fluid Machine Laboratory

Weekly hrs   03

Total hrs   45

Sessional Marks   25

Viva Marks   25

Total   50

Outcome based Objectives:

After performing the experiments the students will be able to

1.   Appreciate the use of Archimedes' Principle

2.   Verify Bernoulli's Theorem

3.   Calculate Discharge using Venturimeter

4.   Calculate Discharge using Notch

5.   DeterminePipe friction using Darcy's formula

6.   Determine the Forces of jet   on fixed and moving plate

7. Know the function of Centrifugal pump

8. Determine the type of flow in a pipe, laminar or turbulent using Reynold's Apparatus

Course content

1.   Measurement of meta centric height of a floating ship model

2.   Experiment on   Bernoulli's theorem

   i)   Using Bernoulli's Apparatus

3.   Determination of coefficient of discharge by using

   i)   Orifice meter

   ii)   Venturimeter

   iii)   Notch

4.   Pipe Friction

   i)   Determination of friction factor 'f' in pipe flow

   ii)   Determination of minor losses in pipe flow

5.   Force of jet

   i)   Determination of force of jet on a fixed and moving plate

6.   Centrifugal pump

   i)   Determination of pressure head

7.   Determination of Laminar flow or Turbulent flow

   i)   Reynolds' Apparatus

5. Course Title– Fundamentals of Electrical & Electronics Engineering

1. Course Code :- El/Et-304
2. Semester :- 3rd
3. Duration of Exam= 3 hrs
4. COURSE OUT COME (CO)

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

➢ Define current, voltage, insulator, conductor etc.
➢ Solve numerical problems using Kirchhoff's law.
➢ Operate motor and generator.
➢ Explain briefly the alternating current and transformer
➢ Explain the use of semiconductor and transistor.
➢ Guide house wiring
➢ Explain the fundamental concept of digital electronics correlated to microprocessor with its applications.

CO s and ILOs

CO s	ILO s
CO -1. define current, voltage, insulator, conductor etc	1. Define conductor, insulator, and semiconductor with examples. 2. Define current, voltage, resistance, capacitance 3. Describe the Ohm's law 4. Solve problems related to Ohm's law
CO-2 Solve numerical problems using Kirchhoff's law	1. Explain DC network. 2. Define and explain the Kirchhoff's current and voltage law 3. Solve of critical problems by using Kirchhoff's current and voltage law 4. Use of Wheatstone bridge 5. Determine of unknown resistance by Wheastone bridge

CO s	ILO s
CO-3 operate motor and generator	1. Define DC generator and motor 2. Explain the construction of DC generator and motor 3. Explain the working principle of DC generator and motor 4. Compare the DC motor and generator 5. Enumerate different types of DC motor and generator 6. Explain use of DC generator and motor
CO -4 Explain briefly the alternating current and transformer	1. Define amplitude, time period, frequency, equation of alternating voltage and current, RMS, average value, instantaneous value, peak factor. 2. Explain RLC circuit 3. Explain inductance of AC circuit 4. Solve numerical problems 5. Explain construction of transformer 6. State operating principle of transformer 7. State type and uses of transformer 8. State step up and step down transformer
CO5- Explain the use of semiconductor and transistor	1. Define semi conductor, energy band, intrinsic and extrinsic semi conductor 2. Doping of semi conductor 3. Explain P-type, N-type semiconductor, 4. Define PN junction diode, forward and reverse biased diode, 5. Explain diode characteristics, application of PN junction diode like Half-wave, Full-Wave rectifier. 6. Explain Transistor: Physical construction of bipolarPNP and NPN transistor. 7. biasing circuit configuration 8. Explain different mode of transistor (CE, CB, CC). 9. State the application of transistor as an amplifier. 10. State elementary ideas of display - LED, LCD, Seven segment display.

CO s	ILO s
CO-6 guide house wiring	1. Define house wiring 2. Explain different methods of house wiring 3. State the safety and precautionary measure to be taken for electrical shock.
CO-7 Microprocessor	1. Explain the various symbolic representation of logic gates, combinational logic, basic operation of flip-flops, counters and registers. 2. State the fundamental concept of microprocessor and its application in instrumentation, 8085 microprocessor and its operation.

5. Teaching Scheme (in hours/week)

Lecture	Tutorial	Practical	Total
3		3	6

6. Examination Scheme :-

Theory			Pass marks (ESE+SS)	Practical		Pass marks (PT+PA)	Total marks (Th+ Pr)	Credit
ESE	Sessional (SS)			PT	PA			
	TA	HA						
70	10	20	33/100	25	25	17/50	150	4

7. Detailed Course Content

Chapter No	Chapter Title	Content	Duration (in hours)
1	**Introduction**	Basics of Electricity: Revision of insulators and conductors and their examples ,Definition and units of voltage, current, resistance, inductance, capacitance, different voltage sources, Ohm's law, series & parallel combination of resistance .	4

Chapter No	Chapter Title	Content	Duration (in hours)
2	DC network	DC network: Kirchhoff's Law, solving network problem to find current and voltage, Wheatstone bridge and Its problem.	5
3	Generator & motor	Faradays laws of electromagnetic induction, Flemings right hand and left hand rule D.C. generator and motor: Construction, operating principle, types, uses.	4
4	AC fundamental	A. C. Fundamentals: Basic terms-cycle, amplitude, time period, frequency, equation of alternating voltage and current, RMS, average value, instantaneous value, peak factor, form factor, simple problem	5
5	AC circuit	R-L-C series circuit: AC through resistance, capacitance, inductance and their combinations, expression for impedance, reactance, current, power factor, simple problem.	4
6	Transformer	Transformer Construction, operating principle, types and uses.	4
7	Semiconductor	Semiconductor: Definition of semiconductor, energy band diagram, intrinsic and extrinsic semiconductor, doping, P-type, N-type semiconductor, PN junction diode, forward and reverse biased diode, diode characteristics, application of PN junction diode like Half-wave, Full-Wave rectifier.	5
8	Transistor	Transistor: Physical construction of bipolar PNP and NPN transistor, biasing circuit configuration (CE, CB, CC). Application of transistor as an amplifier. Elementary ideas of display - LED, LCD, Seven segment display.	5
9	House wiring	9.1 Introduction to house wiring 9.2 Methods of house wiring 9.3 Safety and precautions measures against electrical hazard.	2

Chapter No	Chapter Title	Content	Duration (in hours)
10	Microprocessor	1. Symbolic representation of logic gates, combinational logic, basic operation of flip-flops, counters and registers. 2. Fundamental concept of microprocessor and its application in instrumentation, 8085 microprocessor and its operation.	5
11	Class test	Two class test	2

8.   Distribution of Marks/ Table of specifications

Sr. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	K	C	A	HA
1	Introduction	4	9	3	0	0	
2	DC net work	5	11	3	0	4	
3	Generator & motor	4	9	3	0	5	
4	AC fundamental	5	11	4	3	4	
5	AC circuit	4	9	3	1	4	
6	Transformer	4	9	3	3	1	
7	Semiconductor	5	11	3	1	3	
8	Transistor	5	11	3	2	1	
9	House wiring	2	4	2	0	4	
10	Microprocessor	5	11	4	0	3	
11	Class test	2	4				
	Total	Σ b=45	100	31	10	29	

K   =   Knowledge   C   =   Comprehension   A   =   Application

HA =   Higher Than Application (Analysis,Synthesis, Evaluation)

$C = \frac{b}{\Sigma b} \times 100$

10. Details Table of Specification for Theory

Sl. no	Topic	OBJECTIVE TYPE				SHORT/ DESCRIPTIVE ANSWER TYPE				
		K	C	A	T	K	C	A	HA	T
1	Introduction	1			1	2				2
2	DC net work	1		1	2	2		3		5
3	Generator & motor	1		2	3	2		3		5
4	AC fundamental	2	1	1	4	2	2	3		7
5	AC circuit	1	1	1	3	2		3		5
6	Transformer	1		1	2	2	3			5
7	Semiconductor	1	1	1	3	2		2		4
8	Transistor	1	1	1	3	2	1			3
9	House wiring	1		1	2	1		3		4
10	Microprocessor	1		1	2	3		2		5
	Total				25					45

K = Knowledge   C = Comprehension A =   Application

HA = Higher Than Application   T = Total

N.B.:- 1. The question pattern will be as per the instruction of SCTE or as per existing rules.

2. The objective type questions may be in the form of multiple choice, fill up the blanks, true or false or very short answer type.

3. Optional question (if any) may be from the same topic in the form of either or type like below

Q No. Explain the properties of conductor

Or

Explain the properties of insulator

11. Suggested Implementation Strategies:- Teacher will use Black board, OHP, LCD Projector, Smart board, Video etc for effective teaching learning process .

12. Ref Books:

I. A text book of Electrical Technology Vol – I, B. L. Theraja& A. K. Theraja, S. Chand.

II. Principle of Electronics, V. K. Mehta, S. Chand.

III. Electronic Principle, A.P. Malvino, Tata McGraw-Hill

IV. Electronic Devices & Circuits, Millman&Halkias,   Tata McGraw-Hill

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5.   Course Title :- Fundamentals of Electrical & Electronics Engineering (Practical)

1.Course Title :- **FUNDAMENTAL OF ELECTRICAL & ELECTRONIC ENGINEERING**

(PRACTICAL)

2.Course Code :- El/Et-304

3.Semester :- 3rd

INTELLECTUAL SKILLS

a.   Identify the properties of generator, ammeter, voltmeter, transformer

b.   Interpret the working principle of equipment

c.   Interpret the test results

d.   Follow the IS procedure of testing

MOTOR SKILLS

a.   Measure the quantities accurately

b.   Identify the instruments properly

c.   Handle the equipment carefully.

LIST OF PRACTICAL

 (Students are to perform minimum six experiments)

1.   Verification of KCL and KVL

2.   Study of DC shunt generator.

3.   Milli ammeter as a Voltmeter.

4.   Milli voltmeter as an ammeter.

5.   Study of RLC series circuit.

6.   Study of single phase transformer.

7.   Determination of semi-conductor diode characteristic.

8.   Study of transistor configuration (CE,CB.CC) (Project base)

9.   Study of transistor as an amplifier. (Project base)

10. Hands on activity on house wiring (Mini project work on simple house wiring involving one light point, one fan point, one power socket, one MCB on a wooden or ply board

■ ■

6.   Course Title: Manufacturing Technology - I

MANUFACTURING TECHNOLOGY – I

Subject Title	:	**Manufacturing Technology - I**
Subject Code	:	**Me-303**
Hours Per Week	:	**03**
Hours Per Semester	:	**45**
Class Test	:	**03**
Total hrs	:	**48**
Full marks(Theory)	:	**70**
Sessional Marks	:	**30**
Class hours	**L**	**T**	**P**
	3	**0**	**3**

Pre requisite : None

Aim of the subject : The aim of the subject is to let the students know about the different tools used in finishing the machining processes and how the machines are used for production from raw metal to the final product.   It will also help to know different mechanical manufacturing process of metals.

CO   COURSE OUTCOME

After studying the course the students will be able to

1.   Identify the tool angles of a single point cutting tool used in lathe machine
2.   Identify the different chips in machining process
3.   Know about the metal casting process, pattern making and moulding
4.   Know the use of resistance and arc welding
5.   Know the press operation like bending, cutting, drawing, punching
6.   Appreciate the use of cutting fluids and coolants

CONTENTS:

1.0   Basic of Machine Tools

1.1   Introduction to machine tools.

1.2   Differences between machine and machine tools

1.3   Types of cutting tools

1.4   Cutting tool materials-properties and types.

1.5   Single point cutting tool nomenclatures.

    1.6   Cutting tool life and factors effecting tool life and tool wear.

    1.7   Orthogonal and Oblique cutting.

    1.8   Cutting forces in orthogonal and oblique cutting

    1.9   Chip formation process, temperature zone and forces.

1.10 Types of chips and factors for producing each chip.

1.11 Chip breaker and its types.

2.0   Metal Casting Process

    2.1   Introduction to metal casting

    2.2   Casting: steps involved in casting

    2.3   Pattern for casting

    2.4   Pattern making materials

    2.6   Moulding- Moulding sand-Moulding process

    2.7   Special casting processes - Die casting, Centrifugal casting & Investment casting.

    2.8   Defects in casting and their remedies

3.0   Advanced Welding Processes

    3.1   Introduction.

    3.2   Classification of welding process

    3.3   Resistance welding - Spot, Seam and Projection welding

    3.4   Advanced Arc welding types-Shielded metal arc welding, TIG & MIG welding,Submerged arc welding, Plasma arc welding & Laser beam welding.

    3.5   Defects in welding and their remedies

    3.6   Differences between Brazing and Soldering.

4.0   Press Work

    6.1   Introduction.

    6.2   Presses-Types-Power press

    6.3   Press operations: Cutting, bending, drawing, punching, blanking & notching,

5.0   Powder Metallurgy

    7.1   Basic concepts of powder metallurgy.

    7.2   Methods of powder metallurgy.

    7.5   Applications, merits and limitations of powder metallurgy.

6.0   Cutting Fluids and Coolants

    8.1   Introduction.

    8.2   Purpose and Properties.

    8.3   Coolants and lubricants for different operations

REFERENCE BOOKS:

    1)   Workshop Technology by Hazara Chaudhary VOL - I & VOL – II.

    2)   Production Technology by Dr.P.C.Sharma., S Chand & Co

3) Workshop technology by B.S. Raghuvanshi

4) Introduction to Manufacturing Processes, P N Rao , Vol 1 & Vol II, Tata Mc Grew Hill Publications

5) Manufacturing Process- I & II & III- By Dr. Radhakrishna K

6) Production Technology by R.K.Jain.

7) Manufacturing Technology I &II , Dr P C Sharma , S Chand & Co

8) Manufacturing Technology - P P Date , Jaico Publishing House

9) Foundry Technology –Dr. Radhakrishna.

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6.   Course Title: Manufacturing Technology Laboratory

Manufacturing Technology - I- Lab

Hours Per Week	:	03
Hours Per Semester	:	45
Total hrs	:	48
Sessional Marks	:	25
Viva Marks	:	25

Outcome Based Objectives

After performing the practical the students will be able to

1.   Know the various types of cutting tools

2.   Know the nomenclature of a single point cutting tool

3.   Prepare a mould sand mix

4.   Handle the electrode holder for laying welding beads

Course Content

1.   Machining

    1.1   Draw the single point cutting tool and label various parts

    1.2   Ground the various angles according to single point cutting tool nomenclature on a rectangular work
        piece

2.   Foundry, Moulding and casting of

    2.1   solid bearing

    2.2   flange coupling

    2.3   split bearing

    2.4   connecting rod

    2.5   V pulley

    2.6   Gear pulley

    2.7   Core making

3.   Welding

    3.1   Lay out of beads

    3.2   Butt joints

    3.3   Lap joints

    3.4   T- joint

    3.5   H – joints

    3.6   Angular joints

    3.7   Two joints

…………………………………..XXXXXXXXXX ENGINEXXXX-----------------

7   Course Title: Professional Practice-I

PROFESSIONAL PRACTICE I

Subject code-Ip -310

Class hours	**L**	**T**	**P**
	1	**0**	**2**

Rationale :

To develop general confidence, ability to communicate and attitude in addition to basic technological concepts through Industrial visits , expert lectures, seminars on technical topics and group discussion.

CO s

After studying the subject the student will be able to :

- Acquire information from different sources.
- Prepare notes for a given topic.
- Present a given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture.

Activities

1. **INDUSTRIAL VISITS:**   **10**
2. Structured industrial visits be arranged and report of the same should be submitted by the individual student to form part of the term work.

Visits to **any two** of the following :

- Nearby Petrol Pump (fuel ,oil , Density, product specifications)
- Automobile Service Station (Observation of Components/aggregates)
- Engineering Workshop (Layout, Machines)
- Dairy Plant / Water Treatment Plant

3. **GUEST LECTURE(S):**   **6**

    Lectures by Professional/ Industrial Expert / Student Seminars based on information search to be organized from any THREE of the following areas :

- Pollution Control
- Non destructive testing(NDT)
- Acoustics
- Illumination / Lighting System.
- Fire Fighting / Safety Precautions and First aids
- Computer Networking and Security.

- Topics related to Social Awareness such as – Traffic Control System, Career opportunities, Communication in Industry , Yoga Meditation , Aids awareness and health awareness etc.

4. :   **GROUP DISCUSSION**   **6**

The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. Two topics for group discussion may be selected by the faculty members. Some of the suggested topics are:

    i.   Sports events

    ii.   Current news items

    iii.   Current topics related to mechanical engineering field.

    iv.   Innovative news

5. **STUDENT ACTIVITIES:**   **8**

The students in a group of 3 to 4 will perform any one of the following activities (other similar activities may be considered Activity)

    I.   Collect and study IS code for Engineering Drawing.

    II.   Collecting information from Market: Nomenclatures and specifications of engineering materials.

    III.   Specifications of Lubricants. SAE no

    IV.   Draw orthographic projections of a given simple machine element using CAD software.

    V.   Collect information on issuing of pollution certificate from the DTO's office

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FOURTH SEMESTER

INDUSTRIAL PRODUCTION

ENGINEERING

COURSE STRUCTURE OF INDUSTRIAL PRODUCTION ENGINEERING (4TH SEMESTER)

COURSE STRUCTURE OF 4th. SEMESTER (INDUSTRIAL PRODUCTION ENGINEERING)

Sl. No.	Code No.	Subject Name	Study Scheme Contact hours/week			Evaluation Scheme								Total Marks (Theory+ Practical)	Credit
						Theory				Pass (ESE+SS)	Practical				
							Sessional(SS)				Practical Test(PT)	Practical Assessment(PA)	Pass (PT+PA)		
			L	T	P	ESE	TA	HA	Total (TA+HA)						
1	Me-401	Thermodynamics	3			70	10	20	30	33/100				100	3
2	Me-402	Engineering materials	3			70	10	20	30	33/100				100	3
3	Me-403	Manufacturing Technology-II	3		3	70	10	20	30	33/100	25	25	17/50	150	4
4	Me-404	Theory of Machines	3		3	70	10	20	30	33/100	25	25	17/50	150	4
5	Me-405	Strength of Materials	3	1	3	70	10	20	30	33/100	25	25	17/50	150	5
6	El(Ip)-406	Electrical Technology	3		3	70	10	20	30	33/100	25	25	17/50	150	4
7	Me-410	Professional Practice-II	1		2						25	25	17/50	50	2
			19	1	14										
TOTAL				34										850	25

1: Subject Title : Thermodynamics

Subject Title	:	**Thermodynamics**
Subject Code	:	**Me-401**
Hours Per Week	:	**03**
Hours Per Semester	:	**45**
Class Test hrs	:	**03**
Total hrs	:	**48**

Pre requisite : Applied Physics, Mathematics, Engineering Mechanics

Aim of the subject : The aim of the subject is to let the students know about the different properties of the perfect gases, different thermodynamic processes. standard cycles and its practical significance

The different properties of steam, use of steam tables, Mollier chart., vapour cycles

Outcome Based Objectives

On the completion of the course the students should be able to:

1.   Solve problems on the laws of Perfect Gases

2.   Analyse the thermodynamic process

3.   Know the calorific values of fuel

4.   Solve problems on air standard cycles

5.   Solve problems of steam generation with the help of steam tables

6.   Explain the principle of Rankine Cycle

7.   Know the types of heat transfer

COURSE CONTENTS

1.   **Fundamentals and laws of Thermodynamics.**

   1.1 Definitions for system - boundary, surrounding, working fluid and state of a system.

   1.2   Types of thermodynamic systems – closed, open and isolated systems with examples.

   1.3   Properties of system- Intensive and Extensive properties with examples.

   1.4   Definitions for properties like pressure (p), Volume (v), Temperature (T), Enthalpy (H), Internal energy (U) Specific heat at constant pressure(cp), specific heat at constant volume(CV) for a gas. and their units.

1.5   Definitions for quasi-static work, flow- work, specific heat.

1.6   Zeroth, first, second laws of thermodynamics, simple problems on conversion of Heat
into Work and vice versa.

1.7   Steady flow energy equation (without proof),

2.0 Laws of perfect gases.

2.1   Brief explanation of perfect Gas Laws – Boyle's law, Charle's Law – -Gay-Lussac law-
Avogadro's -Joule's law .

2.2   Derive characteristic gas equation - universal gas equation, universal gas constant and their
relationship with molecular weight of gas.

2.3   Derivation for an expression showing the relationship between the two specific heats and
characteristic gas constant.

2.4   Simple problems on gas equation.

3.0   Thermodynamic processes on gases.

3.1   Types of thermodynamic processes, Constant pressure, Constant volume, Isothermal,
Free expansion, Isentropic, Polytrophic and throttling processes & equations representing
the processes.

3.2   Concept of Entropy.

3.3   Derivation for work done, change in internal energy and Entropy for the above processes.

3.4   Calculation of heat supplied or rejected during the above processes.

3.5   Simple problems on the above processes.

4.0   Fuels and Combustion.

4.1   Definition of fuel. Types – solid, liquid and gaseous fuels examples and uses of different
types of fuels.

4.2   Calorific values (Higher and lower) of fuels, Dulong's formula for calorific value. &
calculation of calorific value of a fuel of given chemical composition.

4.3 Bomb calorimeter unit-Description

.

5.0   Air standard cycles.

　　5.1   Meaning of air standard cycle-its use-Reversible and irreversible process – reversible and irreversible cycles conditions for reversibility of a cycle.

　　5.2   Brief description of Carnot cycle with P.V. and T-S diagrams, Air standard Efficiency - Problems on Carnot cycle.

　　5.3   Brief explanation of Otto cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on Otto cycle.

　　5.4   Brief description of Diesel cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on Diesel cycle.

　　5.5   Brief description of Dual cycle with P.V. and T-S diagrams, Air standard Efficiency - Simple problems on dual cycle.

　　5.5   Reasons for the highest efficiency of Carnot cycle over other cycles working between same temperature limits.

6.0   Properties of steam.

　　6.1   Formation of steam under constant pressure, dryness, fraction and degree of superheat, specific volume.

　　6.2   Determination of enthalpy, internal energy, internal latent heat, entropy of wet, dry and superheated steam at a given pressure using steam tables and Mollier chart.

　　6.3   Simple direct problems on the above using tables and charts.

7.0   Vapour Power cycle

　　7.1   Rankine cycle

　　7.2   Modified rankine cycle

　　7.3   Simple problems on above

8.0   Heat Transfer

　　8.1   Introduction to Heat Transfer Processes.

　　8.2   Conduction, Convection and Radiation.

　　8.3   Heat Exchanger- types with diagram.

REFERENCES

1.   **"Fundamental of thermodynamics"** by Richard E Snnatag, ClausBorgnakke, Gordon J Vanwylen, Wiley Student edition, 6th Ed.,

2.   **" Basic and applied thermodynamics"** by P.K.Nag **,**Tata McGraw hill New delhi 2009

3.   **"Heat engines(Vol-I & Vol-II)"**by Patel and Karmachandani

4.   **"I.C.Engine Fundamentals"** by Hey wood

5.   **"Thermal Engineering** "by R.S.Khurmi

6.   **"Thermal Engineering"** by P.L.Balaney

7.   **"Thermodynamics applied to heat engines"** byLewitt.

8.   **" Heat engines"** by Pandya and shah

9.   **" Thermodynamics " Robert Ballmer ,** Jaico Publishing House

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2: Subject Title : Engineering Materials

Subject Title	:	**Engineering Materials**	
Subject Code	:	**Me-402**	
Hours Per Week	:	**03**	
Hours Per Semester	:	**45**	
Class Test hrs	:	**03**	
Total hrs	:	**48**	
Full marks(Theory)	:	**70**	
Sessional Marks	:	**30**	
Class hours	L	T	P
	3	0	0

Pre requisite: None

Aim: The aim of the subject is to let the students know the properties of engineering materials, the internal structure, brief of heat treatment process of metals , applications.

Outcome Based Objectives:

On completion of the course the students should be able to:

1. Know the mechanical properties of materials
2. Analyse the structure of solids (ferrous metal, non-ferrous metal and alloys)
3. Know the advantage of plastics
4. Appreciate the importance of heat treatment and corrosion
5. Know the testing method of materials both destructive and non-destructive testing
6. Know how the corrosion can be prevented

CONTENTS

UNIT-1. MECHANICAL PROPERTIES OF MATERIALS

Introduction: Definition of mechanical properties such as strength- elasticity, plasticity, ductility, malleability, stiffness, toughness, brittleness, hardness, wear resistance, machinability, cast ability and

weld ability-Fatigue, fatigue strength, creep-temperature creep-cyclic loading and repeated loading-endurance limit.

UNIT-2. STRUCTURE OF SOLIDS

Crystal Structure: Introduction to Atomic Structure-Crystal Structure: Unit Cell and Space Lattice-Crystal System: The seven basic crystal systems-Crystal Structure for metallic Elements: BCC, FCC and HCP-Coordination Number for simple Cubic, BCC and FCC –Atomic Packing Factor for simple cubic, BCC, FCC and HCP-Simple problems on finding number of atoms for a unit cell.

UNIT-3. FERROUS METALS AND IT'S ALLOYS

Iron and carbon steels: Introduction-Flow sheet for production of Iron and Steel-Iron Ores-Pig Iron: Classification, Composition and Effects of impurities on Iron-Cast Iron: Classification, Composition, Properties and uses-Wrought Iron: Properties, Uses/Applications of Wrought Iron.

Steel- Classification of Carbon Steels: Low Carbon Steel, Medium Carbon Steel and High Carbon steel-Composition, Properties and Uses-Comparison of Cast Iron, Wrought Iron and Mild Steel and High Carbon Steel or Hard Steel Standard Commercial Sizes of Steel as per BIS.

Ferrous Alloys: Alloy Steels – Purpose of alloying-Effects of alloying elements-Important Alloy Steels: Silicon Steels, High Speed Steel(HSS) , Heat Resisting Steel, Spring Steel, Stainless Steel (SS) : Types of SS , Applications of SS- Magnet Steel - Composition, Properties and Uses.

UNIT-4. NON- FERROUS METALS AND IT'S ALLOYS

Non –ferrous metals & Alloys: Properties and uses of Aluminium, Copper, Tin, Lead, Zinc, Magnesium and Nickel. Copper Alloys : Brasses, Bronzes- Composition, properties and uses. Aluminium Alloys: Duralumin, Hindalium, Magnelium- Composition, properties and uses. Nickel Alloys: Inconel , Monel ,Nichrome –Composition, properties and uses. Anti-friction /Bearing Alloys : Various types of bearing Bronzes . Standard commercial sizes as per BIS.

Cutting Tool Materials : Characteristics of ideal Cutting tool materials- Types: Carbon Steels, Medium alloy steel – HSS – Satellites – Cemented Carbide _ CBN – Diamond and Abrasives.

Introduction to Metal Matrix Composites (MMC) and Nanomaterials.

UNIT-5. PLASTIC

Plastic: Properties , composition ,classification and production method, Uses of plastic as an engineering material, production defects and remedies- it's advantages and disadvantages.

UNIT-6. TESTING OF MATERIALS

Testing of materials: Destructive testing : Tensile Testing – Compression Testing– Hardness Testing :Brinell, Rockwell, Scleroscope and Mohr's Test – Bend Test – Torsion Test- Fatigue Test _ Creep Test.

Non –destructive Testing : Radiography- Magnetic Particle Inspection – Liquid penetrant test –
Ultrasonic inspection, (Descriptive treatment only).

UNIT-7. HEAT TREATMENT

Heat treatment processes – purpose – procedures – applications of various heat treatment processes- Iron-carbon equilibrium diagram-full annealing-process annealing stress relief annealing-spherodising annealing-isothermal annealing-normalizing-hardening-tempering-quenching medium-different types and their relative merits-case hardening-pack carburizing-cyaniding-nitriding-induction hardening and flame hardening.

UNIT-8. CORROSION &SURFACE ENGINEERING

Corrosion : Nature of corrosion: Why corrosion occurs ? Electro-chemical reactions, Electrolytes –
Factors affecting corrosion : Environment ,Material properties and Physical conditions- Types of corrosion (eight types) – Determination of corrosion characteristics – Corrosion Control : Material selection , Environment control and Design.

Surface Engineering: Reasons for surface engineering – Surface engineering processes : Coatings and Surface treatments – Cleaning and Mechanical finishing of surfaces – Organic Coatings – Electro –plating and special metallic plating – Electro-polishing and Photo –etching – Conversion coatings: Oxide , Phosphate and Chromate coatings- Thin film coatings, PVD and CVD – Surface analysis – Hard –facing, Thermal spraying and High-energy processes – Process /Material Selection.

REFERENCE BOOKS :

1. **Workshop Technology by Hazarachoudhary VOL- I & VOL- II**
2. **Production Technology by Dr. P.C Sharma ,S.Chand& Co**
3. **Engineering Materials by S.C Rangwala, Charotar**
4. **Engineering Materials by P.D. Kulkarni**
5. **Material Construction by R.S Deshpande,United Book Cor. Pune**

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3: Subject Title : Manufacturing Technology-II

Subject Title	:	**Manufacturing Technology-II**
Subject Code	:	**Me-403**
Hours Per Week	:	**03**
Hours Per Semester	:	**45**
Class Test hrs	:	**03**
Total hrs	:	**48**
Full marks(Theory)	:	**70**
Sessional Marks	:	**30**

Class hours	L	T	P
	3	0	3

Pre requisite: Engineering Mechanics, Manufacturing Technology

Aim: The aim of the subject is to understand various operation performed in lathe machine, grinding machine, shaping machine, Planning Machine, its limitations in every machines, Importance of Jigs and fixtures, plastic processing methods, powder metallurgy, cutting fluids.

Outcome Based Objectives :

On completion of the course the students should be able to:

1. Identify the components of a lathe machine
2. Identify the components of shaping , planning, slotting and milling machine
3. Know about the surface finishing with the help of grinding machine
4. Know the machining process performed in milling machine
5. Know about the non traditional machining methods
6. Appreciate the importance of jigs and fixtures

CONTENTS

1.0   Lathe

1.1   Introduction to lathe.

1.2   Classification of lathes -specification of lathe

1.3   Constructional features of Engine lathe (parts)

1.4   Lathe attachments, accessories & work holding devices

1.5   Lathe operations

1.6   Taper turning methods.

1.7   Machining parameters-cutting speed, feed, depth of cut and machining time

1.8   Capstan and Turret lathe -Description-comparison with engine lathe

2.0   Drilling machine

2.1   Introduction

2.2   Classification of drilling machines

2.3   Radial drilling machine-working-drilling operations

2.4   Twist drill nomenclature

2.5   Machining parameters-cutting speed, feed, depth of cut and machining time

3.0   Shaper, Planer &Slotter

3.1   Introduction to Shaper & Classification

3.2   Specifications of Shaper

3.3   Principal parts of shaper.

3.4   Shaper Mechanisms &Shaper Operations

3.5   Cutting Speed, Feed, Depth of cut & Machining time.

3.6   Simple problems.

3.7   Introduction to Planer & Classification

3.8   Specifications of Planer

3.9   Principal parts of Planer

3.10   Planer Mechanisms & Operations

3.11   Differences between Planer & Shaper

3.12   Introduction to Slotter& Classification

3.13   Principal parts of Slotter

3.14   Specifications of Slotter

3.15   Slotter Mechanisms & Operations

3.18   Difference between Planer &Slotter.

4.0 Grinding & Surface finishing

    4.1   Introduction to grinding & Classification

    4.2   Plain Cylindrical grinding machines

    4.3   Grinding wheels

    4.4   Abrasives & classification.

    4.5   Bond & bonding.

    4.6   Grit, Grade & Structure of wheels.

    4.7   Specification of wheels.

    4.8   Types of grinding wheels.

    4.9   Selection of grinding wheels.

    4.10 Mounting of grinding wheels.

    4.11 Glazing and loading of wheels.

    4.12 Dressing and truing of wheels.

    4.13   Balancing of wheels.

    4.14 Diamond wheels.

    4.15 Introduction to surface finish.

    4.16 Surface finishing operations.

5.0   Milling machine

    4.1   Introduction to milling and classification.

    4.2   Column and knee type milling machine & copy milling machine.

    4.3   Milling cutters and classification.

    4.4   Fundamentals of milling processes

    4.5   Milling machine operations.

    4.6   Indexing methods.

    4.7   Cutting speed, feed, depth of cut and machining time.

    4.8   Gear hobbing

6.0   Non-Traditional machining methods

    5.1   Introduction to modern machining.

    5.2   Differences between conventional and non-conventional methods.

    5.3   Classification.

    5.4   Principle of working of - Ultrasonic machining, Electric discharge machining,Abrasive

    jet   machining and Laser beam machining.

    4.5   Applications, merits and demerits of above methods.

7.0   Jigs and Fixtures

6.1   Introduction to jigs and fixtures.

6.2   Definition of jig and fixtures.

6.3   Applications & merits of jig and fixture

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3: Manufacturing Technology –II Lab

Outcome Based Objectives

After performing the Practical in the laboratory , the students will be able to

1. Perform turning operation on a lathe machine

2. Perform the drilling operation on a drilling machine.

3. Identify the components of shaping, planning , slotting and milling machine

4. Know the safety and precaution taken during a machining operation in a workshop

5. Know how to serve and maintenance of the machine

1.   Course content

1. Machine shop(turning)

   1.1   Plain Turning

   1.2   Step Turning

   1.3   Taper turning

   1.4   Turning collars

   1.5   Knurling

   1.6   Facing

   1.7   Thread cutting

   1.8   Combination of all the operations

2. Milling and shaping

   2.1   Shaping practice

   2.2   Key way cutting

   2.3   Various milling operations

   2.4   T- slot cutting on milling machine

3. Slotter planner and drilling

   3.1   perform operation on a slotter and planner

   3.2   draw the drill and label various parts

   3.3   Make hole on flange using jigs

4. Servicing & maintenance

   4.1   sub assembly of small components such as tail stock 3 jaw, 4 jaw chuck

   4.2   measurements of wear on machine elements such as lathe beds guide ways of lathe and

         shaper

4.3   selection of   appropriate recovery methods for a given machine element and performing
        recovery processes by using appropriate methods such as Arc gas welding, Metal spraying
        applying adhesives etc

4.4   Fault finding and repairing of machine tool and preparation of preventive maintenance
        schedule of work shop.

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4: Subject Title : Theory of Machines

Subject Title	:	**Theory of Machines**
Subject Code	:	**Me-404**
Hours Per Week	:	**03**
Hours Per Semester	:	**45**
Class Test hrs	:	**03**
Total hrs	:	**48**
Full marks(Theory)	:	**70**
Sessional Marks	:	**30**

Class hours	L	T	P
	3	0	3

Pre requisite: Engineering Mechanics

Aim: The aim of the subject is toknow the kinematics of machine, their mechanisms, the friction involved. Methods of transmission of power, the role of cams, effect of vibration, balancing, governors.

CO---------Outcome Based Objectives

On completion of the course, the student should be able to

1. Know the definitions of Theory of Machines
2. Appreciate the importance of Kinematics of Machines, their Mechanisms & Inversions
3. Explain the friction involved in bearings, clutches & brakes
4. Know different methods of transmission of power
5. Analyse different types of cams and their motions and also to draw cam profiles for various motions
6. Know different types of vibration and to understand critical speed of shaft
7. Solve problems on balancing of masses in the sameplane
8. Know the function of different types of governors

Subject Content Details

1.0 Introduction

    1.1   Definition of Theory Of Machine(TOM)

    1.2   Sub – divisions of TOM

2.0 Basic kinematics of Machines

    2.1   Kinematic link or element

    2.2   Types of links

    2.3   Kinematic pair –types

    2.4   Types of constrained Motions

    2.5   Kinematic chain

    2.6   Machine, Structure and Mechanism

    2.7   Difference between Machine and Structure

    2.8   Difference between Machine and Mechanism

    2.9   Inversions

    2.10   Types of Kinematic Chains

    2.11   Four Bar Chain

        2.111 Beam Engine

        2.112 Coupling Rod of Locomotive

        2.113 Watt's Indicator Mechanism

    2.12 Single Slider Crank Chain

        2.121 Pendulum Pump

        2.122 Oscillating cylinder engine

        2.123 Rotary I.C Engine

        2.124 Crank and Slotted Lever Quick Return Motion Mechanism

        2.125 Whitworth Quick Return Motion Mechanism.

    2.13   Double Slider Crank Chain

        2.131 Elliptical trammel

        2.132 Scotch yoke mechanism

    2.133 Oldham's coupling

3.0 Friction

    3.1. Friction - Friction in Journal Bearing, Friction of Pivot and Collar Bearing, types of Pivot and Collar Bearing (No derivation requires, formulae only). Simple Problems on the above topic.

3.2. Dynamometer- Difference between brake & clutch, difference between brake and Dynamometer. Types of Dynamometer, classification of absorption type dynamometers.

4.0 Transmission of Power

4.1   Types of Belt Drives

4.2   Length of belt –open and cross belt drives

4.3   Velocity Ratio, Ratio of driving Tensions, Centrifugal Tension and Initial Tension

4.4   Power Transmitted by belts (flat and V) and   ropes

4.5   Maximum power transmitted by belt (without proof)

4.6   Problems on belt drives

4.7   Introduction to Gears

4.8   Classification of Gears

4.9   Spur Gear Terminology

4.10 Problems on gears

4.11 Introduction to Gear Trains

4.12 Types of Gear trains –Simple, Compound, Reverted and Epicyclic gear trains

4.13 Problems on Gear Trains

5.0 Cams

5.1 Introduction

5.2 Classification of cams

5.3 Classification of followers

5.4 Terminology of Radial disc cam

6.0 Mechanical Vibrations

6.1 Introduction

6.2 Terms used in Vibrations

6.3 Types of Vibrations

6.31 Free Vibrations

6.32 Forced Vibrations

6.33 Damped Vibrations

6.4 Types of Free Vibrations- Longitudinal ,Transverse and Torsional

6.5 Critical or Whirling speed of a shaft

7.0 Balancing

7.1 Introduction

7.2 Static and Dynamic balancing

7.3 Balancing of single rotating mass in the same plane of projection

7.4 Balancing of several masses rotating in the same plane of projection

7.5 Problems on above (Analytical and Graphical methods)

8.0 Governors

8.1 Introduction

8.2 Types of Governors

8.3 Centrifugal Governor

8.4 Terms used in governors

8.5 Watt Governor

8.6 Porter Governor

Reference Books :

1. Kinematics of Machines---J B K Das, Sapna Publication

2. Theory of machines--------   R.S. Khurmi&J.K.Gupta , S.Chand publication

3 . Theory of machines-------   P.L.Ballaney , Khanna publication

4. Theory of machines-------   Thomas Bevan ,CBS publication

5. Theory of machines---------Malhotra & Gupta

6. Theory of machines---------S.S .Rattan ,Tata McGraw-Hill publication

7. Theory of machines---------R.K.Bansal ,Laxmi publication

8. Dynamics of Machines----J B K Das, Sapna Publication

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4: Theory Of Machine Lab

Outcome based Course Objectives

After performing the practical, the students will be able to

1. To determine the role of kinematics in machines
2. Calculate the Velocity ratio of components of transmission system like worm and worm wheel , rack and pinion
3. Determine the coefficient of friction of belt drive
4. Calculate the speed of a Porter governor by Instantaneous centre method

Course Content:

1. Study of model and working practically on machines by various mechanisms.

1.1. See the models of various mechanism in laboratory and draw the sketches labeling properly.

1.2. Deduce the formula for ratio of cutting stroke to return stroke , stroke length for quick return motion mechanism. Know why it is called quick return motion mechanism?

1.3. Visit the machine shop and observe the functioning of the mechanism on the machine. Know how stroke length is adjusted.

2. Transmission of Power

2.1. Draw the sketches of various belt drive system.

2.2. Determine the length of belts for various type of drives graphically and theoretically and observe the difference.Deduce the formula for the ratio of driving tensions.

2.3. Draw the sketch of a toothed gear and label all the terminology used on it.

2.4. Observe the models of various types of gears and gear trains in laboratory and draw the sketches.

2.5. Deduce the formula for velocity ratio for each type of gear train.

2.6. Observe the transmission of power by belt and gears practically in machine and industry.

3. Study of governors.

3.1. Deduce the relation between height of governor and speed for watt and porter governor.

3.2. Using universal governor apparatus determine characteristic curves for porter governor

   i) Sleeve Position Vs Speed.   ii) Radius of Rotation Vs Controlling force.

4. Balancing of rotating masses.

4.1. Explain what is balancing and why it is necessary? What is static and dynamic balancing?

4.2. Using static and dynamic balancing apparatus balance the shaft statically and dynamically and observe the effect of unbalance.

5. Mechanical Vibration

5.1 With the help of neat sketch explain the critical or whirling speed of shaft.

5.2. Using whirling of shaft demonstrator study the effect of whirling of shaft with

i) Both ends fixed   ii) Both ends supported iii) One end fixed and one end supported

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5: Subject Title :Strength of Materials

Subject Title	:Strength of Materials
Subject Code	: Me-405
Periods /Week	: 03
Periods/semester	: 45
Class Test	:03
Total class	:48
Full marks(Theory)	:70
Sessional Marks	:30
Class hours	L T P
	3 1 3

Pre Requisite: Mathematics, Engineering Mechanics

Aim:The aim of the subject is to let the students know the physical meaning of stress and strain, the different types beams and the effect of different type of shear load on beam, Torsion , its effect on shaft and helical spring, thin cylinders , column and struts, different type of columns, effect of load on column and struts

CO   -----Outcome Based Course Objectives

After studying the course, the students will be able to

1. Solve problems on simple stress and strain on materials following Hooks' Law
2. Analyse problems on cantilever beam and simply supported beam with overhanging due to point and uniformly distributed load
3. Know simple bending and and its related affect on beams
4. Calculate the bending stress on beams based on pure bending
5. Apply the principle of pure torsion on a power transmitting shaft and a helical spring
6. Design a riveted joint

Course Content

1.0   Simple Stresses and strains

  1.1   Define the strength, Mechanical properties of engineering materials, commonly used.

  1.2   Identify the nature and effect of tensile, compressive and shear forces.

  1.3   Define the terms stress, strain, modulus of elasticity, poisson's ratio.

  1.4   Draw typical stress Vs strain curve for a mild steel specimen under tension indicating salient points on it.

  1.5   Mention the significant of factor of safety.

  1.6   Compute stress and strain values in bodies of uniform section and of composite section under the influence of normal stresses.

  1.7   Calculate thermal stresses, in bodies of uniform section and composite sections.

  1.8   Find the relations between E, G, and K & Poisson's ratio.

  1.9   Compute the changes in axial, lateral and volumetric dimensions of uniform sections under the action of normal forces.

  1.10   Define resilience and Derive and expression for strain energy.

  1.11   Riveted joint. Failure, Strength, efficiency and design of Rivet.

2.0   Shear force and bending moments.

  2.1   List the type of beams and type loads.

  2.2   Definition of shear force and bending moments.

  2.3   SF and BM diagrams for various loads for simply supported, cantilever and over hanging beam and related problems

  2.4   Point of contraflaxture

3.0   Theory of simple bending and Deflection of beam

  3.1   State the theory and terms of   simple bending.

  3.2   List the assumptions in theory of simple Bending.

  3.3   Derive the bending equation $M/I = f/y = E/R$

  3.4   Calculate Bending stress, modulus of section and Moment of resistance.

  3.5 Calculate the safe load and safe span and dimensions of cross section.

  3.6 Define and explain the term deflection.

3.7 Derive the deflection formula for cantilever and simply supported

   beams

3.8   Calculate the values of deflection in the given beams.

3.9   Solve problems

4.0   Stresses in beams

4.1 Neutral surface and neutral axis

4.2 Bending Equation

4.3 Problems of stress on different beams.

5.0   Torsion in circular shafts and springs

5.1 Function of shaft.

5.2 Explain Polar moment of inertia of solid and hollow shaft.

5.3 Derive the torque equation $T/J = fs/R = C\theta/L$

5.4 Design of solid and hollow shafts and power transmitted by solid

   And hollow shaft.

5.5 Definition of spring and types of spring.

5.6 Derivation of deflection equation for helical spring.

5.7 Definition of stiffness of a spring.

5.8 Design of helical spring.

6.0   Columns and Struts

6.1 Definition of columns and struts.

6.2 Failure of a column and a strut.

6.3 Euler,s and Rankine formula for finding critical load.

6.4 Problems on various (4)end conditions of column.

7.0 Rivets and riveted joints

7.1 Riveted joint.

7.2 Failure,

7.3 Strength,

7.4 Efficiency

7.5 design of Rivet

Class Test -3 hrs

REFERENCE BOOKS:

1 .Strength of Materials by Ramamrutham.

2. Strength of MaterialsBy-   M. Chakraborti S.K.Kataria & Sons

3. Strength of Materials ,A.K.UpadhyayS.K.Kataria & Sons

4.Strength of Materials by R. S . Khurmi

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5: Strength of Materials Laboratory

Outcome Based Objective :

After the experiment being performed the students will be able to

1. Draw the stress strain diagram of an MS rod showing salient points

2. Perform the compression test of a brick or a timber block

3. Determine the Hardness Number of materials

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

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

Course Contents

To understand the various material testing method.

    i)   To determine stress strain relation for mild steel rod conducting test on universal testing machine.

    ii)   To determine hardness of materials using Brinell and Rockwell Testing Materials.

    iii)   To perform tension , bending, impact and shear test.

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 test on Mild Steel with the help of a Universal Testing machine.

    2. Compression test of a brick or a timber block on a Compression Testing Machine

  3.Hardness Test:

    Determination of Brinell's Hardness Number for metal specimen

  4.Torsion Test:

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

  5.Impact Test:

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

    6. Impact Test: Finding the resistance of materials to impact loads by Izod test and charpy test.

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6. Course Title: ELECTRICAL TECHNOLOGY

1. Course Code: El(Ip)-406

2. Semester: 4TH.

Rationale:

The knowledge of electrical technology is essential for diploma holders in industrial production engineering for the purpose of understanding applications of the subject areas on the shop floor and in handling electrical machines and equipments. This subject imparts basic concepts, principles and applications to enable students to apply these principles in live situations.

Course Pre-requisite:

The students should have

1. Knowledge of algebra and physical science
2. Basic electrical engineering
3. Basic electronics engineering

Objective

The student will be able to

1. understand the concept, principles and procedures of operating electrical machines
2. understand circuits and system and their applications
3. measure the electrical quantities to judge the performance of the machines
4. know the running and maintaining various electrical machines and drives.
5. identify the type of electric supply system
6. identify different types motors, transformers
7. select suitable drive as per the requirements

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
3		3	6

Examination Scheme:

Evaluation Scheme									
Theory					Practical			Total	Credit
	Sessional(SS)			Pass	Practical	Practical	Pass	Marks	
			Total	(ESE+SS)	Test(PT)	Assessment(PA)	(PT+PA)	(Theory+	
ESE	TA	HA	(TA+HA)					Practical)	
70	10	20	30	33/100	25	25	17/50	150	4

Detailed Course Content:

Chapter No.	Chapter Title	Content	Duration (in hours)
1.	Introduction	Introduction to electrical power supply system generation, transmission, distribution, utilization, AC and DC supply	(2hrs)
2.	DC motor	Construction and principle of operation, speed torque characteristics types, specifications, ratings and applications type of insulation required	(7hrs)
3.	Transformer	construction and principle of operation EMF equation and transformer ratio Load test, efficiency and regulation Specifications and rating Auto transformer and 3 phase transformer concept only Applications of transformers	(7hrs)
4.	AC motor	Construction and principle of operation of 3 phase induction motor Speed torque characteristics Slip, speed control, reversal of rotation Starters, single phase motors, universal motor ,stepper motor, servo motor Motor specification and ratings Applications of these motors in various fields	(8hrs)

5.	Alternator	Testing of motors Industrial applications- classification of drives, factors for selection of motor for different drives Enclosures and mountings Construction, principle of operation and applications Self and separate excitation Synchronous motor- construction, principle of operation, method of starting and applications	(7hrs)
6.	Electric heating	Working principle and types, selection of system, specifications and rating Electric welding- rating of transformer for arc welding and resistance welding, special characteristics of welding transformers Fault finding and repairs.	(7hrs)
7.	Electric safety	Electric safety, tariff and power conservation, necessity of earthing, types safety tools, first aid measures, pf improvements methods, energy conservation and audit, fire extinguishing methods adopted in electrical engg.	(7hrs)

NOTE: Seminars and 3 Class Tests are to be conducted at subsequent intervals. (6hrs)

Total Contact hours- 51

Learning Resources:

Books:

Sl No.	Author	Name of Book	Publisher
1.	E. Hughes	Electrical technology	ELBS
2.	H. Cotton	Electrical technology	Pitman
3.	B.L. theraja	Electrical technology (V-I , II)	S. Chand

6:Course Title: ELECTRICAL TECHNOLOGY (PRACTICALS)

Skills to be developed -

Intellectual Skills

Identification and selection of tools, instruments and components

Understand constructional features and working of devices

Understand working of various electrical machines

Identify various components

Calculate values of various components for given circuit

Interpretation of circuits, signals and results

Motor Skills

List technical details of components and sub-systems

Connect the instruments properly

Follow standard safety and test procedures

Operate devices

Take accurate readings

Identify and rectify the faults in the given sub-systems

List of Practicals:

1. For a given resistive and inductive series and parallel circuit, select ammeter, voltmeter and wattmeter. Make the connections and measure current, voltage and power drawn by the circuit.
2. measurement of current, voltage and power consumed by a motor at various loads.
3. list specifications of given single phase transformer. Perform no load test on it to find transformation ratio.
4. prepare trouble shooting chart of AC and DC motors and identify the faults of a motor
5. Visit a welding/fabrication/factory unit and prepare a report based on following
   a. type of wiring
   b. specifications of motors and transformers used

c.   Total electrical connected load

d.   Safety measures employed

e.   Power/energy consumption per month

f.   Measures taken for energy conservation.

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7: Course Title: PROFESSIONAL PRACTICE II

Subject code-Me -410

Class hours	L	T	P
	1	0	2

Rational :

To develop general confidence, ability to communicate and attitude in addition to the basic technological concepts through Industrial visits , expert lectures, seminars on technical topics and group discussion.

Outcome based Objectives:

The student will be able to :

- Acquire information from different sources
- Prepare notes for given topic.
- Present given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture.

Activities

6. **INDUSTRIAL VISITS:** **6**

Structured industrial visits be arranged and report of the same should be submitted by the individual student to form part of the term work.

Two industrial visits maybe arranged in the following areas/industries.

i. Manufacturing Organisations for observing various manufacturing processes including heat treatment.

ii. Material testing laboratories in industries or reputed organizations.

iii. Auto workshop / Garage

iv. Plastic material processing unit.

v. State Transport workshop / City transport workshop

vi. Ice Plant

7. Lectures by Professional/ Industrial Expert be organized from **ANY THREE** of the following areas**:** **6**

i.   Use of plastics in automobile

ii.   Nonferrous Metals and alloys for engineering applications.

iii.   Surface treatment processes like electroplating , powder coating etc.

iv.   Selection of electric motors.

v.   Computer aided drafting

vi.   Industrial hygiene

vii.   Water treatment plants

viii.   Composite Materials

ix.   Heat treatment processes.

x.   Ceramics.

xi.   Safety Engineering and Waste elimination

8. INDIVIDUAL   ASSIGNMENTS   6

Any two from the list suggested

a) Process sequence of any two machine components.

b) Write material specifications for any two composite jobs.

c) Collection of samples of different plastic material or cutting tools with properties , specifications and applications.

d) Preparing models using development of surfaces.

e) Assignments on bending moment , shear forces, deflection of beams and torsion chapters of strength of material.

f) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable.

g) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes.

h) List the various properties and applications of the following materials –

i) i. Ceramics

    ii. Fibre reinforcement plastics

    iii. Thermo plastic plastics

    iv. Thermo setting plastics

    v. Rubbers.

OR

Conduct **any one** of the following activities through active participation of students and write report

   i.   Rally for energy conservation/ tree plantation.

  ii.   Survey for local social problems such as malnutrition ,Flouride in drinking water ,

        unemployment , cleanliness , illiteracy etc.

 iii.   Conduct aptitude , general knowledge test , IQ test.

 iv.   Arrange **any one** training in the following areas:

        a)   Yoga b) Use of firefighting equipment and First aid Maintenance of Domestic appliances.

9. MODULAR COURSES (OPTIONAL)   :   6

A course module should be designed in the following areas for max 12 hrs . Batch size – min 15 students
Course maybe organized internally or with the help of external organizations.

    a) Forging Technology

    b) CAD-CAM related software

    c) Welding Techniques

    d) Personality development

    e) Entrepreneurship development.

10. 3-D DESIGN USING SOFTWARE   6

Computer screen,coordinate system and planes, definition of HP, VP, reference planes. How to create
them in 2nd /3rd environment. Selection of drawing site & scale. Commands of creation of Line,
coordinate points, Axis, Poly lines, square, rectangle ,polygon , sp line, circles, ellipse ,text,
movecopy,offset,Mirror, Rotate,T rison ,Extend, Break, Chamfer, Fillet ,Curves, Constraints fit
tangency, perpendicularity, dimensioning Line convention ,material conventions and lettering.
The student should draw – different orthographic views (including sections).Auxiliary views according to
first / Third angle method of projection. (Minimum two sheets, each containing two problems) after
learning the contents as above.

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FIFTH SEMESTER
INDUSTRIAL PRODUCTION
ENGINEERING

COURSE STRUCTURE OF INDUSTRIAL PRODUCTION ENGINEERING (5TH SEMESTER)

Sl. No.	Code No.	Subject Name	Study Scheme Contact hours/week			Evaluation Scheme									Total Marks (Theory+ Practical)	Credit
						Theory					Practical				
							Sessional(SS)			Pass (ESE+SS)	Practical Test(PT)	Practical Assessment(PA)	Pass (PT+PA)		
			L	T	P	ESE	TA	HA	Total (TA+HA)						
1	Ip-501	Production Planning & Control	3	1		70	10	20	30	33/100				100	4
2	Ip-502	Computer Aided Machine drawing			6						100	50	50/150	150	3
3	Me-504	Advance Workshop Practice and CNC machines	2		6	35	5	10	15	17/50	50	100	50/150	200	5
4	Ip-503	Automobile Engineering system	3		3	70	10	20	30	33/100	25	25	17/50	150	4
5	El/Me/Au /IPE-505	Non conventional energy	3			70	10	20	30	33/100				100	3
6	Ip-510	Professional Practice-III	1		2						25	25	17/50	50	2
Elective (Any one)															
7	Ip-506	Plant Engineering	3	1		70	10	20	30	33/100				100	4
8	Ip-507	Plant Layout & Material Handling	3	1		70	10	20	30	33/100				100	4
TOTAL			15	2	17									850	25
			34												

1. Course Title: PRODUCTION PLANNING AND CONTROL

1. Course Code: Ip-501

2. Semester: 5TH.

Rationale:

Diploma holders in industrial production engineering are responsible for controlling production and quality of product on the shop floor as well be responsible for production, planning and control. He is also required to supervise erection installation and maintenance of equipment including material handling and undertake work study for better utilization of resources. He is also required to lead a team of workers and motivate them towards realization of organizational objectives. For this purpose knowledge and skills about these topics need to be imparted to them. This subject aims at development of competencies to prepare material, equipment and production control schedules and maintain required quality levels.

Course Pre-requisite:

The students should have

1. Basic information of production machines and processes involved
2. Knowledge of statistics
3. Basic knowledge of production, man, machine and material

Objectives:

The students will be able to

1. Understand importance of productivity and factors for improvement of it.
2. know different product systems and modern trends in manufacturing system
3. prepare/modify layout of production system
4. select suitable material handling devices and plant facilities
5. prepare process plan and chart for analysis of existing process
6. use pert and cpm techniques for scheduling and controlling the manufacturing activities.
7. apply techniques of method study and work measurement for improvement of existing manufacturing methods.

Course Outcome:

CO1 Recognize the objectives, functions, applications of PPC and forecasting techniques.

CO2 Apply the principles and techniques for planning and control of production to optimise and make best use of resources.

CO3 Prepare/modify layout of production system.

CO4 Prepare process plan and chart for analysis of exsisting process.

CO5 Solve routing and scheduling problems.

CO6 Apply better inventory and quality control techniques in production system.

CO7 Demonstrate the use of manufacturing requirments planning, just in time techniques.

CO8 Develop the skills of insight and critical evaluation.

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
3	1	-	4

Examination Scheme:

Evaluation Scheme								
Theory					**Practical**			**Total**	**Credit**
	Sessional(SS)			**Pass**	**Practical**	**Practical**	**Pass**	**Marks**	
			Total	**(ESE+SS)**	**Test(PT)**	**Assessment(PA)**	**(PT+PA)**	**(Theory+**	
ESE	**TA**	**HA**	**(TA+HA)**					**Practical)**	
70	10	20	30	33/100				100	4

Detailed Course Content:

Chapter No.	Chapter Title	Content	Duration (in hours)
1.	Production system	Production- definition, types of production system Productivity- importance, measurement of productivity, techniques of improving productivity	(6hrs)

2.	Plant location, plant layout and material handling	Elements of cost- fixed and variable cost Break even analysis, calculation of break even point. Plant location- importance of site selection, factors affecting site selection, government policies, relaxation for backward areas Plant layout- concept of plant layout, objectives, types of layout, their characteristics, merits and demerits.symptoms of bad plant layout, cellular layout Material handling- need, principles and type of material handling devices- conveyors, hoist and cranes, forklift truck, trolleys, pipes , automated guided vehicles, selection of material handling systems and devices.	(6hrs)
3.	Process planning	Planning of processes from raw materials to finished product, factors affecting process planning, deciding sequence of operations, operation sheet, determination of inspection stages, selection of machine, techniques of assembly planning, types of assembly, plant capacity, machine capacity, plant efficiency (no numericals)	(6hrs)
4.	Production planning and control	Routing, sequencing, scheduling, dispatching, meaning of control, progressive control, concept of line balancing.	(4hrs)
5.	Work study	Method study- objectives, procedures, selection of work, recording techniques- process charts- outline process chart, flow process chart, two hand process chart, multiple activity chart, flow diagram, travel chart. Work measurement- objectives, procedures, time study time study equipments, stop watch time study, standard time, work sampling, predetermined motion study, allowances, calculation of standard time.	(7hrs)

6.	Inventory and quality control	Methods of inventory management, inventory cost relationship, deciding economic batch quantity, EOQ model, introduction of material requirement planning, stores function- storage systems- one bin, two bin system, material issue request, bin card. Meaning of quality, quality of product ,quality of service, cost of quality, meaning of quality control, 100% inspection and sampling inspection, introduction to statistical quality control, concept of total quality management, overview of Quality management systems, ISO 9000 series and other standers	(16hrs)
7.	Repairs and maintenance	Objectives and importance of maintenance, different types of maintenance, nature of maintenance problem, range of maintenance activities, procedure of preventive maintenance, schedules of preventive maintenance, advantages of preventive maintenance. Just in time manufacturing- pull and push type manufacturing systems, waste reduction, concept of continuous improvement.	(2hrs)
8.	Modern trends		(3hrs)

NOTE: Seminar and 3 Class Tests are to be conducted at subsequent intervals. (6hrs)

Total Contact hours- 56

Learning Resources:

Books:

Sl No.	Author	Name of Book	Publisher
1.	L C Jhamb	Industrial management	Everest
2.	O P Khanna	Industrial engg and management	Dhanpat Rai & sons
3.	James C Rigs	Production system, planning, analysis and control	N Y Wiley & sons
4.	ILO	Work study	ILO

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2. Course Title: COMPUTER AIDED MACHINE DRAWING

1. Course Code: Ip-502

2. Semester: 5TH.

Rationale:

Manufacturing of various machine parts and production of various equipments in small to big scale industries start from the basic drawing of components. The assembly of components is also carried out from the drawing. In fabrication works the knowledge of development of surfaces of different solid, interpenetration of solid surfaces is very essential. So machine drawing is an important subject to be studied by supervisor cadre students to carry out and complete the production and assembly process successfully. Practice of manual drawing along with computer aided drawing of commonly used components in industry to give a thorough knowledge of drawing. Review of graphic interface of the software, review of basic sketching commands and navigational commands are necessary to draw drawing with the aid of computer. The overall objective is to impart knowledge to the students so as to carry out the production and the assembly process without wastage of man/machine and material to have economical overall process.

Course Pre-requisite:

The students should have

1. Basic knowledge of engineering drawing
2. Basic knowledge of standards
3. Sound pictorial intelligence
4. Basic knowledge of computer

Objectives:

The student will be able to

1. Draw manually as well as with the aid of computer the commonly used machine parts of industries.
2. visualize and prepare detailed drawing of a machine part/component
3. apply the acquired knowledge and skill to draw industrial drawing of manufacturing parts.
4. draw free hand sketches of some machine component parts.

5. create 2-D and 3-D drafting using standard CAD software.

Course Outcome:

CO1 Visualize and prepare detailed drawing of machine parts/components.

CO2 Identify standard parts and components.

CO3 Apply the acquired knowledge and skills to draw industrial drawing of manufacturing parts.

CO4 Prepare assembly drawing from part drawing

CO5 Create 2-D and 3-D drafting using standard CAD software.

CO6 Draw proportionate free hand sketches of some machine component parts.

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
-	-	6	6

Examination Scheme:

Evaluation Scheme								
Theory					**Practical**			**Total**	**Credit**
	Sessional(SS)			**Pass**	**Practical**	**Practical**	**Pass**	**Marks**	
			Total	**(ESE+SS)**	**Test(PT)**	**Assessment(PA)**	**(PT+PA)**	**(Theory+**	
ESE	**TA**	**HA**	**(TA+HA)**					**Practical)**	
					100	50	50/150	150	3

Detailed Course Content:

Chapter No.	Chapter Title	Content	Duration (in hours)
1.	Development of surfaces of solids	Development of complete surfaces of solids, development of remaining part of solid when cut by a section plane, development of solid having hole (circular, rectangular, hexagonal) cut through it. Development of composite solids.	(15 hrs)

2.	Projection of solids	Projection of solids showing sectional views and true shape of sections.	(8hrs)
3.	Interpenetration of solids	Intersection of surfaces and interpenetration of solids. Cylinder to cylinder, cylinder to prism, prism to prism,	(9hrs)
4.	Machine elements	Preparation of 2-D drawings of standard machine elements (nuts, bolts, keys, cotter, screws, springs), Preparation of 3-D models of parts. Planning and setting of drawings, creating drawing views.	(10hrs)
5.	Details and assembly drawing	Different types of keys (sunk, parallel, gib headed, woodruff, saddle, feather etc) fitted in position, Cotter joint, knuckle joint Shaft couplings- muff, flanged, protected flanged, oldham's, universal coupling. Assembly drawing of bearings- simple, solid, bushed bearing, pedestal bearing, footstep bearing. Assembly drawing of pulleys- classification of pulleys, flat belt , V belt, rope belt, fast and loose pulley , stepped cone pulley Pipe joints- flanged joints, socket and spigot joint, gland and stuffing box, expansion joint Welding joints- different types with symbols Assembly drawing of valves- steam stop valve, gate valve, blow of cock, non return valve Assembly drawing of I.C. engine parts- piston, connecting rod, cross head Steam engine parts- piston rod assembly, eccentric.	(48hrs)

NOTE: 3 Class Tests are to be conducted at subsequent intervals. (6hrs)

Total Contact hours- 96

Sl. No.	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Development of surfaces of solids	4	2	2	8	4		2		6			3		3
2	Projection of solids	4	2		6			2		2			1		1
3	Interpenetration of solids	2	3		3	3				3			2		2
4	Machine elements	2	2	3	7	2	1	2		5					
5	Details and assembly drawing	12	8	5	25	8	6	4		18		3	6		9

DETAILED TABLE OF SPECIFICATIONS FOR COMPUTER AIDED MACHINE DRAWING

TABLE OF SPECIFICATION FOR COMPUTER AIDED MACHINE DRAWING

Sl. No.	TOPIC	Time allotted in Hrs.	%-age Weightage	K	C	A	HA
1	Development of surfaces of solids	15	17	8	2	7	
2	Projection of solids	8	9	4	2	3	
3	Interpenetration of solids	9	10	5	3	2	
4	Machine elements	10	12	4	5	3	
5	Details and assembly drawing	48	52	12	17	10	
	Total	90	100				

Skills to be developed for Practical:

Intellectual skills

Interpret the projection of objects on auxiliary planes

Understand interpenetration of solids

Interpret conventional symbols as per standard code

Understand drawing of machine components

Identify various components in a given assembly

Visualize details of components

Select and develop coordinate system

Understand 2D, 3D commands

Interpret a drawing to draw in CAD software

Motor skills

Draw the projection of objects in auxiliary planes

Draw development of surfaces of different solids

Draw front view and top view of solids cut by a plane and the true shape

of section

Draw front and top view of solids penetrating one with other and find the

shape of the interpenetration curve

Draw the drawing of machine components

Draw, edit and modify drawings with CAD commands

Regarding internal assessment (out of 50 marks) 10 marks for viva voce on autoCAD.

Learning Resources:

Books:

Sl No.	Author	Name of Book	Publisher
1.	N.D. Bhatt	Machine drawing	
2.	P. S. Gill	Machine drawing, geometrical drawing	Katson Publishing house
3.	R. B. Gupta	A text book of engg drawing	Satya prakasan
4.	Sham Tickoo, Surinder Raina	Autodesk inventor 2011 for engineers and designers	Dreamtech press
5.	K. Venugopal	Engineering drawing and graphics +autoCAD	New age international publication

3: Course Title: PROFESSIONAL PRACTICES- III

1. Course Code: Ip-510

2. Semester: 5TH.

Rationale:

The purpose of introducing Professional practices is to fulfill the need of the students to stand in today's global market with knowledge and confidence. Practical aspects of engg. can be learned through industrial visits, industry expert lectures, seminars, searching alternative solutions and validation of the selected alternatives. Subjects like professional practices allow the students to think independently using integrated knowledge of various subjects and give opportunity of working with their own hands.

Objectives:

The student will be able to

1. acquire information from different sources

2. prepare notes for given topics

3. prepare a report on industrial visit, expert lecture

4. present seminar using power projection system

5. interact with peers to share thoughts

6. work in a team and develop team spirit.

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
1	-	2	3

Examination Scheme:

Evaluation Scheme								
Theory					**Practical**			**Total**	**Credit**
	Sessional(SS)			**Pass**	**Practical**	**Practical**	**Pass**	**Marks**	
			Total	**(ESE+SS)**	**Test(PT)**	**Assessment(PA)**	**(PT+PA)**	**(Theory+**	
ESE	**TA**	**HA**	**(TA+HA)**					**Practical)**	
					25	25	17/50	50	2

Skills to be developed:

Intellectual Skills

1. Report writing
2. Collection of information and data
3. Analysis of data

Motor Skills

1. Interpersonal skill
2. Presentation skill, use of multimedia

Content:

1. Information search

Information search be made through manufacturers catalogues, suppliers, traders, workshops, journals & websites and submit a report on it in a group of 5 students (any two)

a) list 10 materials (ferrous and non ferrous metals, alloys and non metals) give their specifications, state their important properties and applications.
b) Advances in material technology- smart materials, nano materials.
c) List the types of ac motors commonly used for various industrial applications, write specifications of any two motors.
d) Heat treatment processes for steels- purposes and applications

2. lectures by professionals/ industrial experts (two lectures) on

a) role of diploma engineers in an organization.
b) Work culture
c) Organizational structure, various functional departments and their inter relationship.
d) Time management
e) Personality development

Students will maintain a diary report for submission

3. Seminar

On any one suggested topic each student will deliver lectures within 10 minutes.

4. Industrial visits

Structured industrial visits are arranged and reports of the same be submitted by individual student to form a part of the team work.

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4. Course Title: PLANT ENGINEERING (ELECTIVE)

1. Course Code: Ip-506

2. Semester: 5TH.

Rationale:

Diploma holders in industrial production engg. are supposed to handle I c engines, air compressors, gas turbines, refrigeration and air conditioning when they work in industrial sector. So the study of working, testing and maintenance of above equipments and machines by the students are very essential to fit into the work front in industry, use of safety devices in machines to avoid accidents are also important. Through this subject students are imparted requisite knowledge and skill to handle in real situations.

Course Pre-requisite:

1. Basic knowledge of handling and safety procedures
2. Knowledge of environmental studies
3. Knowledge of mechanical and electrical equipments
4. Knowledge of basic thermodynamics

Objectives:

The student will be able to

5. Appreciate the need and use of utilities like water, steam, electricity and air.
6. select and use material handling devices
7. know the procedure of maintenance
8. use of different safety devices in machines to avoid accidents
9. get familiar with ISO-14000 system

Course Outcome:

CO1 Justify the need and use of utilities like water, steam, electricity and air in industrial plant.

CO2 Select and use proper material handling devices.

CO3 Develop the ability of proper maintenance procedures

CO4 Justify the use of different safety devices in handling machines to avoid accidents.

CO5 Explain industrial waste disposal systems.

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
3	-	-	4

Examination Scheme:

Evaluation Scheme								
Theory					Practical			Total	Credit
	Sessional(SS)			Pass	Practical	Practical	Pass	Marks	
			Total	(ESE+SS)	Test(PT)	Assessment(PA)	(PT+PA)	(Theory+	
ESE	TA	HA	(TA+HA)					Practical)	
70	10	20	30	33/100				100	3

Detailed Course Content:

Chapter No.	Chapter Title	Content	Duration (in hours)
1.	Basic plant facilities	Industrial ventilation, water supply system, Water purification and treatment , water cooling system, electric power distribution system, electric supply system, stand by and emergency power, lighting, insulators, steam power system	(10hrs)
2.	Material handling Mechanical maintenance	Principles, types, selection and safety precautions of material handling equipments.	(7hrs)
3.			(12hrs)

4.	Electrical maintenance	Importance, Types- breakdown, preventive, predictive and condition based, procedure of preventive maintenance, total productive maintenance, planning and scheduling of maintenance work, repair cycle, maintenance stages, maintenance manuals and reports, machine history chart, maintenance tools, maintenance of rolling contact bearings, compressors and pumps Lubricants charts, lubrication of machine tools, motors, air compressor. Mechanical seals, bearing inspection, bearing removal and fitment. Equipment needed for electrical maintenance Safety measures- earthing, double earthing Precautions against electric shock Prevention of electric fire, lighting arresters on tall building.	(9hrs)
5.	Accidents and safety	Accidents- definition, causes, types, effects Accident report writing, first aid, legal aspects. Personal protective equipments, house keeping. Safety controls.	(7hrs)
6.	Industrial waste and waste disposal	Effluent treatment plant, solid waste disposal, bio treatment of solid and liquid waste. Recycling of waste, ISO-14000 system.	(5hrs)

NOTE: Seminar and 3 Class Tests are to be conducted at subsequent intervals. (6hrs)

Total Contact hours- 56

SI. No.	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Basic plant facilities	2	3		5	2	4	1		7	1	1			2
2	Material handling	2	1		3	3	2			5	1				1
3	Mechanical maintenance	4	3		7	2	2	2		6	2	1	1		4
4	Electrical maintenance	5	2		7	1	3			4		1	1		2
5	Accidents and safety	2	1		3	1	2			3	1	1	1		3
6	Industrial waste and waste disposal	1			1		2			2	2	1	1		4

DETAILED TABLE OF SPECIFICATIONS FOR PLANT ENGINEERING

TABLE OF SPECIFICATION FOR PLANT ENGG

SI. No.	TOPIC	Time allotted in Hrs.	%-age Weightage	K	C	A	HA
1	Basic plant facilities	10	20	5	8	1	
2	Material handling	7	14	6	3		
3	Mechanical maintenance	12	24	8	6	3	
4	Electrical maintenance	9	18	6	6	1	
5	Accidents and safety	7	14	4	4	1	
6	Industrial waste and waste disposal	5	10	3	3	1	
	Total	50	100				

Learning Resources:

Books:

Sl No.	Author	Name of Book	Publisher
1.	H P Garg	Industrial maintenance	S Chand
2.	K T Kulkarni	Introduction to industrial safety	Self published
3.	Robert C Rosaler	Plant engg handbook	Tata McGraw Hill
4.	Lindecy R Higgins	Maintenance engg	Tata McGraw Hill
5.	A A Hattangadi	Failure prevention of plant and machinery	Tata McGraw Hill

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5. Course Title: PLANT LAYOUT AND MATERIAL HANDLING

1. Course Code: Ip-507

2. Semester: 5TH.

Rationale:

Increased productivity and quality of the products of a plant greatly depends on how efficiently the plant is managed through its layout and the handling of materials that flow into the factory right from raw materials to the final product. This subject refers to the arrangement of physical facilities such as machinery, equipment, furniture etc. within the factory building in such a manner so as to have quickest flow of material at the lowest cost and with the least amount of handling in processing the product from the receipt of material to the shipment of the finished product. Only the properly laid out plant can ensure the smooth and rapid movement of material, from the raw material stage to the end product stage. Through this subject a diploma holder in industrial production engineering can acquire the knowledge and skill of the technique of locating machines, processes and plant services within the factory so as to achieve the right quantity and quality of output at the lowest possible cost of manufacturing.

Course Pre-requisite:
   1.   Elementary knowledge of machining, machine tools and manufacturing processes
   2.   Knowledge of mathematics

Objectives:
The student will be able to

   1.   understand the ways of providing enough production capacity
   2.   explain about the reduction of material handling cost
   3.   provide ease of production
   4.   understand the ways of improving productivity
   5.   utilize machines at its maximum capacity
   6.   know the process of reduction of accidents
   7.   understand the efficient material handling ways to reduce the total cost of production.

8.   create and encouragement of safe and hazard-free work condition.

Course Outcome:

CO1 Develop best plant layout technique for a factory

CO2 Explain about the reduction of material handling cost

CO3 Select production line at ease.

CO4 Develop the ways of improving productivity

CO5 Analyse the process of reduction of accidents.

CO6 Create safe and hazard free work condition.

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
3	-	-	3

Examination Scheme:

Evaluation Scheme								
Theory					**Practical**			**Total**	**Credit**
	Sessional(SS)			**Pass**	**Practical**	**Practical**	**Pass**	**Marks**	
			Total	**(ESE+SS)**	**Test(PT)**	**Assessment(PA)**	**(PT+PA)**	**(Theory+**	
ESE	**TA**	**HA**	**(TA+HA)**					**Practical)**	
70	10	20	30	33/100				100	4

Detailed Course Content:

Chapter No.	Chapter Title	Content	Duration (in hours)
1.	Introduction	Definition and objectives of plant layout- problems and principle of plant layout, different types of plant layout.	(4hrs)
2.	Factors in plant layout	Different factors influencing the layout, man, machine, material movement, service, building, storage etc. Analysis and coordination- plant layout procedure- symptoms of bad layout.	(6hrs)

3.	Planning and layout	Process planning – materials, building, determination of equipment cost Layout fundamentals: getting the fact, flow studies, proximity cross charts: flexibility and layout aids templates, tapes, reproduction methods- evaluation of the layout.	(8hrs)
4.	Installing the layout	Plant layout procedure, plant engineering and acceptance	(4hrs)
5.	Introduction to material handling	Objectives and elements- material handling activities, functions, systems of bad material handling.	(6hrs)
6.	Material handling organizations	Fundamental principles: relation to plant layout, safety in operation, traffic and handling equipments Bad material handling system	(3hrs)
7.	Material handling equipment	Classification and types: conveyors, its types: hoists, mobile equipments- positioning equipment, supper equipment, selection of material handling equipments.	(10hrs)
8.	Economics in material handling	Unit load concept in material handling, systematic handling analysis, economics of material handling	(9hrs)

NOTE: Seminar and 3 Class Tests are to be conducted at subsequent intervals. (6hrs)

Total Contact hours- 56

DETAILED TABLE OF SPECIFICATIONS FOR PLANT LAYOUT AND MATERIAL HANDLING

Sl. No.	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Introduction	1	2		3	1	1			2	1				1
2	Factors in Plant layout	2	2		4	2	1			3		1			1
3	Planning and Layout	2	2		4	2	2	1		5	1	1			2
4	Installing the Layout	1	2		3	1	1			2	1				1
5	Introduction to material handling	2	2		4	1	1			2	1	1			2
6	Material handling organisations	2			2	2				2					
7	Material handling equipments	4	1		5	3	3	1		7	1	1			2
8	Economics in material handling	2	2		4	2	3	1		6	2	1			3

TABLE OF SPECIFICATION FOR PLANT LAYOUT AND MATERIAL HANDLING

Sl. No.	TOPIC	Time allotted in Hrs.	%-age Weightage	K	C	A	HA
1	Introduction	4	8	3	3		
2	Factors in Plant layout	6	12	4	4		
3	Planning and Layout	8	16	5	5	1	
4	Installing the Layout	4	8	3	3		
5	Introduction to material handling	6	12	4	4		
6	Material handling organisations	3	6	4			
7	Material handling equipments	10	20	8	5	1	
8	Economics in material handling	9	18	6	6	1	
	Total	50	100				

Learning Resources:

Books:

Sl No.	Author	Name of Book	Publisher
1.	G K Agarwala	Plant layout and material handling	
2.	Mathur	Practical plant layout	
3.	T K Ray	Mechanical handling of materials	Asian book publication
4.	S Ray	Material handling	New age international

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6:Course Title: Advance Workshop Practice & CNC Machine

Subject Title		**:Advance Workshop Practice& CNC Machine**
Subject Code	:	**Me-504**
Hours Per Week	:	**2(Th)+6 hrs practice**
Hours Per Semester	:	**30(Th)+90(Pract)**
Class Test	:	**02+06**
Total hours	:	**32+96**
Full marks(Theory)	:	**35**
Sessional Marks	:	**15**
Total Marks	:	**50**
Class hours	L	T	P
	2	0	3

Total Contact hours—90(Practical Part)

Theory—Contact hours -30

Unit-1

1. Introduction

2. Machine Tools: Definition and development

3. A few basic machine tools

4. Requirement of Machine Tools

5. Cutting tool specification, IS

Unit-2

1. Shop Talk and activities

2. Lathe Machine- Function classification and specification

3. Main Lathe parts and working principles

4. Feed mechanism , feed reversing mechanism, feed drive and apron mechanism

Unit-3

1. Lathe Accessories and Attachment

2. Lathe Centres and Carriers etc.

3. Chucks, face plate, angle plates

4. Mandrels, Steady Rest, follower rest

Unit-4

1. Lathe tools

2. Different types of lathe tools used

3. Lathe operations- Turning , Parting, Facing, Taper turning, grooving, boring, threading (External and Internal) and knurling

Unit-5

1. Metal Cutting and Cutting tools

2. Orthogonal cutting and Oblique cutting

3. Chip formation and types of chips

4. Reference planes

5. ORS system and ASA system

6. Merchant circle diagram for cutting forces

Unit-6

1. Use of single point cutting tool and multiple point cutting tools

2. Knowledge of rake, clearance and cutting angles

3. Influence of tool angles and tool setting

4. Importance of positive, negative and zero, rake angle and restricted cutting

5. Mechanism of cutting , cutting speed and feeds

6. Factors determining speeds , feeds and depth of cut

7. Various cutting fluids

8. Method of lubrication

9. Measurement on different type of operation

Unit-7

1. Fundamentals of CAM

2. NC machine and its introduction

3. Basic Components of NC machines

4. Problems with NC machines

5. NC simple programming

6. CNC machine Tool

7. DNC machine

8. Classification of CNC machines

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7: Course title: NON CONVENTIONAL ENERGY

Subject Title	: No Conventional Energy			
Subject Code	:	El/Me/IPE/Au-505		
Hours Per Week	:	03		
Hours Per Semester	:	45		
Class test	:	03		
Total Hours	:	48		
Full marks(Theory)	:	70		
Sessional Marks	:	30		
Class hours	L	T	P	
	3	0	0	

Outcome based course objectives

After studying the course the students will be able to

1. Know the details of Non Conventional energy sources and its uses
2. Explain the principle of solar energy collection
3. Apply solar energy storage system for day to day uses
4. Know the principle of wind energy conversion system
5. Explain the principle of ocean thermal energy conversion
6. Explain the principle of biomass conversion for storing and utilizing of energy
7. Know about the geothermal energy
8. Apply the principle of thermal energy storage system
9. Know about the chemical storage system

COURSE CONTENTS

1.0   Introduction to Non-Conventional Energy Sources

1.1   Energy consumption

1.2   Energy Sources & their Availability

1.3   Importance of Non Conventional Energy sources.

2.0   Solar Energy Engineering

2.1   Introduction

2.2   Solar Constant

2.3   Solar Radiation at the Earth's surface

2.4   Solar Radiation Measurements

2.5   Solar Energy Collectors

    2.5.1   Principles of Conversion of Solar Radiation into heat

    2.5.2   Flat Plate Collectors – Types, Applications & Advantages

    2.5.3   Concentrating   Collectors – Focusing & non-focusing types

    2.5.4   Advantages & Disadvantages of concentrating collectors over flat plate collectors.

2.6   Applications of Solar Energy - Water Heating, Air Heater, Solar Cooker, Solar Pond, Solar Photovoltaic and Solar Distillation.

3.0   Wind Energy Engineering

3.1   Introduction

3.2   Basic Principles of Wind energy conversion

    3.2.1 The nature of wind

    3.2.2 The power in the wind (No derivations)

    3.2.3 Forces on the Blades (No derivations)

3.3   Site Selection considerations

3.4   Basic components of a wind energy conversion system (WECS)

3.5   Wind energy collectors (Wind mill)

    3.5.1 Horizontal Axis Machines

    3.5.2 Vertical Axis Machines

3.6   Advantages & Limitations of WECS.

4.0   Ocean Energy Engineering

4.1   Introduction

4.2   Ocean Thermal Energy Conversion (OTEC)

    4.2.1 Introduction to OTEC

    4.2.2 Methods of OTEC

    4.2.3 Site Selection for OTEC

    4.2.4 Prospects of OTEC in India.

4.3   Tidal Energy

4.3.1 Introduction

4.3.2 Basic Principles of Tidal Power

4.3.3 Components of Tidal Power Plants

4.3.4 Schematic Layout of Tidal Power house

4.3.5 Operation methods of utilization of Tidal energy (single and double basin

arrangement)

4.3.6 Advantages & Limitations of Tidal power

4.3.7 Prospects of Tidal Energy in India.

5.0   Geothermal Energy Engineering

5.1 Introduction

5.2 Nature of Geothermal fields

5.3 Geothermal Sources

5.4   Hydro thermal Sources

5.4.1 Vapour dominated systems

5.4.2 Liquid dominated systems

5.5   Prime movers for geothermal energy conversion

6.0   Bio Energy Engineering

6.1   Introduction

6.2   Biomass conversion techniques

6.3   Biogas Generation.

6.4   Factors affecting biogas Generation

6.5   Types of biogas plants

6.6   Advantages and disadvantages of types of biogas plants

7.0   Direct Energy Conversion Systems

7.1   Magneto Hydro Dynamic Generator

7.1.1 Introduction

7.1.2 Basic principle

7.1.3 MHD Systems (open cycle & closed cycle)

7.1.4 Advantages of MHD

7.2   Thermo-Electric power

7.2.1 Basic Principles

7.2.2 Thermo electric power generator

7.2.3 Thermo Electric materials & selection of materials

7.3   Thermoionic Generation

7.3.1 Introduction

7.3.2 Thermoionic emission & work function

7.3.3 Basic Thermoionic generator

8.0   Chemical Energy Sources

8.1 Fuel cells

8.1.1 Introduction

8.1.2 Fuel cells – Principles of operation, classification & Types

8.1.3 Applications of fuel cells

8.2 Hydrogen Energy

8.2.1 Introduction

8.2.2 Principles of operation

8.2.3 Applications

Reference:

1.   Non conventional Energy sources by G.D.Rai, Khanna Publishers

2.   Solar Energy by S P Sukhatme Tata Mc Graw Hill

3.   Solar Energy Utilization G D Rai Khanna Publishers

4.   Power Plant Technology by M M EI Wakil ,Tata McGraw Hill

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1. Course Title: AUTOMOBILE ENGINEERING SYSTEM

2. Course Code: Ip-503

3. Semester: 5TH.

Rationale:

A diploma holder in industrial production engineering should have an overall view of automobiles and the detail aspects of various systems of automobile. This subject provides a broad knowledge and skill about the different systems like frame and chassis, transmission, steering system, suspension system, automobile electrical systems and an outline of manufacturing of major automobile components. This knowledge will be helpful to the students engaged in automobile industries in order to correlate various system with each other and understanding the individual system in a better manner.

Course Pre-requisite:
The students should have
1. Knowledge of physics
2. Basic knowledge of applied mechanics
3. knowledge of material science
4. knowledge of theory of machines

Objectives:

The student will be able to
1. know different classifications of automobile vehicles
2. identify various automotive systems and subsystems
3. explain working and construction of various systems
4. carryout preventive maintenance and performance testing of vehicles
5. work effectively in automobile manufacturing organization
6. understand manufacturing process for automobile.

Course Outcome:

CO1 Differentiate two-stroke and four-stroke cycle engines
CO2 Identify various automotive systems and subsystems
CO3 Develop the ability of proper maintenance procedure
CO4 Demonstrate the transmission system used in a vehicle.
CO5 Explain the different parts fitted in a steering system and their functions.
CO6 Justify the fault in a braking device
CO7 Apply the knowledge in process planning of automobile production line.

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
3	-	3	6

Examination Scheme:

								Total Marks (Theory+ Practical)	Credit
Evaluation Scheme									
Theory					**Practical**			**Total Marks (Theory+ Practical)**	**Credit**
	Sessional(SS)			**Pass (ESE+SS)**	**Practical Test(PT)**	**Practical Assessment(PA)**	**Pass (PT+PA)**		
ESE	**TA**	**HA**	**Total (TA+HA)**						
70	10	20	30	33/100	25	25	17/50	150	4

Detailed Course Content:

Chapter No.	Chapter Title	Content	Duration (in hours)
1.	Introduction	Basic engine nomenclature, I.C. engine classification, four-stroke cycle spark-ignition and compression ignition engines, two-stroke engine. Comparison of two-stroke and four-stroke engines, fundamental difference between S.I. and C.I. engines, Air standard cycles-otto cycle, diesel cycle, duel combustion cycle. Actual cycles.	(6hrs)
2.	Automobiles	Classification of automobiles Vehicle layout & types, body construction- type and nomenclature of car body, introduction to aerodynamic body shapes, major manufacturers, their products and collaborations.	(6hrs)
3.	Automobile transmission	Clutch- of coil spring and diaphragm spring type clutch necessity, construction and working Gear box- types of gear box, construction & working of constant mesh GB and synchromesh GB, epicyclic GB Final drive- necessity, construction and working of propeller shaft and differential. Axle-type of rear axles, front axles and their applications	(12hrs)
4.	Steering system	Requirement of steering system, construction and working , steering gear box, introduction to power steering, steering geometry- camber, caster, toe-in, toe-out, kingpin inclination and their effects.	(10hrs)
5.	Brake & suspension system	Construction and working of hydraulic and pneumatic brakes, comparison of disc and drum brake. Necessity and classification of suspension system, introduction to air suspension.	(5hrs)
6.			(5hrs)

7.	Automobile electrical systems Outline of manufacturing of major automobile components	Battery, ignition system, starting system, charging system, wiring and lighting system Cylinder block, piston, liners, piston rings, cylinder head, crankshaft, gears, chassis frame, leaf springs	(6hrs)

NOTE: Seminar and 3 Class Tests are to be conducted at subsequent intervals. (6hrs)
Total Contact hours- 56

SI. No.	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Introduction	3			3	2	2			4		1			1
2	Automobiles	3			3	2	2			4			1		1
3	Automobile Transmission	4	1		5	3	3	1		7	2	2	1		5
4	Steering System	4	1		5	2	3			5	2	1	1		4
5	Brake and Suspension system	3			3	1	1			2	1	1			2
6	Automobile electrical systems	3	1		4		1	1		2		1			1
7.	Outline of manufacturing of major automobile components			2	2	1	2	2		5		1	1		2

DETAILED TABLE OF SPECIFICATIONS FOR AUTOMOBILE ENGINEERING SYSTEM

Sl. No.	TOPIC	Time allotted in Hrs.	%-age Weightage	K	C	A	HA
	TABLE OF SPECIFICATION FOR AUTOMOBILE ENGINEERING SYSTEM						
1	Introduction	6	12	5	3		
2	Automobiles	6	12	5	2	1	
3	Automobile transmission	12	24	9	6	2	
4	Steering System	10	20	8	5	1	
5	Brake and Suspension system	5	10	5	2		
6	Automobile electrical systems	5	10	3	3	1	
7.	Outline of manufacturing of major automobile components	6	12	1	3	5	
	Total	50	100				

Learning Resources:

Books:

Sl No.	Author	Name of Book	Publisher
1.	K K jain & R B Asthana	Automobile engg	Tata McGraw Hill
2.	H M Sethi	Automotive technology	Tata McGraw Hill
3.	S Srinivasan	Automobile mechanics	Tata McGraw Hill
4.	William Crouse, D L Anglin	Automotive mechanics	Tata McGraw Hill
5.	G B S Narang	Automobile engg	Khanna publication
6	Kripal Singh	Automobile engg	Standard publication

PRACTICALS

Skills to be developed :
    # Intellectual skills
        Specify an automobile
        Specification of auto components
        Identify various systems and subsystems of the vehicle
        Understand the functions of different components
    # Motor skills
        Servicing an automobile
        Study different mechanisms and motions of various systems component
        Ability to find fault in different systems
        Replacing an automobile component

List of Practicals

1. Demonstration of single plate coil spring and diaphragm type clutch
2. demonstration of synchromesh gearbox
3. demonstration of differential
4. demonstration of rack and pinion steering gearbox
5. demonstration of rigid axle suspension
6. demonstration of hydraulic brake system
7. write a report on functions of any four components of different types of vehicle.
8. demonstration on wheel alignment
9. study of the effect of defective tyre- (under and over inflated)

SIXTH SEMESTER
INDUSTRIAL PRODUCTION ENGINEERING

COURSE STRUCTURE OF INDUSTRIAL PRODUCTION ENGINEERING (6TH SEMESTER)

Sl. No.	Code No.	Subject Name	Study Scheme Contact hours/week			Evaluation Scheme									Total Marks (Theory+ Practical)	Credit
						Theory					Practical				
						ESE	Sessional(SS)			Pass (ESE+SS)	Practical Test(PT)	Practical Assessment(PA)	Pass (PT+PA)		
			L	T	P		TA	HA	Total (TA+HA)						
1	Hu-601	Industrial Management and Entrepreneurship	3			70	10	20	30	33/100				100	3
2	Me-606	Advance Machining Method	3			70	10	20	30	33/100				100	3
3	Me-604	Metrology	3			70	10	20	30	33/100				100	3
4	Me-602	Drawing Estimating & Costing	3		3	100	20	30	50	50/150				150	4
5	Ip-611	Project & Seminar		1	6						100	50	50/150	150	3
6	Ip-612	General viva		2							50		17/50	50	2
7	Ip-610	Professional Practice-IV	1		2						25	25	17/50	50	2
Elective (Any one)															
8	Ip-606	Thermal Engg & Heat Transfer	3		3	70	10	20	30	33/100	25	25	17/50	150	5
9	Ip-607	Welding & Foundry Technology	3		3	70	10	20	30	33/100	25	25	17/50	150	5
			16	3	14										
TOTAL			33											850	25

COURSE STRUCTURE OF 6th. SEMESTER (INDUSTRIAL PRODUCTION ENGINEERING)

1: Course Title :Industrial Management and Entrepreneurship

1. Course Code: **Hu – 601**

2. Semester: **VI**

3. **Aim of the Course:**
    1. To acquaint the students with managerial activities
    2. To provide introductory knowledge of Cost Accounting
    3. To introduce students with industrial legislation
    4. To explain the scope for self-employment
    5. To compare and contrast different forms of business organization
    6. To identify the opportunities to start a small scale industry

4. **Course Outcomes**:

   On completion of the course on IME, students will be able to
   - CO_1 =   explain managerial activities.
   - CO_2 = describe leadership qualities and decision making process.
   - CO_3 = state the elements of costs.
   - CO_4 =   explain important industrial laws.
   - CO_5 = define   different   forms   of   business organisations
   - CO_6 = identify   entrepreneurial   abilities   for   self employment through small scale industries.

5. **Teaching Scheme (in hours)**

Lecture	Tutorial	Practical	Total
42hrs	3 hrs	--	45 hrs

6. Examination Scheme:

Theory				Practical				Total Marks
Examination Full Marks	Sessional Full Marks	Total Marks	Pass Marks	Examination		Sessional		
70	30	100	33	--	--	--	--	100

7. Detailed Course Content:

Chapter No.	Chapter Title	Content	Intended Learning Outcomes	Duration (in hours)
				42 hrs
1.0	**Introduction to Management :**	i) Meaning and Concept ii) Functions of Management iii) Principles of Management	i) Explain functions and principles of management	3
2.0	**Leadership Decision Making & Communication :**	i) Definition of Leader ii) Functions of a leader iii) Decision making – Definition iv) Decision making process v) Communication – definition, importance & types	i) Develop leadership qualities ii) Demonstrate decision making abilities	4

3.0	**Introduction to Cost :**	i) Definition and classification of Cost ii) Elements of Cost iii) Break Even Analysis	i) State elements of costs ii) Explain Break Even Analysis	3
4.0	**Human Resource Management:**	i) Meaning of manpower planning ii) Recruitment and Selection procedure iii) Payment of wages – factors determining the wage iv) Methods of payment of wages – Time rate and Piece rate v) Labour Turnover – definition, its causes, impact and remedy	i) State selection procedure of employees ii) Distinguish Time rate and Piece rate system of wage payments iii) Explain causes and impact of labour turnover	5
5.0	**Industrial Legislation :**	i) Need of Industrial legislation ii) Indian Factories Act – 1948 – Definition of Factory, main provisions regarding health, Safety and Welfare of Workers	i) Identify the needs and importance of industrial laws	5

		iii) Industrial Dispute Act – 1947 – Definition of Industrial dispute, Machineries for settlement of Industrial dispute in India		
6.0	**Production Management :**	i) Meaning of Production ii) Production Management – definition, objectives, functions and scope iii) Inventory Management, Basic idea	i) State the objectives and functions of Production management	3
7.0	**Marketing Management:**	i) Meaning and functions of marketing ii) e- Commerce iii) Channels of distribution iv) Wholesale and retail trade	i) state the functions of wholesalers and retailers	2
8.0	**Entrepreneur andEntrepreneurship:**	i) Definition of Entrepreneur and Entrepreneurship ii) Qualities required by an entrepreneur iii) Functions of an entrepreneur iv) Entrepreneurial motivation	i) State the qualities and functions of an entrepreneur	3
9.0	**Forms of Business Organisation:**	i) Sole Trader – meaning, main	i) Differentiate	5

		features, merits and demerits ii) Partnership – definition, features, merits and demerits iii) Joint Stock Company – Definition, types, features, merits and demerits	different forms of Business organization ii) compare and contrast features, merits and demerits of different business organizations .	
10.0	**Micro and Small Enterprises:**	i) Definition of Micro & Small enterprises ii) Meaning and characteristics of Micro and Small enterprise iii) Scope of SSI with reference to self-employment iv) Procedure to start SSI – idea generation, SWOT analysis v) Selection of site for factories	i) Define micro and small enterprises ii) Explain the procedure to start a small enterprise	4
11.0	**Support to Entrepreneurs**	a) Institutional support: i) Introduction ii) Sources of information and required application forms to set up SSIs iii) Institutional support of various National & State level organizations – DICC, NSIC, IIE,	i) identify the supporting agencies to entrepreneurs ii) Explain the role of financial support organisations	5

		MSME - DI, Industrial Estates		
		b) Financial support: i) Role of Commercial banks, RRB, IDBI, ICICI, SIDBI, NEDFi, and State Financial Corporations ii) Special incentives and subsidies for Entrepreneurship Development in the North East		
	Class Test			3 hrs
	Total			**45 hrs**

(9) TABLE OF SPECIFICATIONS for Industrial Management & Entrepreneurship

Sl. No	Topic (a)	Time allotted in hours (b)	Percentage Weightage (c)	Knowledge	Compre-hension	Application	HA
1	Introduction to Management	3	7	2	3	0	0
2	Leadership & Decision Making	4	9.5	3	4	0	0
3	Introduction to Cost	3	7	3	2	0	0
4	Human Resource Management	5	12	6	2	0	0
5	Industrial Legislation	5	12	4	4	0	0
6	Production Management	3	7	3	2	0	0

7	Marketing Management	2	5	4	0	0	0
8	Entrepreneur & Entrepreneurship	3	7	3	2	0	0
9	Forms of Business Organisation	5	12	3	5	0	0
10	Micro & Small Enterprises	4	9.5	4	3	0	0
11	Support to Entrepreneurs	5	12	4	4	0	0
	Total	**42**	**100**	**39**	**31**	**0**	**70**

K = Knowledge   C = Comprehension   A = Application   HA =
Higher Than Application (Analysis, Synthesis, Evaluation)

$$C = \frac{b}{\sum b} \times 100$$

10. Distribution of Marks:

DETAILED TABLE OF SPECIFICATIONS FOR IME

Sl. No	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE					Grand
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T	Total
1	Management	1	0	0	1	1	0	0	0	1	0	3	0	0	3	5
2	Leader &Decisi	1	0	0	1	2	1	0	0	3	0	3	0	0	3	7
3	Cost	1	1	0	2	2	1	0	0	3	0	0	0	0	0	5
4	HRM	2	1	0	3	1	1	0	0	2	3	0	0	0	3	8
5	Laws	3	0	0	3	0	0	0	0	0	1	4	0	0	5	8
6	Product Manage	2	1	0	3	1	1	0	0	2	0	0	0	0	0	5
7	Market	2	0	0	2	2	0	0	0	2	0	0	0	0	0	4
8	Entrepreneurship	1	1	0	2	2	1	0	0	3	0	0	0	0	0	5
9	Forms of BO	2	1	0	3	0	0	0	0	0	1	4	0	0	5	8
10	MSME	2	0	0	2	0	0	0	0	0	2	3	0	0	5	7
11	Support to Entp.	3	0	0	3	1	0	0	0	1	0	4	0	0	4	8
	Total	**20**	**5**	**0**	**25**	**12**	**5**	**0**	**0**	**17**	**7**	**21**	**0**	**0**	**28**	**70**

K = Knowledge   C = Comprehension   A = Application
HA = Higher Than Application T   = Total
Higher than Application (Analysis, Synthesis, Evaluation)

11. Suggested implementation Strategies: Modified syllabus may be implemented with effect from January, 2020 (Starting with the present batch (2018) of 2nd Semester students)

12. Suggested learning Resource:

a. **Book list** :

Sl. No.	Title of Book	Name of Author(s)	Publisher
1	Industrial Management	S.C. Jain H.S. Bawa	DhanpatRai& Co. (P) Ltd. New Delhi-110006
2	Business Organisation and Entrepreneurship Development	S.S. Sarkar R.K. Sharma Sashi K. Gupta	Kalyani Publishers, New Delhi-110002
3	Entrepreneurial Development	S. S. Khanka	S. Chand & Co. Ltd. New Delhi-110055
4	Business Methods	R.K. Sharma Shashi K Gupta	Kalyani Publishers, New Delhi
5	Entrepreneurship Development and Management	Dr. R.K. Singhal	S.K. Kataria& Sons, New Delhi-110002
6	Business Administration & Management	Dr.S.C.Saksena	SahityaBhawan, Agra
7			
8			

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b. List of Journals

c. Manuals

d. Others

XXXXXXXXXXXXXXXXXXX

2: Course Title : Drawing, Estimating & Costing

Subject Title	:	**Drawing, Estimating & Costing**
Subject Code	:	**Me-602**
Hours Per Week	:	**3(T)+3(Dr)**
Hours Per Semester	:	**45+45**
Class Test	:	**1+3**
Exam Hours	:	**4 hrs**
Full Marks	:	**100**
Sessional Marks	:	**50**

Pre requisite: Engineering Drawing ,Machine Drawing, Applied Mathematics

Rationale

On the completion of the course the students should be able to:

1. Draw Jigs and Fixtures

2. Know the fundamentals of estimating and costing

3. Estimate the cost of production of machine or engine components

4. Calculate the depreciation cost of a machine

5. Estimate the machining time of a final product

6. Estimate the fabricating time of a simple component

Subject Content Details

Chapter I

1. Jigs and Fixtures:

1.1 Drawing of Jigs and Fixtures, such as Drill Jigs, Bushing and Tool Guides,

1.2 Lever Clamps , Locating Devices, Indexing Jigs, Milling Fixtures(Any Two)

2. Assembly Drawing

2.1 Valves , (Stop Valve, Non return Valve)

2.2 Engine parts(Stuffing box, Connecting Rod)

2.3 Machine tools (Tool post, tail stock)

(6 nos of Drawing Sheets to be submitted)

2. Introduction to Estimation and costing

2.1 Estimation - Definition, Importance and Aims

2.2   Qualities and functions of an Estimator

2.3   Source of errors in estimation

2.4   Constituents of Estimation

2.5   Costing - Definition and Aims

2.6   Standard cost and its Advantages

2.7   Difference between estimation and costing

2.8   Advantages of efficient costing

3.0   Elements of costs

3.1   Elements of cost- material, labour, expenses

3.2   Material - Direct material, indirect material and examples

3.3   Calculation of Material cost

3.4   Labour - direct, indirect labour and examples

3.5   Calculation of labour cost

3.6   Expenses - direct, indirect expenses and examples

3.7   Classification of expenses - factory, administrative, selling and distribution expenses and examples

3.8   Fixed and variable expenses and examples

3.9   Components of cost - prime cost, factory cost, office cost, total cost

3.10   Selling price

3.11   Block diagram to show the relationship between elements and components of cost

3.12   Simple problems on above

3.13   Allocation of on-cost - methods and simple problems

4.0   Indirect expenses and depreciation

4.1   Indirect expenses - depreciation, obsolescence, inadequacy, idleness, repair and maintenance

4.2   Depreciation - causes,methods of calculating depreciation

4.3   Simple problems on each method

5.0   Mensuration and Estimation of material cost

5.1   Area of regular plane figures

5.2   Volume and surface area of solids (formulae only)

5.3   Estimation of material costs of step block, spindle lathe centre, Rivets,
V block and different types of components

6.0   Estimation of Machining Time

6.1   Estimation in machine shop - Definition of cutting speed, feed, depth of cut

6.2   Estimation of time for various operations like Turning, Knurling, Facing, Drilling,

Boring, Reaming, Threading, Tapping, Milling, Grinding, Shaping

7.0 Estimation of Welding & Fabrication Time Sheet metal

7.1   Estimate the material required for preparation of container open on one side

Cylindrical drum

7.2   Estimation in welding shop - estimation of gas welding cost -Simple problems

References:

1. Drawing Estimating and Costing by Banga and Sarmah

2. Drawing Estimating and Costing by KP S Rao

Xxxxxxxxxxxxxxxx

3: Course Title: METROLOGY

Subject Title	:	**Metrology**
Subject Code	:	**ME-604**
Hours Per Week	:	**03**
Hours Per Semester	:	**45**
Class Test	:	**03**
Total Class	:	**48**
Total Marks	:	**100**
Theory	:	**70**
Sessional	:	**30**

Class hours	**L**	**T**	**P**
	3	**0**	**0**

Outcome based Course Objectives

On the completion of the course the students should be able to:

1 Know the principle of operation and calibration of an instrument.

2. Know different measuring device for a particular application.

3. Explain the concepts of limits, fits and tolerance

4. Explain various device and tools for angular measurements

5 Know the various comparators with their working principles and applications

6. Explain the different devices used to measure screw threads,gears

7 Explain the different devices used to measure textures and surface finish

8 Explain the different techniques and devices used to measure a groove, bores, ring
and plug gauges

COURSE CONTENTS

1.0   Metrology concepts and standards

1.1   Definition of Metrology

1.2   Significance of measurement,

1.3   Standards of measurements-line standard, wavelength standard

    1.4   Factors in selecting the measuring instruments

    1.5   Terms applicable to measuring instruments: Precision and Accuracy, Sensitivity and Repeatability, Range, Threshold, Hysteresis, calibration and magnification

    1.6   Errors in Measurements: Classification of errors, Systematic and Random error.

    1.7   Handling and care of Measuring instruments

    1.8   Objects of Metrology   - ISO and ISI specifications

2.0   Basic Precise and Non Precise Measuring instruments

    2.1   Introduction

    2.2   Thread measurements: Thread gauge micrometer

    2.3   Angle measurements: Bevel protractor, Slip gauges, Sine Bar

    2.4   Use, Sizes, Care of slip gauges and Sine Bar

    2.5   Gauges: plain plug gauge, ring Gauge, snap gauge, limit gauge

    2.6   Vernier calliper , Vernier height gauge , Vernier depth gauge

    2.7   Outside Micrometer, Inside Micrometer

    2.8   solving small problems using slip gauges, sine bar

3.0   Limits, Fits, Tolerances and Gauges

    3.1   Limit: Maximum limit, Minimum limit, Basic size, Nominal size

    3.2   Fit: Types of fits -Hole basis and Shaft basis system

    3.3   Tolerance: Basic terminology, unilateral and bilateral tolerance

    3.4   Interchangeability and selective assembly

    3.5   Symbols

    3.6   Solving problems on limit, fit and tolerance

4.0   Angular Measurements

    4.1   Concept of Angular measurements

    4.2   Construction and working of Bevel protector, Sine Bar, Angle Gauges,

    4.3   Clinometer-different types of Clinometer

    4.3   Autocollimator- principle and application

    4.4   Use of Straight Edges and Rollers

    4.4   Solving problems on angular measurement using sine bar.

5.0   Comparators

    5.1   Principle and operation of various comparators

    5.2   Types-Mechanical, Electrical, Optical, Pneumatic comparators

    5.3   Relative advantages and disadvantages of various comparators

    5.4   Characteristics of a good comparator

6.0   Screw Thread Measurement

    6.1   Terminology of screw thread

    6.2   Measurement of external and core diameter

    6.3   Testing of leads, thread angle and thread profile

    6.4   Use of screw thread micrometer, tool makers microscope, optical profile projector

7.0   Gear Measurement

    7.1   Terminology of gears

    7.2   Measurement of chordal thickness, addendum using gear tooth vernier

    7.3   Parkinsons gear tester

8.0   Surface Finish Measurement

    8.1   Terminology

    8.2   Primary and secondary texture, CLA, RMS and RA value

    8.3   Use of Straight edges and surface plates (Wedge method and Level method)

    8.4   Principle and operation of Stylus probe instruments

9.0   Machine tool metrology

    9.1   Testing instruments for machine tools alignment testing

    9.2   Checking Parallelism, Straightness, flatness, squareness ,alignment testing of machine tool as per IS standard procedure.

    9.3   Test for level of installation

10.0   MISCELLANEOUS MEASUREMENTS

    10.1   Checking size of a groove

    10.2   Gauging Large bores with point gauge and by four ball method

    10.3   Gauging Small bores by two and three spheres method

    10.4   Measuring taper ring & plug gauge

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4: Course Title: Advanced Machining Methods

Subject Title	:	**Advanced Machining Methods**
Subject Code	:	**Me-606**
Hours Per Week	:	**3**
Hours Per Semester	:	**45**
Total Marks	:	**100**
Theory	:	**70**
Sessional	:	**30**

On the completion of the course the students should be able to:

1. Appreciate the need of advanced machining methods

2. Acquire the knowledge of Spark Erosion Machine

3. Know the advantages of Ultra Sonic Drilling

4. Know about the Abrasive Jet Machining

5. Explain the basic technology of Chemical Machining including Electro Chemical machining

6. Know about the working principle of PAM LBM and, EBM

Course Contents

Chapter I   Introduction

1.0   Need for Non conventional Machining Methods

1.1   Characteristics features of Advanced Machining Process

1.2   Basic principle of New Machining Methods

1.3   Advantages of non traditional machining process

1.4   Limitations of non traditional machining process

1.5   Classification of new machining methods

1.6   Abbreviations used for non conventional machining methods

Chapter –II- Spark Erosion Machining

1.0   Basic Principle of Spark Erosion

1.1   Tools materials used in Spark Erosion Machining

1.2   Die Electric Fluid

1.3   Servo System to provide controlled feed rate

1.4   Characteristics of EDM Process

1.5   Construction details of EDM

1.6   Description of process

1.7   Application and uses of EDM

1.8   Advantages and disadvantages of EDM

1.9   Wire cut EDM

Chapter –III- Ultrasonic Drilling (USD)

3.0   Basic Principle of the process

3.1   Different parameters of USD

3.2   Description of process

3.3   Hollow tools vs solid tools used in USD method

3.4   Applications of USD

3.5   Advantages and Limitations of Ultrasonic Machining

3.6   Characteristics of USD process

Chapter-IV---Abrasive Jet Machining (AJM)

a.   Process Description

b.   Tool material and Abrasive Particles used in AJM

c.   Mixing ratio, Importance of maintaining an optimum mixing ratio in an abrasive Machining

Process

d.   Applications of AJM

e.   Advantages and limitations of AJM

Chapter –V   Chemical Machining(Chemical Milling)(CHM)

5.0 Basic Techniques of   CHM

Non selective metal removal

Selective Metal removal

5.1 Steps involved in Chemical Milling

5.2   Mechanism of metal removal

5.3 Applications

5.4 Advantages and limitations of CHM

Chapter –VI-- Electro Chemical Machining (ECM)

6.0   Principle of ECM

6.1   ECM process Details

6.2   Chemical reaction in ECM

6.3   Applications

6.4   Advantages and limitations of ECM

6.5   Comparison between EDM and ECM

Chapter VII----Electro Chemical Grinding(ECG)

a.   Description of the ECG process

b.   Electrolyte used in ECG process

c.   Metal Removed rate in ECG process

d.   Important points to be observed during the ECG process for successful results

e.   Advantages over conventional grinding

f.   Types of grinding wheels used in ECG

g.   Applications of ECG

h.   Advantages and Disadvantages of ECM

Chapter VIII-------Plasma Arc Machining(PAM)

8.0   Introduction

8.1 Description of the process

8.2 Mechanism obf metal removal

8,3 Types of PAM

8.5 Application of the process

8.6 Advantages and limitation of the process.

8.7 Characteristics of PAM

8.8   TIGwelding Comparison between Plasma Arc Welding and TIG welding

Chapter (IX)   Laser Beam Machining(LBM)

9.0   Introduction

9.1   Lasering Process

9.2   Description of the Process

9.3   Applicationof the process

9.4   Advantages and Disadvantages of the Process

Chapter X_____(Electron Beam Machining(EBM)

10.0   Introduction of the process

10.1   Description of the process

10.2   Need for high vacuum in EBM

10.3   Applications of the EBM

10.4   Advantages and Disadvantages of EBM

10.5 Electron Beam Welding

10.6   Application of the EBM in Nuclear and Atomic Energy, Industries Aerospace industries and electronic industries

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5: Course Title: PROJECT, SEMINAR AND GENERAL VIVA

1. **Course Code for Project & Seminar: Ip-611 and for General Viva (GV):Ip-612**
2. **Semester: 6TH.**

Rationale:

The practical training cum project work is intended to place the students for project oriented practical training in actual work situations for the stipulated period with a view to :

i) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the course of study.

ii) Develop understanding of subject based knowledge given in the class room in the context of its application at work places.

iii) Develop first hand experience and confidence amongst the students to enable them to use and apply polytechnic based knowledge and skills to solve practical problems in the world of work.

iv) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

Teaching Scheme (Contact Hours/Week) : for Project & Seminar: Ip-611

Lecture	Tutorial	Practical	Total
-	1	6	7

Examination Scheme:

Evaluation Scheme								
Theory					Practical			Total	Credit
	Sessional(SS)			Pass	Practical	Practical	Pass	Marks	
			Total	(ESE+SS)	Test(PT)	Assessment(PA)	(PT+PA)	(Theory+	
ESE	TA	HA	(TA+HA)					Practical)	
					100	50	50/150	150	3

1. **Teaching Scheme (Contact Hours/Week) : for General Viva (GV):Ip-612**

Lecture	Tutorial	Practical	Total
	2	-	2

Examination Scheme:

Evaluation Scheme								
Theory					**Practical**			**Total Marks**	**Credit**
	Sessional(SS)			**Pass (ESE+SS)**	**Practical Test(PT)**	**Practical Assessment(PA)**	**Pass (PT+PA)**	**Marks (Theory+ Practical)**	
ESE	**TA**	**HA**	**Total (TA+HA)**						
					50	-	17/50	50	2

Skills to be developed:

Intellectual skills

Develop the related machine components and mechanism

Convert innovative idea into reality

Understand and interpret drawings and mechanisms

Select the viable, feasible and optimum alternative from different

Alternatives

Motor skills

Use of skills learnt in workshop practical

Assemble parts or components to form machine or mechanism

Classify and analyse the information collected

Implement the solution of problem effectively.

Effort should be made to identify actual field problems as project work for the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them. The chosen activities should be such which are of curricular interest to students and of professional value to industrial /field organizations.

Part-A – Project

A batch of maximum 4 students will select a problem and then plan, organize & execute the project work of solving the problem in a specified duration. Industrial engineering based projects- projects based on work study, method study, method improvements leading to productivity improvement, data collection, data analysis and interpretation be undertaken.

Maintenance based projects, literature survey based projects, investigative projects environmental management system projects etc.can be undertaken.

Reports should be of minimum 40 pages.

Part-B- Seminar

Every student will prepare and deliver the seminar. Seminar report should be 10-20 pages. Seminar can be on project selected by batch.

PART-C- Every students will appear for the General viva conducted by the respective faculties.

6: Course Title: PROFESSIONAL PRACTICE- IV

1. **Course Code: Ip-610**
2. **Semester: 6TH.**

Rationale:

In order to develop general confidence, ability to communicate and attitude in addition to basic technological concepts through industrial visits, expert lectures, seminars on technical topics and group discussion.

Objectives:

Students will be able to:

1. Acquire information from different sources
2. Prepare notes for given topic
3. Present given topic in a seminar
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Skills to be developed:

    # Intellectual Skills

        4. Report writing

        5. Collection of information and data

        6. Analysis of data

    # Motor Skills

        3. Interpersonal skill

        4. Presentation skill, use of multimedia

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
1	-	2	3

Examination Scheme:

Evaluation Scheme									Credit
Theory					Practical			Total	
	Sessional(SS)			Pass	Practical	Practical	Pass	**Marks**	
			Total	(ESE+SS)	Test(PT)	Assessment(PA)	(PT+PA)	(Theory+	
ESE	TA	HA	(TA+HA)					Practical)	
					25	25	17/50	50	2

Sl. No.	Activities
01.	Industry visit (Two in numbers) Structured industrial visits be arranged and report of the same should be submitted by the individual students, to form a part of the team work.
02	Lectures by industrial experts/ professionals. (Four lectures of two hours duration) Student shall submit the report of each lecture.
03	Seminar by individual students on selected topics.

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7: Course Title: THERMAL ENGINEERING AND HEAT TRANSFER (ELECTIVE)

1. Course Code: Ip-606

2. Semester: 6TH.

Rationale:

A diploma student in industrial production Engg. is supposed to maintain steam generators, turbines and other power plant equipments due to that they should know the basics of heat transfer and its applications.

Course pre-requisite:

The students should have

1. Knowledge of general physics, thermodynamics
2. Ability to choose appropriate thermal system
3. Knowledge of energy flow

Objectives:

The students will be able to :

1. Understand construction and working of boilers and turbines
2. Describe the construction and functions of steam condensers
3. Know the elements and functions of nuclear power plant.
4. Understand diesel and gas power plant functions
5. Understand basics of heat transfer and its applications.

Course Outcome:

CO1   Explain the different elements of a Steam power plant.

CO2   Classify the different steam generating units.

CO3   Describe the constructional features and their functions of steam generators.

CO4   Differentiate the different types of boilers.

CO5   Identify the different mountings and accessories.

CO6 Explain steam prime movers with their classifications

CO7 Describe the construction and functions of steam condensers.

CO8 Describe the working principle and classification of air compressor

CO9 Suggest different elements needed for a nuclear Power plant.

CO10 Differentiate diesel engine and gas turbine power plant functions.

CO11 Apply different laws in solving problems under different conditions in heat transfer.

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
3	-	3	6

Examination Scheme:

Evaluation Scheme								Total	Credit
Theory					**Practical**			**Total**	
	Sessional(SS)			**Pass**	**Practical**	**Practical**	**Pass**	**Marks**	
			Total	**(ESE+SS)**	**Test(PT)**	**Assessment(PA)**	**(PT+PA)**	**(Theory+**	
ESE	**TA**	**HA**	**(TA+HA)**					**Practical)**	
70	10	20	30	33/100	25	25	17/50	150	5

Detailed course content:

Chapter No.	Chapter Title	Content	Duration (in hours)
1.	Steam generating unit (Boilers)	Elements of steam power plant. Concept of steam generating unit. Classifications, major components and their functions, types of superheater, superheat control methods, Feed water heating, Types of feed water heaters, Air preheater, purpose and types. Furnaces and draft systems Modern high pressure boiler & its characteristics.	(7hrs)
2.	Steam prime movers	Steam turbine –advantages as a prime movers, principle elements of steam turbine, classifications.	(5hrs)

3.	Steam condensing equipment	Functions of condenser, classification, surface condenser components and their functions. Requirement of a good condensing system, Cooling towers- purpose and types. Uses of compressed air,	(4hrs)
4..	Air compressor	Working principle and classification, Definition of terms associated with air compressor, single , two stage and multi stage compressor. Elements of nuclear power plant, nuclear reactor, fuels, moderators, coolants, control, classification of	(4hrs)
5,	Nuclear Power Plant	nuclear power station, comparison of nuclear power station with a steam power station. Health hazards, safety precautions. Advantages and disadvantages of diesel engine. Plant layout, Essential elements of diesel power plant.	(6hrs)
6.	Diesel Engine Power Plant	Fuel injection system, performance testing of diesel engine power plant. Brayton cycle- schematic diagram, thermal efficiency, advantages of gas turbine over diesel engines,	(4hrs)
7.	Gas Turbine Power Plant	classification of gas turbines, important parts and their functions, fuel for gas turbines, methods of improving thermal efficiency, advantages and disadvantages.	
8.	Basics of heat transfer	Explanation of three basic modes of heat transfer (conduction, convection and radiation) Fourier's Law of heat conduction, thermal conductivity and concept of thermal resistance. Heat transfer through plane homogeneous wall, heat transfer through composite wall, heat transfer through	

| | | hollow cylinder, heat transfer through combined conduction and convection (simple numericals) Stefan-Boltzman Law of heat radiation with explanation of terms with units(no numericals) Definition and inter relation of absorptivity, reflectivity and transmissivity. Concept of black body and gray body. Principles of heat exchanger, construction, working principle and applications. | (8hrs)   (12hrs) |

NOTE: Seminar and 3 Class Tests are to be conducted at subsequent intervals. (6hrs)

Total Contact hours- 56

	DETAILED TABLE OF SPECIFICATIONS FOR THERMAL ENGINEERING AND HEAT TRANSFER															
Sl. No.	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Steam generating unit	2	2		4	2	1	1		4		1		1	2
2	Steam prime movers	2	1		3	1	1	1		3		1			1
3	Steam condensing Equipment		1		1	2				2		1	1		2
4	Air compressor	2	1		3	1		1		2		1			1
5	Nuclear Power plant	2	1		3	2	1			3	1	1			2
6	Diesel Engine Power plant	1	2		3	1	1			2	1				1
7	Gas turbine Power plant	3	2		5	2	1	1		4		1		1	2
8	Basics of heat transfer	3	3		6	3	2	2	1	8	1	1	1		3

Sl. No.	TOPIC	Time allotted in Hrs.	%-age Weightage	K	C	A	HA
	TABLE OF SPECIFICATION FOR THERMAL ENGG AND HEAT TRANSFER						
1	Steam generating unit	7	14	4	4	1	1
2	Steam prime movers	5	10	3	3	1	
3	Steam condensing Equipment	4	8	2	2	1	
4	Air compressor	4	8	3	2	1	
5	Nuclear Power plant	6	12	5	3		
6	Diesel Engine Power plant	4	8	3	3		
7	Gas turbine Power plant	8	16	5	4	1	1
8	Basics of heat transfer	12	24	7	6	3	1
	Total	50	100				

Learning Resources:

Books:

Sl No.	Author	Name of Book	Publisher
1.	V.M. Domkundwar	A course in thermal engg.	Dhanpat Rai &Co
2.	P.L. Ballaney	A course in thermal engg.	Khanna Publishers
3.	P.K.Nag	Engg. Thermodynamics	Tata McGraw Hill
4.	A.R.Basu	Thermal Engg.(heat Power)	Dhanpat Rai &Co
5.	J.P,Holman	Heat transfer	Tata McGraw Hill
6.	Vijay Gupta	Elements of heat and mass transfer	New age international

PRACTICAL

Skills to be developed:

Intellectual skills

Understand the working of boilers and other power generation systems

Compare diesel, gas and nuclear power plants

Understand working of steam condenser and compressor

Motor skills

Observe and draw boiler mountings

Start reciprocating air compressor and to take readings

Study and compare heat exchanges

Conduct trial on the setup for calculation of thermal conductivity of

Metal rod

<u>List of Practicals</u>

1. Study of different types of power plants and their subsystems with the help of available charts, models and actual units in the institution.
2. Performance testing of different systems and subsystems available in the institu tion.
3. visit to power stations and study the different subsystems.
4. Calculation of thermal conductivity of a solid metal rod.
5. Verification of Stefan-Boltzman's law.
6. study and compare various heat exchangers such as radiators, condensers, evaporators, plate type heat exchangers.

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8. Course Title: WELDING & FOUNDRY TECHNOLOGY (ELECTIVE)

1. Course Code: Ip-607

2. Semester: 6TH.

Rationale:

The student should understand the scope, objective and application of welding and foundry technology.

Course pre-requisits:

The students should have

1. Basic knowledge of materials and its properties
2. Basic knowledge of manufacturing processes
3. Basic knowledge of joining
4. basic knowledge of casting

Objectives:

Student will be able to understand

1. The advantages and disadvantages of different classes of manufacturing processes.
2. different welding process
3. choose the proper process for different joining cases
4. the different casting process
5. the process of pattern and mold making
6. Choose the best casting process for a specific product.

Course Outcome:

CO1 Classify different welding processes.

CO2 Differentiate various welding procedures.

CO3 Suggest suitable welding methods to be adopted for a specific job.

CO4 Explain the merits and demerits of different welding processes

CO5 Suggest suitable measures to be taken for defect free welding

CO6 Describe the different features involved in pattern and mold making.

CO7 Explain the melting and pouring practices with precautions involved in casting.

CO8 Inspect the casting defacts with suitable techniques.

CO9 Describe the different die casting processes.

Teaching Scheme (Contact Hours/Week) :

Lecture	Tutorial	Practical	Total
3	-	3	6

Examination Scheme:

Evaluation Scheme								
Theory					**Practical**			**Total**	**Credit**
	Sessional(SS)			**Pass**	**Practical**	**Practical**	**Pass**	**Marks**	
			Total	**(ESE+SS)**	**Test(PT)**	**Assessment(PA)**	**(PT+PA)**	**(Theory+**	
ESE	**TA**	**HA**	**(TA+HA)**					**Practical)**	
70	10	20	30	33/100	25	25	17/50	150	5

Detailed course content:

Chapter No.	Chapter Title	Content	Duration (in hours)
1.	Introduction of welding process	Classification of welding processes, Advantages and disadvantages of welding processes. Arc welding processes-Carbon arc, submerged arc, Tungsten inert gas(TIG), Metal inert gas(MIG), plasma arc, stud welding and related arc welding processes-Theory, comparison on merits, limitations and applications, Fluxes used in arc welding. Gas welding-Processes and equipments used, types of flames, gas cutting, merits, demerits and applications.	(8hrs)

2.	Resistance welding	Resistance welding- spot, seam, projection, butt, percussion welding, tube welding, electric resistance welding process, its merits demerits and applications. Solid state welding- pressure, diffusion, ultrasonic, explosive, friction, forge, principle, equipment used, flux used, merits demerits and applications.	(9hrs)
3.	Other welding processes	Thermit welding, Laser beam welding, Electron beam welding, braze welding, welding of dissimilar metals, welding of polymers, welding of cast iron,welding of tool steel welding of aluminium and its alloys. Safe practices in welding, welding inspection, welding defacts and their classification, welding symbols.	(7hrs)
4.	Pattern and mold making	Foundry layout, foundry departments and sections, pattern and pattern making, allowances for pattern, colour code for pattern, storage of patterns. Moulding sands and core sands, sand control test, core and core making- introduction, core making procedure, type of cores, core print, core boxes, mould and mould making- moulding methods, moulding processes, gating systems.	(9hrs)
5.	Melting and pouring practices	Melting furnaces and their selections, Cupola and its operation, advantages and limitations and applications, Induction melting furnaces, advantages limitations and applications, pouring practice and equipments, ladle technology, solidification of castings, strike out, fettling, cleaning and surface preparation of castings, inspection and testing of castings, defects in castings.	(7hrs)

6.	Die casting process	Pressure and gravity die casting, shell mould castings, investment castings, continuous casting, centrifugal casting. Applications, merits and limitations of all. Ferrous and nonferrous castings. Use of robots in foundry.	(10hrs)

NOTE: Seminar and 3 Class Tests are to be conducted at subsequent intervals. (6hrs)

Total Contact hours- 56

DETAILED TABLE OF SPECIFICATIONS FOR WELDING AND FUNDRY TECHNOLOGY

Sl. No.	Topic	OBJECTIVE TYPE				SHORT ANSWER TYPE					ESSAY TYPE				
		K	C	A	T	K	C	A	HA	T	K	C	A	HA	T
1	Introduction of Welding process	3	2	1	6	2	1			3	1	1			2
2	Resistance welding	2	3		5	3	1	1		5	2	1			3
3	Other welding processes	4			4	2	2			4		2			2
4	Pattern and mold making	2	2	1	5	3	2			5	2	1			3
5	Melting and pouring practices	3	2		5	2	2			4	1				1
6	Die casting process	3	2		5	3	3			6	2	1			3

Sl. No.	TOPIC	Time allotted in Hrs.	%-age Weightage	K	C	A	HA
	TABLE OF SPECIFICATION FOR WELDING AND FUNDRY TECHNOLOGY						
1	Introduction of Welding process	8	16	6	4	1	
2	Resistance welding	9	18	7	5	1	
3	Other welding processes	7	14	6	4		
4	Pattern and mold making	9	18	7	5	1	
5	Melting and pouring practices	7	14	6	4		
6	Die casting process	10	20	8	6		
	Total	50	100				

Learning Resources:

Books:

Sl No.	Author	Name of Book	Publisher
1.	O.P.Khanna	A text book of welding Technology	Dhanpat Rai &sons
2.	O.P.Khanna	A text book of foundry Technology	Dhanpat Rai &sons
3.	Md Ibrahim Khan	Welding science & technology	New age international
4.	P.L.Jain	Principles of foundry technology	Tata McGraw Hill

PRACTICALS

Skills to be developed:

Intellectual skills

Understand the welding and foundry processes

Adopt recommended safety procedures

Identify different equipments used

Understand the various methods of welding joints

Motor skills

Use welding equipments

Perform welding jobs for various joints

Inspect after joining

Perform moulding operation

List of Practicals

1. Study of different types of welding equipments available in the institute
2. Make a field visit where welding are done and prepare reports on it.
3. Moulding and core sand testing (clay content test, moisture content test.
4. Fillet welding of T-joint of two MS plate.
5. Arc welding of single V butt joint of two MS plate.

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