AISECT UNIVERSITY

A STATUTORY UNIVERSITY UNDER SECTION 2(f) OF THE UGC ACT

SCHEME OF EXAMINATION
&
DETAILED SYLLABUS

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COURSE STRUCTURE OF DIPLOMA IN MECHANICAL ENGINEERING

SEMESTER – I, SET A+B Course [ME, CE]			Theory		Assignment		
Subject Code	**Subject Name**	**Total Marks**	**Max Marks**	**Min Marks**	**Max Marks**	**Min Marks**	**Aggregate Pass Marks**
DE-101	Applied Mechanics	100	70	22	30	12	34
DE-102	Environmental Engg. & Safety	100	70	22	30	12	34
DE-103	Introduction to Computers	100	70	22	30	12	34
DE-104	Engg. Drawing	100	70	22	30	12	34
DE-106	Professional Activity	GRADE TO BE AWARDED					
Practical Group			**Term End**		**Lab Work**		
DE-101	Applied Mechanics	50	30	12	20	8	20
DE-102	Environmental Engg. & Safety	50	30	12	20	8	20
DE-103	Introduction to Computers	50	30	12	20	8	20
DE-105	Workshop Practice	50	30	12	20	8	20

SEMESTER – II			Theory		Assignment		
Subject Code	**Subject Name**	**Total Marks**	**Max Marks**	**Min Marks**	**Max Marks**	**Min Marks**	**Aggregate Pass Marks**
DE-201	Communication Skills	100	70	22	30	12	34
DE-202	Physics	100	70	22	30	12	34
DE-203	Chemistry	100	70	22	30	12	34
DE-204	Mathematics	100	70	22	30	12	34
DE-205	Professional Activity	GRADE TO BE AWARDED					
Practical Group			**Term End**		**Lab Work**		
DE-202	Engg. Physics	50	30	12	20	8	20
DE-203	Chemistry	50	30	12	20	8	20

SEMESTER – III			Theory		Assignment		
Subject Code	**Subject Name**	**Total Marks**	**Max Marks**	**Min Marks**	**Max Marks**	**Min Marks**	**Aggregate Pass Marks**
DME 301	Material Technology	100	70	22	30	12	34
DME 302	Manufacturing Processes	100	70	22	30	12	34
DME 303	Basic Electrical & Electronics	100	70	22	30	12	34
DME 304	Mechanical Drafting & Auto CAD	100	70	22	30	12	34
DME 305	Strength of Material	100	70	22	30	12	34
DME 306	Professional Activities	GRADE TO BE AWARDED					
Practical Group			**Term End**		**Lab Work**		
DME 301	Material Technology	50	30	12	20	8	20
DME 302	Manufacturing Processes	50	30	12	20	8	20
DME 303	Basic Electrical & Electronics	50	30	12	20	8	20
DME 305	Strength of Material	50	30	12	20	8	20

SEMESTER – IV			Theory		Assignment		
Subject Code	**Subject Name**	**Total Marks**	**Max Marks**	**Min Marks**	**Max Marks**	**Min Marks**	**Aggregate Pass Marks**
DME 401	**Fluid Mechanics & Hydraulic Machines**	100	70	22	30	12	34
DME 402	Thermal Engineering	100	70	22	30	12	34
DME 403	Theory of Machines	100	70	22	30	12	34
DME 404	Industrial Management	100	70	22	30	12	34
DME 405	Entrepreneurship	100	70	22	30	12	34
DME 406	Professional Activities	GRADE TO BE AWARDED					
Practical Group			**Term End**		**Lab Work**		
DME 401	**Fluid Mechanics & Hydraulic Machines**	50	30	12	20	8	20
DME 402	Thermal Engineering	50	30	12	20	8	20
DME 403	Theory of Machines	50	30	12	20	8	20

SEMESTER – V			Theory		Assignment		
Subject Code	**Subject Name**	**Total Marks**	**Max Marks**	**Min Marks**	**Max Marks**	**Min Marks**	**Aggregate Pass Marks**
DME 501	Process Planning, Estimating & costing	100	70	22	30	12	34
DME 502	Machine Tool Technology	100	70	22	30	12	34
DME 503	Engineering Measurements and Maintenance Practices	100	70	22	30	12	34
DME 504	Modern Practices in Manufacturing and Management	100	70	22	30	12	34
DME 505	Industrial Engineering	100	70	22	30	12	34
DME 506	Professional Activities	GRADE TO BE AWARDED					
Practical Group			**Term End**		**Lab Work**		
DME 502	Machine Tool Technology	50	30	12	20	8	20
DME 503	Engineering Measurements and Maintenance Practices	50	30	12	20	8	20
DME 504	Modern Practices in Manufacturing and Management	50	30	12	20	8	20
DME 505	Industrial Engineering	50	30	12	20	8	20

SEMESTER – VI			Theory		Assignment		
Subject Code	**Subject Name**	**Total Marks**	**Max Marks**	**Min Marks**	**Max Marks**	**Min Marks**	**Aggregate Pass Marks**
DME 601	Design of Machine Elements	100	70	22	30	12	34
DME 602	Option (any one) • Automobile Engineering • CAD/CAM	100	70	22	30	12	34
DME 603	Option (any one) • Refrigeration and Air Conditioning • Power Plant Engineering	100	70	22	30	12	34
DME 604	Project	100	70	22	30	12	34
DME 605	Professional Activity	100	70	22	30	12	34
Practical Group			**Term End**		**Lab Work**		
DME 602	Option (any one) • Automobile Engineering • CAD/CAM	50	30	12	20	8	20
DME 603	Option (any one) • Refrigeration and Air Conditioning • Power Plant Engineering	50	30	12	20	8	20
DME 604	Project	50	30	12	20	8	20

SEMESTER-I
DE-101 APPLIED MECHANICS

RATIONALE:

In the wider sense "Applied Mechanics" may be defined as a science which deals with the problems related to objects in motion or in equilibrium.

Depending on the discipline of the technicians the depth of knowledge and extent of areas of mechanics will vary.

Only those topics which form common requirement of the different courses and those to, a depth required by all have been included in this subject. Further study of this subject in respect of topic/ depth is left out and could be integrated with their use in subjects like theory of structure, strength of materials, theory of mechanics and basic machine design.

COURSE CONTENT:

1. COMPOSITION AND RESOLUTION OF FORCES

1.1 Definition, Effect, characteristics of force.

1.2 System of Forces.

1.3 Principle of Transmissibility of Forces.

1.4 Concept of Resultant Force.

1.5 Law of-

- Parallelogram of Forces
- Triangle of Forces
- Polygon of Forces

1.6 Determination of Resultant of two or more concurrent forces (analytically and graphically).

2. PARALLEL FORCES AND COUPLES

2.1 Classification of Parallel Forces.

2.2 Methods of finding resultant Force of parallel forces- analytically & graphically.

2.3 Position of resultant force of parallel forces.

2.4 Definition, Classification and characteristics of a force Couple, moment of couple.

3. MOMENTS AND THEIR APPLICATIONS

3.1 Definition, Types and law of moment.

3.2 Varignon's Principle of moment and its applications.

3.3 Lever and its Applications.

3.4 Types of supports and determination of support reactions of a simply supported beam subjected to point load and uniformly distributed load (UDL).

4. EQUILIBRIUM OF FORCES

4.1 Equilibrium of a system of concurrent forces.

4.2 Conditions and types of Equilibrium.

4.3 Lami's Theorem and its applications.

5. CENTRE OF GRAVITY

5.1 Difference between Centroid and Center of Gravity (CG).

5.2 Centroid of standard plane figures and CG of simple solid bodies.

5.3 Method of finding out Centroid of composite plane laminas and cut sections.

5.4 Method of finding out CG of Composite solid bodies.

6. FRICTION

6.1 Concept and types of friction.

6.2 Limiting Friction, coefficient of friction, angle of friction, angle of repose.

6.3 Laws of friction (Static and Kinetic).

6.4 .Analysis of equilibrium of Bodies resting on Horizontal and inclined Plane.

6.5 Utility / Nuisance value of friction.

7 SIMPLE LIFTING MECHINES

7.1 Concept of lifting Machines.

7.2 Definition of Mechanical Advantage, Velocity Ratio and Efficiency of Machines and their relation.

7.3 Reversibility of Machines and condition for self locking machine.

7.4 Law of Machines, Maximum mechanical advantage and maximum efficiency of machine.

7.5 Friction in machine (In terms of Load and effort).

7.6 Calculation of M. A, V.R. and efficiency of following machines

- Simple wheel and axle
- Differential wheel and axle
- Single purchase crab
- Double purchase crab
- Simple screw jack
- Different System of simple pulley blocks

8 MOTION OF A PARTICLE

8.1 Definition of speed, velocity, acceleration, uniform velocity, uniform acceleration and variable acceleration.

8.2 Motion under constant acceleration/ retardation (equations of motion).

8.3 Motion under force of gravity.

8.4 Concept of relative velocity.

8.5 Definition of projectile, velocity of projection , angle of projection, time of light, maximum height, horizontal range and their determination.

8.6 Definition of angular velocity, angular acceleration and angular displacement.

8.7 Relation between linear and angular velocity of a particle moving in a circular path.

8.8 Motion of rotation under constant angular acceleration.

9 LAWS OF MOTION

9.1 Newton's Laws of motion and their applications.

10 WORK, POWER AND ENERGY

10.1 Definition unit and graphical representation of work.

10.2 Definition and unit of power and types of engine power and efficiency of an engine.

10.3 Definition and concept of Impulse.

10.4 Definition, unit and types of energies.

10.5 Total energy of a body falling under gravity.

LIST OF EXPERIMENTS:

1. Verification of laws of parallelogram of forces.
2. Verification of laws of polygon of forces
3. Verification of laws of moments
4. Determination of forces in the members of Jib Crane
5. Determination of Centroid of plane lemina by graphical method
6. Determination of coefficient of friction for surfaces of different materials on horizontal plane
7. Determination of coefficient of friction for surfaces of different materials on an inclined plane
8. Determination of mechanical advantage, velocity ration and efficiency of the following lifting machines
   - Simple wheel and axle
   - Differential wheel axle
   - Single purchase crab
   - Double purchase crab
   - Simple pulley block
   - Simple screw jack
9. Measurement of B.H.P. of an engine using roap break dynamometer

REFERENCE BOOKS:

1. A text book of Applied Mechanics - R.S. Khurmi, S.C. Chand & Co. , New Delhi
2. Applied Mechanics - I.B. Prasad, Khanna Publishers, New Delhi

3. Applied Mechanics (Hindi) - R.S. Jog, Anand Publishers, Gwalior
4. Applied Mechanics (Hindi) - A.R. Page, Deepak Prakashan, Gwalior

DE-102 ENVIORNMENTAL ENGINEERING & SAFETY

RATIONALE:

Engineers and scientists from a number of related disciplines have been involved over years in the development of an academic basis for understanding and management of the environment. The purpose of keeping the Environment Engineering & Safety is to introduce a unique approach to the overall concept of environmental engineering an approach that emphasizes the relationship between the principles observed in natural purification processes and those employed in engineered processes.

COURCE CONTENTS:

1. INTRODUCTION TO ENVIRONMENT

1.1 THE BIOSPHERE, biotic and abiotic

1.2 An aquatic ecosystem

1.3 Types of pollution

1.4 Impact of hum a being on environment.

1.5 Impact of environment on human being

1.6 Basic approach to improve environmental qualities

1.7 Roll of an environmental engineer

2. AIR POLLUTION SOURCES AND EFFECTS

2.1 Standard definition of air pollution

2.2 Composition of natural air

2.3 Names of air pollutants

2.4 Classification of air pollutants, primary and secondary pollutants

2.5 Classification of source of air pollutants on different bases

2.6 Definition of different types of aerosols.

2.7 Effect of air pollution on: human health, material properties, vegetation.

2.8 Major toxic metals and their effects

2.9 Major environmental phenomenon e.g., acid rain, global warming, green house effect, ozone layer depletion.

2.10 Air quality standards

2.11 Brief description of air pollution laws.

3. METEOROLOGICAL ASPECTS OF AIR POLLUTANT DISPERSION

3.1 Meteorological parameters influencing air pollution

3.2 Environmental laps rate, temperature inversion, atmospheric stability and adiabatic loss rate.

3.3 Turbulence, topographical effects,

3.4 Plume behavior, looping, coning, fanning fumigation, lofting , trapping.

4. AIR POLLUTION CONTROL METHODS AND EQUIPMENTS

4.1 Natural purification processes of air

4.2 Artificial purification methods of air

4.3 Brief description of following control equipments along with sketch e.g, gravitation settling chamber, cyclone, scrubber, bag house filter, electrostatic precipitator.

4.4 Brief description of following processes for the control of gaseous pollutants e. g., absorption, adsorption, condensation, combustion etc.

5. WATER POLLUTION SOURCES AND CLASSIFICATION

5.1 Water resources

5.2 Uses of water

5.3 Classification of water

5.4 Origin, composition and characteristics of domestic waste water as well as industrial waste water

5.5 Biochemical oxygen demand

5.6 Water pollution laws and standards

5.7 Uses of waste water

5.8 Classification of waste water

5.9 Chemical oxygen demand

6. WASTE WATER TREATMENT METHOD

6.1 basic processes of water treatment

6.2 Meaning of primary, secondary and tertiary treatment

6.3 Flow chart of a simple effluent treatment plant

6.4 Theory of industrial waste treatment

6.5 Volume reduction, neutralization and proportioning

7. SOLID WASTE MANAGEMENT

7.1 Sources and classification of solid waste

7.2 Public health aspects

7.3 Disposal methods - open dumping, sanitary, land fill

7.4 Incineration, compositing

7.5 Potential methods of disposal

7.6 Recovery and recycling of paper, glass, metal and plastic

8. NOISE POLLUTION AND CONTROL

8.1 Sources of noise pollution

8.2 Units of Noise pollution measurement

8.3 Allowable limits for different areas

8.4 Problems of noise pollution and measures to control it

8.5 Noise pollution control devices brief discussion

9. SAFETY PRACTICES

9.1 Responsibility of employees and employers regarding health and safety

9.2 Fire hazards prevention and precautions

9.3 Industrial hazards prevention and protection

9.4 Protection from air and noise pollution

LIST OF PRACTICALS:

1. GROUP A AIR POLLUTION

(any one experiment may be selected from this group)

1. Air monitoring and determination of SPM, CO, Nox, S02 with high volume sampler.
2. Monitoring of stack gases and determination of SPM, CO, Nox, S02 with slack monitoring kit.
3. Determination of CO,HC, in exhaust gases from petrol vehicle

2. GROUP B NOISE POLLUTION

1. Determination of sound pollution in (a) Auditorium (b) Factories (c) Busy roads (d) Theatre (e) TV rooms (select any three situations)

3. GROUP C INDUSTRIAL WASTE WATER (ANY TWO EXPERIMENT MAY BE SELECTED FROM THIS GROUP)

1. Determination of BOD/COD ratio in industrial waste water.
2. Determination of Ph and alkanity/ acidity in industrial waste water.
3. Determination of solids in industrial waste water.
4. Determination of turbidity, colour, and temperature of industrial waste water.

4. GROUP D POLLUTION STANDARDS (ANY TWO EXPERIMENT MAY BE SELECTED FROM THIS GROUP)

1. Study of drinking water standards.
2. Study of effluent standards for water disposal.
3. Study of air pollution standards.

REFERENCE BOOKS:

1. Environmental pollution control Engineering by C. S. Rao
2. Air pollution and control by Seth
3. Air pollution byM.NRao
4. Industrial waste and its treatment by Seth
5. Paryavaran Yantriki Hindi granth akadami

DE-103 INTRODUCTION TO COMPUTERS

RATIONALE:

This subject is design to make students aware of basic concepts of computers including operating systems. Studying this subject will make students acquainted with word processing, spread sheet and data base concepts and working. This subject also introduces computer communication and networks, including internet & E-mail. The basic objective is to make students excel with good knowledge about computers.

COURSE CONTENT:

1. INTRODUCTION TO COMPUTERS

1.1 Basic Concepts, Generations of Computers, Overview of computer Systems, Classifications of Computers, Characteristics of Computes, Applications of Computers.

1.2 Numbers System & Codes, Decimal, Binary, Octal, Hexadecimal, Conversions from one system to other, Binary Coded, Decimal & ASCII Code.

1.3 Computer Hardware

Input Devices

Keyboard, Mouse, Trackball, Joystick, Scanner, OMR OCR Bar-Code Reader, MICR, Digitizer, Card Reader, Voice Recognition, Web Cam, Video Cameras, Etc.

Output Devices

Monitors, Printers : Dot matrix, Inkjet & Laser, Plotters, Commuter, Output Micro Film (COM), Multimedia Projector, Speech Synthesizer, Dumb, Smart & Intelligent Terminal.

Storage Devices

Primary and Secondary Storage, Characteristics and Limitation, Floppy, Hard disk, CD ROM DVD, Disk Cartridge.

Microprocessor

Registers, Arithmetic Unit, Control Unit, Buses, Instruction Set, Processor Speed.

Memory Concepts

Concept of Memory, Unit of Memory, Types of Memory, RAM, ROM, PROM,

EPROM, EEPROM, Cache Memory.

1.4 **Computer Software**

Computer Software System Software V/s Application Software Operating

System Programs Language Processor, Assembler, Compiler & Interpreter.

Application Software

Types of Application Software and their examples. High Level Language,

Low Level Language, Assembly Language.

1.5 **Multimedia**

Basics of Multimedia Components- Tex, Graphics, Animation, Audio, Images & Video. Multimedia Applications.

2. **OPERATING SYSTEM**

2.1 Overview of DOS

- Internal Commands
- External Commands

2.2 Windows Operating System

Overview of different versions of Windows,

Characteristics and Facilities of Windows,

Terminologies of Windows - Desktop, Icon, Menu etc.

Components of Desktop.

Working with Files and Folders.

Windows Utilities and Accessories-Notepad, WordPad, Paintbrush, Windows Explorer, Calculator.

2.3 Introduction to Linux

An overview of Linux

Basic Linux elements System

Features Software

Features File structure

Linux H/W & S/W requirements.

3. WORD PROCESSING

- Saving, Closing, Opening of documents Selecting text Editing text Finding and replacing text\Printing documents Merge Documents Character and paragraph Formatting Page Design and layout Spell Check Creating Tables and Charts. Handling Graphics

4. SPREADSHEET PACKAGE

- Spreadsheet concept - Need, advantage, Terminology like cell, row, column etc. Working with Spreadsheet - Creating, Saving, Editing and printing Entering data - Entering number, text, date, time etc. Selecting cells - Cut, copy, paste date Editing Worksheet data Formatting - Text and Cells, Applying border shading, background patterns, conditional formats, positioning cells, formatting numbers, text, Date, time. Creating formulas- Entering, Editing, Using Functions, Controlling calculations. Working with Charts- Creating charts, Adding & changing text, changing the view and display, types of charts.

5. PRESENTATION SOFTWARE

- Introduction Presentation design tools Presentation terminologies Creating, Opening and Saving Presentation Working with different views

Creating and Organizing slides Adding and Formatting text in slides Formatting paragraphs Adding drawings and objects Creating special effects Working with table and charts Printing Presentation.

6. DATABASE

- Introduction - need, Characteristics and terminologies of database
- Types of database - relational, Hierarchical and Network
- Basic entities - Tables, records, Data types, Data Validation and constraints, keys relation between tables.
- Query - Select, Insert, Update, Delete.
- Forms - Creating forms, Forms controls Report Designer- Customize formats, grouping reports.

7. COMPUTER COMMUNICATION & NETWORKS

7.1 Information Networks

- The Technology of Workgroup Computing
- Types of network
- Network topology
- Network components

7.2 Data Communication

- Introduction to Data Communication
- Types of Data
- Transmission media

7.3 Internet and E-mail

- Internet Basics
- Websites- Applications, terminologies, naming conventions.
- Web Browsers- Types, Navigation and tools
- E-mail - concept, terminologies, mailing services
- provider, advantages comparison with Conventional mailing
- Search engine - concept, search engine websites, searching methods.

LIST OF EXPERIMENTS:

1. Study of various components of computer like CPU, keyboard, mouse, monitor, printer, CVT and storage devices. Internal and external commands of DOS.
2. Using Windows operating system, study of desktop, control panel, accessories and settings.
3. File management in windows explorer, Study of WordPad, Note Pad, Paint Brush, Calculator etc. Study of Linux operating system.
4. Study of MS-word - opening and saving of documents, formatting, editing and spell check, find and replace, printing, merging. Creating Table, Charts and

Graphics.

5. Study of Spreadsheet - creating, saving, editing and printing. Entering data, selecting cells, formatting text.
6. Applying border shades and backgrounds, creating formulas, creating charts.
7. Study of Power Point - creating, opening, editing and saving of slides. Adding and formatting text, creating animations, working with images and special effects. Printing presentation.
8. Study of MS Access- creating, saving, editing and printing of tables. Managing relationships, writing queries e.g. SELECT, UPDATE, DELETE, INSERT. Forms designing and report printing.
9. Study of Web Browser and mailing programs.

REFERENCE BOOKS:

1. S . Jaiswal, A First Course in Computers, Golgotha Publication
2. Slotnick, Butterfield, Colantonio and Kopetzky, Computers & Application, C.C. Health & Company.
3. Suresh K. Basandra, Computers Today, Galgotia Publication
4. Ron Mansfield, the Complete Guide to Microsoft Office Professional, Sybex /BPB Asian Edition
5. Norton Peter, Inside IBM PC.
6. Hardware Bible, BPB Publication.
7. Computer Hardware, Osborne Series.
8. DOS & Utilities, BPB Publication
9. Learning Windows in 24 Hours, Sam Techmedia
10. Tay Vaughan, Multimedia Making it work, Tata McGrawHill
11. Chapman, Understanding windows, BPB Publication

DE-104 ENGINEERING DRAWING

RATIONALE:

Engineering Technician irrespective of his field of operation in an industry is expected to possess a thorough understanding of drawing which includes clear spatial visualization of objects and the proficiency in reading and interpreting a wide variety of engineering drawings. Besides this he is also expected to possess a certain degree of drafting skill, depending upon his job functions in his day to day activities. This course of engineering drawing for diploma courses in Engineering branches is aimed at developing basic knowledge and skill, of engineering drawing.

COURSE CONTENT:

NOTE: ONLY FIRST ANGLE PROJECTION METHOD IS TO BE FOLLOWED

1. INTRODUCTION TO DRAWING INSTRUMENTS:

- Introduction of drawing instruments, materials and their uses
- Applications of minidrafter
- Applications of compass and divider
- Applications of French curves and spline
- Pencils grades and their uses
- Designation and sizes of drawing sheet and drawing board

2. PLANNING AND LAYOUT OF DRAWING SHEET:

- Planning of drawing sheet as per I. S.: 696-1972 (SP 46: 1988)
- This should include
- Margin.
- Title Block.
- Zoning.
- Revision panel.
- Folding marks.
- Numbering of sheet.

3. CONVENTIONAL REPRESENTATION:

Conventional representation of the following as per BIS practice

COMMON ENGINEERING MATERIALS ELECTRICAL INSTALLATIONS AND FITTINGS

Main switches, (lighting and power), socket outlets (3 pin 5AMP, 3pini5 AMP), bell, buzzer, loud speaker, Aerial, ceiling fan, exhaust fan, Bracket fan, fan regulator, battery and earth point.

ELECTRONICS COMPONENTS

Diode: Zener, varactor, Scotty, step recovery, light emitting diode (LED), PNP and NPN transistors, resistance, capacitor, Inductors (fixed and variable both), IC

(8pin and 14pin) SCR, TRIAC, DIAC, UJT, FET, MOSFET, LOGIC GATES

SANITARY FITTINGS
showerhead, wall lavatory basin, comer Lavatory basin, urinal stall, kitchen sink, Indian type WC,Water closets (Asian pan, urissapan, Anglo-Indian, European)

BUILDING
Single and double swing doors and windows.

MECHANICAL COMPONENTS
Internal and external threads, slotted head, Square end and flat, radial arms and ribs, serrated shaft, splined shaft, Chain wheel, bearing, straight and diamond knurling, Compression and tension spring, leaf spring (with and without eye), Spur and helical gear

4. LINES, LETTERING AND DIMENSIONING:

- Introduction of type of lines and their applications
- Single stroke vertical, inclined letters (capital and lowercase)
- And numerals.
- Dimensioning:
- Elements of dimensioning- dimension line, extension line, arrowhead And leader line
- Dimensioning system - Aligned and unidirectional.
- Dimensioning of Arcs and Circles.
- Angular Dimensioning.
- Dimension of counter sunk and counter bore.

5. METRICAL CONSTRUCTIONS AND ENGINEERING CURVES:

- Divide a line into any number of equal parts by parallel line method bisecting of line and angle.
- Construction of triangles and polygons Introduction of conic sections (curves)
- Construction of Ellipse by Eccentricity and Concentric circles methods Construction of Parabola by Eccentricity and Rectangle methods Construction of Hyperbola by Eccentricity method Construction of Cycloid
- Construction of Involutes of circle and polygon
- Construction of Archimedean Spiral of any number of convolutions

6. SCALES:

- Introduction of scales and their applications
- Concept of reducing, enlarging and full size scale
- Classification of scales - plain, diagonal, vernier,
- Scale of chord and comparative scales
- Definition of R.F

- Construction of plain and diagonal scales

7. ORY OF PROJECTION AND PROJECTION OF POINTS, LINES AND PLANES

- Definition of various term associated with theory of projection-
- Planes of projection, Quadrants, first & third angle projection method
- Projection of points in all the four quadrants.
- Projection of lines-
    1. Parallel to HP and VP both.
    2. Perpendicular to one plane and parallel to other.
    3. Inclined to one plane and parallel to other.
    4. Knowledge of projection of line inclined to both the planes (No practice required)
- Projection of planes -
    1. Perpendicular to HP and VP both
    2. Perpendicular to one plane and parallel to other
    3. Inclined to one plane and perpendicular to other.
    4. Knowledge of projection of plane inclined to both the planes

8. PROJECTIONS OF SOLIDS:

Projection of cylinder, cone, prism and pyramid. Under the following conditions:

1. Axis parallel to HP and VP
2. Axis perpendicular to HP and parallel to VP
3. Axis perpendicular to VP and parallel to HP
4. Axis inclined to HP and parallel to VP.
5. Axis inclined to VP and parallel to HP.
6. Axis inclined to both HP and VP

9. SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES:

Section of cone, cylinder, prism and pyramid (Solid resting on its base in the HP i.e. the Axis perpendicular to HP and parallel to VP) in the following cases:

1. Section plane parallel to HP and perpendicular to VP
2. Section plane parallel to VP and perpendicular to HP.
3. Section plane inclined to HP and perpendicular to VP.
4. Section plane inclined to VP and perpendicular to HP.

Drawing True shape of section.

Introduction to development of lateral surface of solids-

- Cone, Cylinder, Prism and Pyramids (Simple and truncated)
- Under the condition - solid resting on its base in the HP and axis

- Perpendicular to HP and parallel to VP
- Development of funnel and elbow

2. INTERSECTION OF SURFACES

- Intersection of following cases -
- Cylinder to cylinder and Prism to prism
- (With their axis intersecting and perpendicular to each other.)

3. ORTHOGRAPHIC PROJECTIONS & FREE HAND SKETCHING:

- Principles of orthographic projections
- Identification of necessary views and superfluous view
- Selection of front view
- Preparation of necessary orthographic views of simple objects
- From given pictorial views
- Dimensioning of orthographic views as per standard practice.
- Free hand sketches of simple objects (Using Pencil, Eraser & Paper only)

4. ISOMETRIC VIEWS

- Concept of isometric projection and isometric view (Isometric Drawing)
- Construction of isometric scale
- Construction of isometric view of polygon and circle
- Construction of isometric view of cone, cylinder, prism and pyramids
- Construction of isometric view of simple objects
- From given orthographic views

REFERENCE BOOKS:

1. Engineering Drawing - N.D. Bhatt
2. Engineering Drawing - R.K. Dhawan
3. Engineering Drawing - P. S.Gill
4. First Year Engineering Drawing - Ac.Parkinson
5. Sp: 46-1988 Bureau Of Indian Standard -
6. Principles Of Electronics - Malvino
7. Abhiyantrik A Are Khan - Shivdatt Upadhyay

DE-105 WORKSHOP PRACTICE

RATIONALE:

Work shop practice is the fundamental exposure to basic skill required for all students pursuing their studies in various diploma-engineering disciplines. The practice experience would help students to understand the intricacies of industrial Working in relatively shorter period of time more over the contents of this Curricula forms a basic link for higher studies of engineering programs.

The students are advised to undergo each skill experience with know-how approach giving special emphasis to know-why for the various instructions imparted to them in each shop.

COURSE CONTENT:

1. INTRODUCTION TO WORK SHOP

1.1 General Safety rules of workshop.

1.2 State the General Safety Measures to be observed in Workshop.

1.3 State the General housekeeping activities.

1.4 Prepare a list of general safety Rules to be followed in Workshop.

2. FITTING SHOP

2.1 Layout of Shop.

2.2 Sketch & Label Details of shop Layout.

2.3 Type of jobs produced in fitting shop.

2.4 Understand the functions of fitting shop.

2.5 Understand different Metals, Alloys & their Sections.

2.6 List the Commonly used Metals, Alloys.

2.7 State at least Five Sections, Shape & Size of Metals, Alloys.

2.8 Use relevant IS Code for commonly used materials with their samples of different Cross sections.

2.9 Fitting tools.

2.10 Know use of fitting tools, sketch various tools & label their parts.

2.11 Classify fitting tools as marking tools, Clamping devices, striking tools, cutting tools etc.

2.12 Know the marking out & inspection instruments such as surface plate, marking block, scriber, tri square, bevel protractor etc.

2.13 Fitting operation:

Use of Various fitting tools, inspection & measuring Instruments. To produce given jobs.

2.14

2.15 Choose correct Shape & Size of Blank for a given drawing.

2.16 Marking as per drawing using correct method, tools & sequence.

2.17 Choose correct sequence of operations for the job viz. Sawing, filing, scraping, drilling & Tapping etc.

2.18 Select appropriate Tools, inspection and measuring instruments.

2.19 Clamping the job in correct position in an appropriate clamping device.

2.20 Perform the operation with appropriate body posture, method & precision, exercising personal judgment of need of the force.

2.21 Inspect the job as and when necessary.

2.22 Introduction to screw threads.

2.23 Know common types of screw threads & the terminology used.

2.24 Sketch and label details of Metric &Whitworth thread.

3. CARPENTRY SHOP:

3.1 Carpentry shop lay out.

3.2 Sketch & Label Details of shop Layout.

3.3 Type of jobs produced in carpentry shop.

3.4 Understand the functions of carpentry shop.

3.5 Introduce type of jobs produced by carpenter.

3.6 Commonly used raw materials:

3.7 Know commonly used raw materials &their commercially available size.

3.8 Name various type of raw materials used such as Timber: - logs, planks, battens etc. Ply, Teak ply, block board, sun mica, Formica etc.

3.9 Carpentry tools: - Know various carpentry tools with their specifications and uses e.g. Different saws, chisels, gauges, scales, hammers, tri squares planners , vice etc.

3.10 Carpentry Joints:-
Introduction of various joints like T, comer, mortise & tennon joints, dovetail, pin, cross half lap joint, etc.

3.11 Choose correct shape &size of timber blank for a given job drawing.

3.12 Do marking as per drawing using correct method, tools & sequence.

3.13 Identify correct operations e.g. sawing, chiseling, planning, grooving etc.

3.14 Select appropriate Tool, inspection & measuring Instruments.

3.15 Clamping the jobs in correct position in an appropriate clamping device.

3.16 Perform the operation with appropriate body posture, method & precision, exercising personal judgment of need of the force.

3.17 Inspect for size & quality of finish as and when necessary.

3.18 Assemble the components produced.
Inspect for proper joint quality &take remedial steps.

4. BLACK SMITHY SHOP:-

4.1 Understand the function of black smithy & forging shop.

4.2 Layout of Shop.

4.3 Sketch & Label Details of shop layout.

4.4 Know the different jobs produced in smithy shop e.g. round to hexagonal shapes or vice versa J -hook, S- hook, circle, chain etc.

4.5 Commonly used raw materials: - M.S. Bars of different shapes and size.

4.6 Smithy Tools: - Know various smithy tools with their specifications e.g. different type of hammers, hot / cold chisel, flatters, tongs, leg vice, swage block, anvils, open hearth and furnaces etc.

4.7 Preparation of job (any three)

J-hook, S-hook, chain, circle, tong, chisel etc.

4.8 Safety measures: -

Know the safety regulation in black smithy shop.

5. SHEET METAL SHOP:

5.1 Layout of Shop

5.2 Sketch & Label Details of shop layout.

5.3 Know the different jobs produced in sheet metal shop e.g.

Open tray, cylinder, prism, Funnel etc.

5.4 Commonly used raw materials: -M. S. sheet (black), G.I.,

M.S.rivets, and aluminum rivet etc.

5.5 Understand foil, sheet and plate.

5.6 Tools used:-

5.7 Different snips, shears, stacks, latter punch, figure punch,

Solid punch, hollow punch, mallet, soft hammers, channel,

Square bars, std. Sheet gauge.

5.8 Type of j oints and operations: -

5.9 Introduction of various sheet metal operations &joints e.g. seaming, single seam , double seam, Grooved seam, comer joint, cap joint etc.

5.10 Preparation of job (any two): - Open tray, cylinder, prism, Funnel etc.

5.11 Choose correct shape &size of sheet for a given job drawing considering

allowances for joint or seam.

5.12 Do marking as per drawing using correct method, tools and sequence.

5.13 Identify correct operation e.g. shearing, punching, bending, debarring, folding, strengthening, stamping, riveting, etc.

5.14 Select appropriate Tool, inspection & measuring Instruments.

5.15 Holding the job in correct position.

5.16 Perform the operation with appropriate body posture, method & precision, exercising personal judgment of need of the force.

5.17 Inspect for proper joint quality and take remedial steps.

6. WELDING SHOP:

Layout of Shop

6.1 Sketch & Label Details of shop lay out.

6.2 Know the different jobs produced in Welding shop e.g.

Lap joint, single butt, double butt, corner, T joint, etc.

6.3 Tools & equipments used:-Specifications & use of various tools and equipments used in Welding shop e.g. . AC. welding transformer, Gas welding set, electrode used, chipping hammer, wire brush, shield, gloves, apron etc.

6.4 Preparation of j ob: - (any two)

Lap joint, single butt, double butt, corner, T joint, etc.

6.5 Safety measures:- Know the safety regulation in Welding shop.

7. PLASTIC MOULDING:-

Know the commonly used plastic materials i.e. Thermosetting, Thermo plastic. Sketch & label various parts of bench molding m/c.

Production of any product on bench molding m/c.

8. REVISION:-

Understand the difference in theory and practice.

Explain the importance of skills in production of quality jobs

NOTE:

1. Theoretical inputs will be provided on shop floor during workshop Practice.
2. Shop safety would include First Aid training for each shop.

REFERENCE BOOKS:

1. Production technology vol. I — RC. Patel &C.G. Gupta
2. Production technology vol. I — Dalela
3. Work shop technology vol. I — Raghuwanshi
4. Work shop technology vol. I — Chapman
5. Workshop Vol. I — P.N.Vijayvargiya (Hindi medium)

SEMESTER-II
DE-201 COMMUNICATION SKILLS

RATIONALE:

The wide range of communicative and functional need of English in the evolving global and technical professional environment has more than ever imposed a demand of acquiring proficiency in communication skills in our technicians and diploma pass outs. Besides being a professional language, it also acts as a window to technical and scientific knowledge. Diploma pass outs are required to communicate with personnel belonging to different echelons of authority. Therefore, acquiring proficiency in listening, speaking, reading and writing English is an integral part of professional and technical competence.

ENABLING OBJECTIVES:

The students, after completing the course, will be able to

- Understand slowly delivered spoken material in Indian English.
- Understand general purpose words of English.
- Use general purpose words of English to express himself in speaking reasonably clearly and correctly on routine matters.
- Write reasonably and grammatically correct English.
- Develop a habit of reading with comprehension to achieve an optimum speed of 75 WPM.
- Communicate effectively in a professional environment through speaking and writing to achieve desired objectives.

COURSE CONTENT:

1. COMMUNICATION PROCESS AND ITS NEEDS:

1.1 (i) How to make communication effective.

(ii) Barriers in communication, Removal of barriers.

1.2 Grammar and vocabulary for correct English usage.

(i) Determiners, Prepositions, Auxiliary verbs and subject- verb agreement.

(ii) Rewrite as directed (change voice, correct form of verbs/tenses).

(iii) Vocabulary - One word substitution, words often misused and wrongly spelt.

2. PASSAGES OF COMPREHENSION:

2.1 Prescribed passages (six from existing syllabus)

(i) Language of Science

(ii) Desalination or Desalting Process

(iii) Safety Practices

(iv) Non-conventional Sources of Energy

(v) Our Environment

(vi) Entrepreneurship

2.2 Writing summary, moral and characterization of any one story from the book prescribed.

3. BUSINESS COMMUNICATION

(one question with internal choice)

3.1 Principles of effective business correspondence Its parts, mechanics, styles and forms

3.2 Application for job, Bio-Data and C.V.

3.3 Letter of Enquiry

3.4 Placing order

3.5 Complaint

4. COMPOSITION & TRANSLATION

4.1 Writing paragraphs of 150 words on topics of general interest i.e. pollution, ragging in college, importance of computers, importance of communication skill, importance of science and technology etc.

4.2 Translation (Hindi to English and vice-versa)

5. UNSEEN PASSAGES & PRECIS WRITING

(i) Answer the questions based on the passage.

(ii) Give suitable title

OR

(iii) Writing Precis

REFERENCE BOOKS:

1. English Conversation Practice - Grant Taylor
2. Practical English Grammar - Thomson & Martinet
3. Communication Skills for Technical Students Book -1, Book - II by M/S Somaiya Publication, Bombay
4. Living English Structure - S. Allen
5. English Grammar, Usage, and Composition - Tickoo & Subramanian, S. Chand & Co. Standard Allen Longman.
6. Essentials of Business Communication - Dr. Rajendra Pal & J.S. Korlahalli, S.Chand & Sons, New Delhi.
7. Effective Business Communication - M.V. Rodriques, Concept Pub. Co., New Delhi.
8. Communication for Business - Shirely Taylor, Longman, England.
9. Communication for Engineers and Professors by P. Prasad, S.K.Kataria and sons publications, New Delhi
10. Technical English Book-II, Somaya Publications, New Delhi

SUGGESTED READINGS:

1. TO ENHANCE THE READING SKILLS AND GENERATE INTEREST

- A Brief History of Time: - Stephan Hawking, Bentham Books, Great Britain.
- Cosmos: - Carl Sagan, Bentham Books, Great Britain.
- Ignited Minds: - A.P.J. Abdul Kalam, Penguin Books.

- India 2020: - A.P.J. Abdul Kalam, and Y.S. Rajan Penguin Books.
- Beyond the Last Blue Mountain: - J.R.D. Tata, Penguin Books.
- Life and Times: - Albert Einstein, Bentham Books.
- Power of Oration: - Abraham Lincoln.

2. FASTER READINA FOR DERIVINA PLEASURE

- Interpreter of Maladies: - Jhumpa Lahiri.,Harper & Collins.
- Short stories by R.K.Narayan,Tagore,Tolstoy,Mulkraj Anand, O.Henry.

3. FOR VOCABULARY BUILDING.

- Word Power made Easy: - Norman Lewis, Bloomsbury.
- Reading, Spelling, Vocabulary, Pronunciation, Book 1,2 &3: - Norman Lewis.
- The Joy of Vocabulary: - Levine, Levine & Levine.
- Roget's Thesaurus of Synonyms and Antonyms.
- Cambridge English Pronouncing Dictionary: - Danial Jones .
- Audio- Visual learning resources and multimedia learning material for pronunciation improvement and listening skills.

DE-202 PHYSICS

RATIONALE:

Curriculum revision needs to be updated and revised in the light of the changes occurring in the life so that they fulfill the objectives.

1. To minimize the poor technical knowledge in thebasics of his /her discipline.
2. To improve practical skill on the basis of theoretical knowledge imported.
3. To improve the problem solving skill.

Physical science forms the foundation of engineering, the subject of physics has its importance amongst all the physical sciences, therefore, it is to be taught exclusively to the students of diploma in engineering.

COURSE CONTENT:

UNIT-I

UNITS & MEASUREMENT:

1.1 Fundamental and derived units.

1.2 Scalar and vector, Basic requirements to represent vector.

1.3 Symbols, abbreviation, and proculation.

1.4 Linear measurement by vernier calipers, screw gauge and spherometer.

1.5 Angular measurement by angular vernier.

UNIT-II

MOTION:

2.1 Motion and its type

2.2 Linear motion (laws and equation)

2.3 Circular motion

- 2.3.1 Angular velocity and relation with linear velocity
- 2.3.2 Centripetal acceleration, Centripetal and Centrifugal forces

2.4 Rotatory motion

- 2.4.1 Axis of rotation
- 2.4.2 Moment of Inertia, Radius of gyration
- 2.4.3 Kinetic energy of rotation

2.5 Numerical problems and solution on the topic

UNIT-III

MOLECULAR PHENOMENON OF SOLIDS, LIQUIDS AND GASES:

3.1 Postulates Of Molecular Kinetic Theory Of Structure of matter.

3.2 Brownian motion

3.3 Kinetic and Potential energy of molecules

3.4 Kinetic theory of gases

- 3.4.1 Postulates

3.4.2 Calculation of pressure by Kinetic theory
3.4.3 Prove of different gases law by Kinetic theory.

UNIT-IV

PROPERTIES OF MATTER:

4.1 Elasticity: Meaning, definition, stress, stain, Hook's law and elastic limit.

4.2 Surface Tension: Meaning, definition, molecular forces, cohesive and adhesive forces, surface energy, capillary rise and capillary rise method.

4.3 Viscosity: Meaning, definition, stream line and turbulent flow, critical velocity, Stock's law.

4.4 Numerical problems and solution on the topic.

UNIT-V

HEAT:

5.1 Heat and temperature, concept of heat as molecular motion

5.2 Transmission of heat, study state and variable state.

5.3 Concept of heat capacity, specific heat and latent heat.

5.4 Calorimeter and its uses

5.5 Thermodynamics

5.5.1 Relation between heat and work

5.5.2 Mechanical equivalent of heat

5.5.3 First law of thermodynamics and its application

5.5.4 Second law of thermodynamics and its application

5.5.5 Carnot cycle

5.6 Numerical problems and solution on the topic.

UNIT-VI

HEATING EFFECT OF CURRENT AND THERMOELECTRICITY:

6.1 Heating effect of electric current: Joule's law, work energy and power in electric circuit, calculation of electric energy.

6.2 Thermo electricity

6.2.1 Seeback effect and thermoelectric power.

6.2.2 Neutral temperature, temperature of inversion and relation between them

6.2.3 Thermo electric thermometer and thermo couples.

6.3 Numerical problems and solution on the topic.

UNIT-VII

SOUND:

7.1 Production of sound waves (Longitudinal and transverse waves)

7.2 Progressive and stationary waves

7.3 Basic knowledge of refraction, reflection, interference and diffraction.

7.4 Ultrasonic,

7.4.1 Audible range, Production of ultrasonic, properties and uses.

UNIT-VIII

OPTICS AND OPTICAL INSTRUMENTS:

8.1 Refraction, critical angle and total internal reflection, refraction through lenses and problems

8.2 Power of lenses

8.3 Spherical and chromatic aberrations

8.4 Simple and compound microscope, telescope and derivation for their magnifying power

8.5 Numerical problems and solution on the topic.

UNIT-IX

ELECTROSTATICS AND ELECTROMAGNETIC INDUCTION:

9.1 Coulomb's law, Electric field intensity, potential.

9.2 Capacity, principle of capacitor, types of capacitor, combination of capacitors

9.3 Electromagnetic Induction:

9.3.1 Faraday ' s law, Lenz ' s law

9.3.2 Self and mutual inductance

9.3.3 Transformer and electric motor, Induction coil

UNIT-X

MODERN PHYSICS, BASIC ELECTRONICS:

10.1 Photoelectric effect, threshold frequency, Einstein- equation, Photo electric cells

10.2 Radioactivity : decay constant, Half life, mean life

10.3 Properties of nucleus, nuclear mass, mass defect

10.4 Production of x-rays, properties and its uses

10.5 Thermal emission, semiconductors,

10.6 Types of semiconductors

10.7 Explanation of conductor, semiconductor and insulators on the basis of band theory

10.8 P-N junction, diode as rectifier.

LIST OF EXPERIMENTS:

1. Refractive index of prism (I-d) curve.
2. Refractive index of prism (spectrometer).
3. Focal length of a convex lens by u-v method.
4. Focal length of a convex lens by displacement method.
5. Verification of Ohm's law.
6. To find out unknown resistance by meter bridge.
7. To find out internal radius of hollow tube by vernier calipers.
8. To find out volume of given cylinder by screw gauge.
9. Surface tension by Capillary rise method.
10. Coefficient of viscosity.
11. Coefficient of Thermal conductivity by searl's method.
12. Verification of Newton's cooling law.

LIST OF EQUIPMENTS:

1. VERNIER CALIPER
2. SCREW GUAGE
3. OPTICAL BENCH
4. SEARLS APPRATUS FOR "Y"
5. SEARLS APPRATUS FOR "K

REFERENCE BOOKS:

1. Applied Physics Vol. 1 & 2 by Saxena and Prabhakar
2. Physics TTTI Publication
3. Physics Vol. 1 &2 by Halliday And Resnic R
4. Engineering Physics by Gaur And Gupta
5. Principle of Physics by Brij Lal & Subram Any An
6. Physics for Technical Education by Ls Zednov

DE-203 CHEMISTRY

RATIONALE:

As the knowledge of chemistry is essential for a technician, the syllabus of chemistry for the student of first year diploma in all branches of Engg. has been developed in the view of the following abilities required to developed in the students.

- To develop habit of scientific enquiry.
- Understand the changes in the structure, properties of matter and process involved.
- Unable student to develop essential ability to investigate cause and effect relationship.
- Develop ability to predict results in different applications under given conditions.
- Understand the chemistry of essentials for various Engg. materials
- Comprehend the required prerequisite knowledge for understanding technical subjects.
- Topic like alloy, polymers, lubricants, corrosion, surface chemistry, catalyst have been incorporated with special reference to the requirement of all Engg. Branches.

COURSE CONTENT:

1. ATOMIC STRUCTURE AND RADIO ACTIVITY

Discovery of electron, proton ,neutron and nucleus. Ruther ford's and Bohr's model of an atom. Bohr Burry scheme of filling the electrons in various orbits. Idea of s,p,d,f orbital .Alfa, Gamma and Beta rays, theory of radio activity, Group displacement law, half life period, numerical problems on half life period, fission and fusion.

2. SURFACE CHEMISTRY AND ITS APPLICATION

True solution, colloidal solution and suspension, lyophobic and lyophillic colloids, optical and electrical properties of colloids, coagulation, coagulants, idea about gels and emulsions.

3. ELECTROCHEMISTRY

Electrolysis, Faraday's laws of electrolysis, Numerical problems on Faradays Law, electroplating of copper and nickel.

4. COLLIGATIVE PRPOPERTIES

Osmosis & osmatic pressure, Relative vapour pressure and Routls law. Internal energy (enthalpy) Entrophy, Entrophy fusion free energy, Effect of change in temperature catalysis.

5. CHEMICAL BONDING AND CATALYSIS

(A) Bonding: Nature of bonds- Electro valent, Co-valent, co-ordinate and hydrogen bond.

(B) Catalysis : Types , theory characteristic, positive , negative, auto and induced catalyst. Catalytic Promoter, and catalytic inhibitors. Industrial Application of catalysis.

6. WATER:

Sources of water, types of water, hardness of water, its causes, types and removal, Boiler feed water, harmful - effects of hard water in boiler. Municipal water supply. Numerical on soda lime process. Determination of hardness of water by O. Hener's, EDTA and soap solution method.

7. METALS AND ALLOYS:

Physical and chemical properties of metals, copper, iron, aluminum, tin, nickel. General principal of metallurgy, minerals/ ores, ore dressing, roasting ,smelting, bassemerisation, fluxes, purification . Explanation of alloying purposes, methods of alloying, composition and uses of alloy like brass, bronze, duralium, German silver, gun metal, solder, stainless steel, casting and bearing alloy.

8. IONIZATION, PH VALUE CORROSION AND PROTECTION:

Arhenius theory of ionization, factors affecting ionization. pH meaning (numerical), Buffer solutions and Buffer actions, choice of indication (acidimetry and alkalimetry). Explanation of corrosion, types of corrosion, factors effecting corrosion, corrosion control (protection against corrosion), metal and organic coating for corrosion control.

9. GLASS, CEMENT AND REFRACTORY:

Glass: Basic raw materials for glass, composition and manufacture of glass, varieties of glass and annealing of glass,.

Cement : Constituting compounds in cement, Composition of Portland Cement, its manufacture, setting and hardening of cement.

Refractories : Meaning, characteristics , use of common refractory materials.

10. HIGH POLYMERS, RUBBER AND INSULATORS:

Polymerization and condensation, classification of plastics, Compounding and Moulding constituents of plastics. Preparation Properties and uses of PVC, polyethene, polystyrene, polyamides, polyesters , Bakelite. Synthetic fibers - nylon, rayon, decron, and polyesters.

Definition characteristics , classification and properties of insulators. Glass, wool and thermo cole.

Idea about rubber and vulcanization .

11. LUBRICANTS, PAINTS AND VARNISHES:

Lubricants: Meaning , type and theory of lubricants, properties of a good lubricants, Flash and fire point and cloud point, emulsification number, viscosity. Paints and Varnishes : Meaning, ingredients and characteristics of good paints and varnishes, their engineering applications.

12. FUELS, FIRE EXTINGUISHERS AND EXPLOSIVES :

Classification of fuel, gross and net calorific value, Determination of a solid fuel by bomb calorimeter, octane and octane number. Proximate analysis of fuel, its utility, crude petroleum, products of fractional distillation .

Fire extinguishers - Description and use.

Explosives - Meaning, types, characteristic and use of explosives. Name Dynamite, lead azide, T.N.T., Picric acid, R.D.X.

13. POLLUTION AND CONTROL:

Introduction and chemical toxicology, air and water pollution, control of air and water pollution. Harmful effect of different gases like carbon mono-oxide, carbon dioxide, sulphur dioxide, nitric oxide, nitrous and lead.

LIST OF EXPERIMENTS:

1. To identify one Anion and Cation in a given sample.
2. Determination of flesh point and fire point of a given sample of oil by Abel's apparatus.
3. Determination of viscosity by Red Wood Viscometer no. 1 and no. 2.
4. Redoximetry Titration :
   a. Percentage of Iron in given sample of alloy.
   b. Determination of strength of ferrous ammonium sulphate.
   c. Determination of strength of anhydrous ferrous sulphate and ferrous sulphate.
5. Determination of hardness of water by :
   a. EDTA Method and Soap Solution Method
6. Determination of solid content in the given sample of water.
7. Determination of percentage of moisture in the given sample of coal by proximate analysis.

REFERENCE BOOKS:

1. Physical Chemistry - Bahl and Tuli
2. Inorganic Chemistry - Satyaprakash
3. Modern Text Book Of .Applied Chemistry - Dr. G. C. Saxena, Jain Prakashan, Indore
4. Applied Chemistry - Dr. G. C. Saxena, Deepak Prakashan,Gwalior
5. Applied Chemistry - Shrivastava & Singhal, Pbs Publication, Bhopal.
6. Engineering Chemistry – Uppal
7. Engineering Chemistry - Rao .And Agarwal
8. Engineering Chemistry - P.C. Jain
9. Polymer Chemistry - O.P. Mishra
10. Applied Chemistry - H.N. Sahni, Deepak Prakash

DE-204 MATHEMATICS

RATIONALE:

Mathematics forms backbone for all technologies and hence occupies an important place in the curriculum of polytechnic education. The subject is equally important for the future self development of Polytechnic students. In designing the curriculum for foundation course the admission level to Polytechnics has been considered as 10th Board examination and mathematical needs of Technical subject have been given due consideration. To understand difficult concepts in higher engineering courses and to solve many problems of design and development a good background in mathematics is necessary. Keeping in view this requirement for engineering diploma programmes.

COURSE CONTENT:

ALGEBRA

1.1 Permutation

- Meaning of factorial n
- Permutation of'n' dissimilar thing taken 'r' at a time,

1.2 Combination

- Combination of n dissimilar things taken 'r' at a time,

1.3 Binomial Theorem

- Statement of the theorem for positive integer
- General Term, Middle term, Constant term

1.4 Partial Fractions

- Define a proper-improper fraction
- Break a fraction into partial fraction whose denominator contains Linear, Repeated linear and Non repeated quadratic factors.

1.5 Determinant

- Concept & principles of determinants
- Properties of determinant
- Simple examples.

1.6 Complex Numbers

- Algebra of Complex Numbers
- Polar form

TRIGONOMETRY :

2.1 Allied angles.

2.2 Trigonometrical ratios of sum and difference of angles, (Only statement)

2.3 Sum and difference of trigometric ratios (C-D formula)

2.4 Multiple angles (Only double angle and half angle)

2.5 Properties of triangle (without proof)

MATRIX:

3.1 Definition of Matrix.

3.2 Types of Matrix.

- Row, Column, Square, Unit, Upper and lower triangular, Symmetric & Skew Symmetric, Singular and non Singular Matrices.

3.3 Adjoint of a Matrix.

3.4 Inverse of a Matrix.

CO-ORDINATE GEOMETRY:

4.1 Co-ordinate System: Cartesian and Polar.

4.2 Distance, Division, .Area of a triangle.

4.3 Locus of a point and its equation.

4.4 Slope of St. Line

- Angle between two St. lines.
- Parallel and perpendicular St. lines.

4.5 Standard and general equation of St. line. Point of intersection of two st lines.

STATISTICS:

5.1 Measures of Central tendency (Mean, Mode, Median)

5.2 Measures of Dispersion (Mean deviation, standard deviation)

DIFFERENTLIAL CALCULUS:

6.1 Define constant, variable, function.

6.2 Value of the function

6.3 Concept of limit of a function.

6.4 Definition and concept of differential coefficient as a limit.

6.5 Standard results.

6.6 Derivatives of sum, difference, product, quotient of two functions.

6.7 Diff. coeff. of function of a function.

6.8 Diff. coeff. of implicit function.

6.9 Logarithmic Differentiation.

6.10 Differential coeff. of Parametric function.

INTEGRAL CALCULUS:

7.1 Definition as a inverse process of differentiation

7.2 Standard Results (including inverse function)

7.3 Methods of Integration

- Substitution
- Integration by parts

- Breaking up into partial fraction

7.4 Concept of Definite Integral

VECTOR ALGEBRA:

8.1 Concept of Vector and Scalar Quantities.

8.2 Different types of vectors.

8.3 Addition and subtraction of vectors.

8.4 Components of a vector

8.5 Multiplication of two vectors

- Scalar Product
- Vector Product
- Applications (Work done, power & reactive power)

EQUIVALENCY:

New paper code is equivalent to old paper code of respective branch.

REFERENCE BOOKS:

- Mathematics for Polytechnics - Prepared By T.T.T.I. Bhopal Vol BI and II Bhopal
- Differential Calculus - Gorakh Prasad
- Integral Calculus - Gorakh Prasad
- Co-Ordinate Geometry - By S.L. Loni
- Engineering Mathematics - Dr. S.K. Chouksey
- (M.P. Hindi Granth Akadami) & Manoj Singh
- Mathematical Statistics - By Ray and Sharma
- Higher Engineering Mathematics - By B.S. Grewal

SEMESTER-III
DME-301 MATERIALS TECHNOLOGY

COURSE CONTENT:

1. **Requirement of Engineering materials, mechanical properties and their testing :** Introduction to engineering materials, classification of engineering materials and their properties. Mechanical properties of materials, destructive including Tensile test, compression test, hardness test, impact test fatigue test, endurance limit, bending test, shear test and non- destructive testing methods.

2. **Structure of Solid materials:** Classification amorphous and crystalline states, unit cells and crystal structure (B.C.C., F.C.C. and H.C.P) allotropy. Crystal imperfection and their effects on properties

3. **Solidification of Metal and ingot structure:** Process of nucleation and grain growth, ingot solidification, dendritic and columnar structure, segregation of impurities, grain and grain boundaries.

4. **Equilibrium Phase Diagrams and Phase Transformation Equilibrium of phase Diagrams :** Plotting of equilibrium diagrams, interpretation, phase rule and lever rule and its application Phase transformations - Eutectic Eutectoid, Peritectic and Peritectoid.

5. **Practical Metallography :** Preparation of specimen, selecting the specimen, mounting the specimen, grinding , polishing, etching and etching reagents. The metallurgical microscope. Use and care of microscope.

6. **Iron- Carbon Equlibrium System :** The complete iron carbon diagram and its interpretation. The solidification and cooling of various carbon steels, structures produced, correlation of mechanical properties with carbon content.

7. **Heat Treatment of Steels:** Objective of heat treatment, thermal processes- annealing, normalizing, hardening and tempering. Hardening process : Surface hardening, flame hardening, case hardening methods, their scope, limitations and advantages, quenching mediums and their effect on hardness, Hardening defects due to improper quenching, hardenability, Jominy end quench test and interpretation of its results. T.T.T. curves interpretation and use, Isothermal heat treatment processes -martempering, austempering, spherodising and patenting.

8. **Ferrous Metals and Alloys :** Classification, types of cast irons their properties and uses, alloy cast-irons, various alloying elements used, their effects on properties and uses. Classification, composition and uses of plain carbon steels, effect of impurities, Alloy steels -various alloying elements, their effects on properties and uses. Alloy steel classification.Tool Steel : Typical compositions, requirements of tool steels, high speed steel, high carbon steel. Standardization of steels. Designation of steals as per B.I.S. codes.

9. **Non- Ferrous Metals and Alloys :** Copper : Its Properties and uses Cooper Bases Alloys : Brasses, their classification, composition, properties and uses, designation of copper alloys as per B.I.S. aluminum its properties and uses.

   Aluminum Alloys : Their composition, Classification, properties and uses.

   Designation of Al- alloys as per B.I.S, Zinc, Nickel and lead their alloys properties and uses Bearing alloys - their composition and field of application.

10. **Non- Metallic Materials :** introduction to Ceramic Refractory, Rubbers Insulators and Lubricants.

11. **Plastics:** characteristics, classification, commonly used thermo¬setting and thermoplastic - their properties and uses. Ingredients for processing plastics.

    Plastic processing methods different methods.

12. **Powder Metallurgy:** Introduction and application. Description of process, manufacture and blending of metal powder compacting and sintering.

13. **Metal Preservation:** Corrosion meaning various mechanism effect of corrosion, methods of minimizing corrosion.

14. **Modern Trends in Materials Engineering:** New materials like FRP, Composites, synthetic fibers, synthetic wood. Super conductors.

LIST OF EXPERIMENTS:

1 Preparation of micro specimen.

2 To study micro structural characteristics of gray cast iron white cast iron and malleable cast iron.

3 To study effect of normalising, annealing on the hardness and microstructure of high carbon steel.

4 To study the effect of carbon and temperature on hardening of steel.

5 To study the effect of temperature on the properties during tempering of steel.

6 To study the effect of quenching media on hardness of steel.

7 To study the carbonizing and case hardening of steel.

8 Joining hardenability test and its industrial use.

9 To Study the microstructure of some important brasses and bornzes.

10 To observe the micro structural characteristics and other properties of various cast irons and prepare a report there of, for industrial uses.

REFERENCES

1 Engineering physical Matallurgy-By Prof. Y Lakhtin MIR Publishers mascow.

2 A Text Book of Material Science And Metallurgy by O.P. Khanna.

3 Material Science And Process. by S. K. Hazia Choudhry.

4 Mechanical Metallurgy by Dieter (Tata Mcgrawhill).

5 Materials For Engineers by M.H.A. Kempsty.

6 Introduction to Material Science And Engineeringby K.M. Ralls, T.H. Courtney, John Wuff (Wiley Eastern New Delhi)

7 Physical Matallurgy Principles by Read Hill (Affiliated East- West Press Pvt. Ltd. New Delhi.).

8 Engineering Metallurgy by R. Higgins (ENS).

9 Materials Science by B.S. Narang (Pub. CBS pub. & Distributions New Delhi)

10 Padarth Prodyogiki (Hindi) by P.N. Vijayvergiya (Deepak Prakashan, Gwalior) .

DME-302 MANUFACTURING PROCESSES

RATIONALE:

Manufacturing processes are advancing very fast with the expansion of technology. This course will provide basic insight to the students regarding methods of manufacturing processes. The course gives the opportunity for exhaustive study of metal casting, Mechanical working of metals, press working and metal joining. The abilities developed by studying this course will be directly helpful to all the technicians, in whichever field they are employed.

COURSE CONTENTS:

1 **Introduction to Manufacturing Processes :** Definition, classification of basic manufacturing processes i,e, mechanical working, casting, metal joining processes, metal cutting process, press working . Examples of each of the above listed manufacturing processes, factors which influence selection of manufacturing process for a particular application.

2 **Metal Casting :** Introduction , advantages and limitations of casting as production process.

Pattern Making : Definition of pattern, types of patterns and their details, materials, allowances, tools required, colour code for patterns.

Moulding : Definition, moulding methods and types of moulds, moulding materials, moulding sand and its composition, sand properties, testing parameters of sand, and their effects, sand preparations, sand conditioning, characteristics and defects of moulds. Function of runners, risers and gate.

Cores and core making, core boxes. Cleaning of casting,

Special casting methods, need for special casting methods, die casting, centrifugal casting, investment (lost wax) casting, casting defects, causes and analysis, area of application of casting process.

Furnaces : Cupola ,crucible, pit and electric arc furnaces, induction furnace , their salient features, safety aspects.

3 **Press Working :** Introduction of press working of metals, principle of press working , description of a simple press working unit, press working operations : punching, shearing, drawing, bending, slitting, knurling, notching, trimming, piercing etc.

Double action press, description and its field of application, die and punch, types of dies, specifications of a press, safety precautions to be observed while working on a press.

4 **Mechanical Working :** Introduction - hot and cold working Principle of recrystalization.

Metal Rolling : Principle of metal rolling , basic components of a simple rolling process equipment. Types of deformation during rolling. roller material, selection and desirable properties, principles of thread rolling- description with sketches, manufacture of seamless tubes by rolling. types of rolling mill. Rolling defects Metal Drawing : Basic Principle of drawing of metals, differentiate between the drawing and deep drawing of metals, principle of wire drawing and example.

Extrusion : Definition, Classify the methods of extrusion, their limitations, advantage and disadvantage. Tube extrusion, impact extrusion, application of extrusion processes. Extrusion defects.

Forging : Types of forging, Die forging, differentiate between the cold die and hot die forging , advantage of forming by forging, common defects and their reasons. Limitations of forging, press forging, drop forging, upset forging, die material , applications of forging processes in engineering.

5 **Metal Joining :** Introduction, Classification of metal joining processes

Welding: classification, Plastic, fusion and forge welding, Weldability of metals, metallurgy of welding

Resistance welding : Spot, seam, butt, projection, percussion techniques.

Gas welding and gas cutting : Principle of operation and technique, gas cutting.

Arc Welding : Carbon arc, TIG, MIG, Submerged arc , Atomic hydrogen, Eletro-slag, Plasma arc welding processes, Electrodes- types and selection , flux and their uses. Special welding techniques- Welding of different metals. Defects in welds, testing and inspection. Accident prevention in gas and arc welding Equipments & tools used in metal arc welding, specification and functions. Soldering, Brazing and Adhesive bonding

MANUFACTURING PROCESSES

1 Making a split/solid pattern from wood. Making a core box.

2 Tempering of sand, practice of green and dry sand making.

3 Practice of core making and baking

4 Practice of open mould in a two boxes, using split pattern and solid pattern, Locating the core .

5 Demonstration of metal melting in pit furnace& casting process.

6 Simple forming practice (Making a square bar out of a given round bar, making of a chisel and bolt)

7 Practice of upsetting of a round on power hammer.

8 Practice of sheet cutting with the help of straight and bent snips. Making small rectangular prism and cylinder.

9 Practice of making of washer of any size on a flypress.

10 Practice of piercing, notching and circle cutting with the help of Metal master machine.

11 Practice of piercing, notching and circle cutting with the help of Metal master machine.

12 Practice of piercing, notching and circle cutting with the help of Metal master machine.

13 Practice of edge preparation for welding.

14 Demonstration and practice of bead laying (Welding) on a Flat pieces

15 Practice of Welding of corner, edge and Tee joint

16 Welding ' V' butt joint.

17 Practice of joining wires and rods of different size on spot welding machine.

18 Practice of making gas flames with nozzles and making simple joints.

REFERENCES:

1. Process And Materials of Manufacture by Lindberg.
2. Workshop Technology by Hazara & Choudhary.
3. Materials And Manufacturing process by Dalela.
4. Manufacturing Processes by Yankee.
5. Manufacturing Process by S.E. Rusinof
6. Welding Engineering by B.E. Rossi.
7. Production Engineering - P.C. Sharma
8. Manufacturing Technology- P.N. Rao
9. Production Technology- R.K. Jain
10. Foundry Engineering by P.L. jain.
11. Nirman Prakram (Hindi) by P.N. Vijayvargiya. (Deepak Prakashan, Morar, Gwalior)

DME-303 BASIC ELECTRICAL AND ELECTRONICS

RATIONALE:

Electricity finds its base as basic energy for modern industrial activities and so is the case of electronics, which is being extensively used today in all industries, power system operation, communication systems, computer and information technology. Hence it has become absolutely necessary for all diploma holders to have basic understanding of -

a. Basic laws of electricity

b. D.C. and A.C. Circuit and machines

c. Electronic Components, their functions and applications.

d. Electrical and Electronic instruments

e. Safety Measures

This will form the base for handling various types of equipment used in industries & will facilitate technicians in operation and maintenance of equipment.

The practical work to be performed in this course will help in developing skills of operation and testing of component and various gadgets.

COURSE CONTENTS:

1. FUNDAMENTALS OF ELECTRICAL ENGINEERING:

1.1 Concept of electric current, potential and potential difference (Voltage).

1.2 Sources of D.C. and A.C. Electric energy.

1.3 Methods of voltage generation and standard voltages used in generation transmission and distribution.

1.4 Electrical Power, energy and their units.

2. D.C. CIRCUITS:

2.1 Ohm's Law, Concept of resistance, conductance, resistivity, conductivity and their units. Effect of temp. on resistance. Temperature coefficient of resistance (Definition only)

2.2 Connections of resistances. Series, Parallel connections and their combinations. (Simple Numericals)

2.3 Kirchoffs Voltage Law, Kirchoffs Current Law (Simple Numerical)

3. A.C. CIRCUITS:

3.1 Generation of single phase and three phase sinusoidal voltage. Vector representation. Concept of Cycle, Frequency, time period, amplitude, phase and phase difference.

3.2 Define instantaneous value, average value, RMS value and peak value of sinusoidal electrical quantities. Derive relationship between them . Form factor and peak factor (Definition only).

3.3 Current voltage and power in pure resistive, inductive and capacitive circuit.

3.4 Concept of Reactance , impedance and power factor in R.L., R. C. and RLC Series circuit. (Simple Numericals).

3.5 Causes and effect of poor power factor. Methods of improving power factor.

3.6 3 phase AC supply- three phase three wire and three phase four wire system. Relationship between VL and VPH, IL and IPH and three phase power in star and delta connected load.(Simple Numerical)

4. D.C. MACHINES:

4.1 Review of concept of Electromagnetism and related laws (Faraday's Law, Lenz's Law, Cork Screw Rule, Fleming's Left Hand & Right Hand Rule.)

4.2 Construction of D.C. Machines, its main parts and their functions. Classification of D.C. Machines.

4.3 D.C. Generator : Principle , EMF equation(Derivation and simple numerical), Types of D.C. Generator (No Numerical), Applications of DC generator.

4.4 D.C. Motor : Working Principle of DC motor, Types of DC motor, significance of back emf, Torque equation(No Numerical).

4.5 Characteristics of D.C. Series and Shunt Motor. Applications of D.C. Motor.

D.C. Motor starter - 3 point starter. Efficiency (No numerical)

5. A.C. MACHINES:

5.1 Single Phase Transformer : Construction, working principle.

5.2 EMF Equation (Derivation with simple numerical), Turn ratio, Step up and step down transformers and their application.

5.3 Losses , efficiency and regulation (No derivation).

5.4 Three Phase Induction Motor : Construction, types , principle of operation. Concept of Slip (Simple Numerical), Applications, Starters: DOL and Star Delta.

5.5 Single Phase Induction Motor : Methods of making a single phase motor self start. Types of single phase induction motor- capacitor start, capacitor run and shaded pole and their applications.

5.6 Synchronous Machines : Synchronous motor- construction, principle of operation, comparision with three phase induction motor.

Synchronous generator (alternator) - Construction, principle of operation, speed and frequency, synchronous speed.

6. MEASURING INSTRUMENTS AND TRANSDUCERS:

6.1 Classification of Measuring Instruments, absolute and secondary instruments. Indicating, Integrating and Recording instruments, their examples.

6.2 Elementary idea about working principles and construction of MI and MC type Ammeter and voltmeter. Electrodynamometer type watt meter. Induction type energy meter , electronic energy meter. Application of Megger and earth tester.Multimeter, CRO, its block diagram and applications.

6.3 Transducers - Definition, primary and secondary transducers, active and passive transducers, variable parameter R,L,C type transducers.

6.4 General idea about strain gauge, LVDT, Thermocouple, Peizo Electric and Photoelectric Transducers.

7. ELECTRIC WIRING:

7.1 Types of Wiring and their Applications.

7.2 Size of conductor , S.W. gauge. Accessories like switches, fuses, holders, sockets and MCB's.

7.3 Staircase Wiring , Fluorescent tube light wiring .

8 ELECTRONIC DEVICES AND CIRCUITS:

8.1 Semiconductor PN Junction Diode, Zener Diode, PNP and NPN transistor , UJT, FET, MOSFET and SCR. Their layer diagram, symbol, V-I characteristics and applications.

8.2 Electronic Circuits : Concept of biasing of diode and transistor.

8.3 Single Phase Half wave and Full wave rectifier(I/O waveform), Concept of ripple, filter circuit (shunt capacitor and series inductor) . Transistor as an amplifier, concept of gain, Zener regulator, regulated power supply (Block diagram only).

9. ELECTRIC SAFETY:

9.1 Electric shock and its prevention , effect of electrical current on human body, shock treatment, need of earthling.

LIST OF EXPERIMENTS:

01. Verification of Kirchoffs Law
02. To Measure Voltage Current and power in single phase AC circuit.
03. To calculate Impedance, power and power factor by measuring voltage across each element and current to the circuit for a given RLC series
04. circuit.
05. Study of different parts of DC machine .
06. Study of three point starter for DC motor.
07. To determine transformation ratio of a given single phase transformer.
08. Study and operation of DOL and Star Delta Starter.
09. To measure slip for a given three phase induction motor.
10. To measure insulation resistance by Megger.
11. To measure earth resistance by earth tester.
12. To measure linear displacement by LVDT.
13. To make connection for stair case wiring.
14. To make connection for fluorescent tube light circuit.
15. Testing of various electronic components using multimeter and CRO.
16. To draw V-I characteristics of Zener diode.

17. To observe input and output wave form of full wave / half wave rectifier on CRO.

    To observe amplified output of a given amplifier.

NOTE : The list of the experiment given above, the student has to perform atleast 12 experiment.

REFERENCES:

1. Fundamental of Electrical Engineering and Electronics - B.L. Thareja , S. CHAND Publication
2. Basic Electrical Engineering - V.K. Mehta , S. CHAND Publication
3. Principles of Electronics - V.K. Mehta , S. CHAND Publication
4. Basic Electrical Engineering - V. N. Mittle, TMH
5. Electrical Machines Vol I & II - S.K.Bhattacharya, TTTI, Chandigarh
6. A Curse book in Electrical & Electronic Measurement and Instrumentation, A.K. Sawhney.
7. Principles of Electrical Engg. and Electronics - V.K. Mehta , S. CHAND Publication
8. Electrical Technology - S.L.Uppal, Khanna Publication
9. Electrical Measurement - J.B. Gupta, Dhanpat Rai & Sons.

DME-304 MECHANICAL DRAFTING AND AUTOCAD

RATIONALE:

This course in mechanical Drafting has been prepared with a view to develop elementary drafting skill in the students. Looking to the professional needs of the technicians, more emphasis has been laid on the use of I.S. Code of practice and reading and interpretation of drawings. The topics on multi view representation dimensioning and tolerance, Free hand sketching and sections of M/c parts are included to build foundation for production drawing. The topic of pipe drafting will help the students to understand the importance and functions of piping system in industry.

Computer Graphics is a modern concept in Mechanical Drafting and knowledge of computer interface like AutoCAD is needed like primary education to draw and present drawing in electronic data form.

COURSE CONTENTS:

1 **Projection and multi view Representation:** Projection orthographic projection. First and third angle projection, superfluous view, choice of views, auxillary views- views -full and partial, conversion of pictorial views in to orthographic views, conventional representation as per IS: 696.

2 **Sectional Views :** Full section, half section, partial or broken section, revolved section, removed section, offset section. Sectioning conventions, section lines. Hatching procedure for different materials as per IS code 686 1972. Sectional views of assembled parts. Choosing from IC engine parts, couplings, clutches, brackets, bearing etc. (Use 1st and 3rd angle projections both)

3 **Dimensioning Tolerance, Machining And Welding Symbols :** Types of dimensions (size and location) dimensioning terms and notations. (use of I.S.Code 696 &2709) general rules for dimensioning and practical hints on dimensioning systems of dimensioning. Dimension of cylinder holes arcs of circle narrow space, angles, counter sunk hole, screw threads taper etc. Application of tolerances. (Use I.S. Code 696) Machining marks, finish marks, countersinking, counter boring spot facing, figures and notes for same. Representation of characteristics machining (circularity, Angularity etc .) (Ref IS 969) Representation of welded joints, welding symbols, tolerance of forms and positions. Procedure of drawing fits, limits, size, tolerance, clearance etc.

4 **Production Drawing:** Detailed drawing, assembly drawing, scale, finish tolerances, notes etc. Title block, tool list, gauge list. Preparation of production drawing for pattern shop. Forging shop, machine shop, preparation of assembly drawing from detailed drawing. exploded views, sectional pictorial views, assembly drawing of nut and bolt, plummer block, flange coupling, stepped pulleys, foot-step bearing, Universal coupling, connecting rod, piston of I.C. engines, cotter joint, Knuckle joint. Preparation of detailed drawing from assembly drawings and assembled pictorial views, Interpretation of production drawing.

5 **Introduction to Auto CAD:** Coordinate system. Draw command- line ,arc, circle rectangle, polygon, point, ellipse, hatch, table. Modify commands-erase, copy, offset, array, trim, extend, break, join, chamfer, fillet, move, rotate, scale, stretch, lengthen. Dimensioning

Tray settings: snap, grid, ortho, polar, osnap

Format commands: line type, point style, units, layers, drawing limit, dimension style

6 **Application of Auto CAD:** practice of assembly drawings using Auto CAD

7 **Presentation:** Block, creating layout, insert layout ,ploting/printing

8 **Pipe Drafting :** Various symbols used in pipe line work as per IS code of Practice, C.I. flanged joint, socket and spigot joint, gland and stuffing box, expansion joint, pipe fitting typical pipe bends, pipe supports and accessories.

9 **Gear Drawing :** Gear terminology such as pitch, pitch circle diameter module, addendum, root circle diameter, hole depth, blank diameter etc. construction of cycloidal, involute teeth profiles, pinion and rack mashing, spur gear mashing.

10 **Graph and Charts :** Introduction, Classification of chart, graphs and diagrams, quantitative and qualitative charts and graphs, Drawing and curve titles, legends notes etc. procedure for making a graphical representation in ink. Logarithmic graphs, semi logarithmic graphs, bar charts area (Percentage) charts, pie chart, alignment charts (Nomo graphs) Forms and construction, construction of functional scale, parallel scale charts for equations of the form [f (t) +f(u) +f (v), (f (t) x f (u) = f (v)] three scale alignment chart, graphical construction of a Z-chart, four variable relationship parallel scale alignment chart.

SUGGESTED TERMS –WORK:

1 Projection and multi views representation
2 Sectional views
3 Dimensioning, tolerance, machining and welding symbols
4 Production drawing
5 Pipe drafting
6 Gear Drawing
7 Graphs and charts
8 Computer graphics

REFERENCES:

1 Fundamentals of Engineering Drawing by Warren J. Luzadder (Prentice-Hall).
2 Machanical Drawing by Giesecke, Mic- hell Specer, Hill. (Collier Macmillan Internal Edition)
3 Engineering Graphics by Giesecke/Mitchell/ Spencer/ Hill/ Loving (Macmillan) .
4 Mechanical Drawing By N.D.Bhatt
5 Mechanical Drawing By P.S.Gill
6 Mechanical Drawing By R.K.Dhawan
7 Inside AUTO CAD by Daniel Raker and Harbest Rice(BPB Publisher)
8 Computer Graphics and CAD Fundamentals By Noel M Morries(Wheeler)

DME-305 STRENGTH OF MATERIALS

RATIONALE:

The technicians from mechanical engineering discipline are expected to know much about this subject so as to fulfill his job functions efficiently. The knowledge is very essential for those who are engaged in design, maintenance, shop- floor inspection, quality control and production departments.

The course includes the study of behavior of Engineering materials and stress produced in the structure due to various types of loading systems.

The subjects is kept in diploma course so that the students of mechanical engineering discipline should know the proper use of material for common engineering problems.

COURSE CONTENTS:

1 **Simple Stress and Strains :** Introduction types of loads and deformation, types of stresses and strain. Hooke's law, stress strain diagram for ferrous and non ferrous materials modulus of elasticity. rigidity and bulk modules of materials Stress in bars of varying cross sections, composite sections and compound sections Thermal stresses and strains, thermal stresses in composite sections. Poisson's ratio, volumetric strain, relation between different modulus, strain energy, resilience, proof resilience, modules of resilience suddenly applied loads and impact loads.

2 **Mechanical properties and their testing :** Mechanical properties of materials, destructive including Tensile test, compression test, hardness test, torsion test, impact test fatigue test, endurance limit, bending test, shear test and non-destructive testing methods.

3 **S.F. and B.M. Diagrams :** Definition, types of loading types of beams, shear force and bending moment sign conventions S.F. and B.M. diagrams for cantilever simply supported and overhanging beams with point or concentrated loads uniformly distributed loads and combination of point and U.D.L. Point of contra flexure, numerical problems.

4 **Principal Planes and Principal Stresses :** Stresses on inclined plane subjected to direct shear or combination of stresses in two mutually perpendicular planes. Principal planes and principal stresses, analytical and graphical methods.

5 **Bending Stresses in Beams :** Theory of simple bending as assumptions made in simple bending theory position of neutral axis, surface moment or resistance. Modules of section of symmetrical sections such as rectangular, circular and I sections, bending stresses in symmetrical sections. Simple problems. Reinforced concrete beams, beam of uniform strength.

6 **Shear Stresses in Beams:** Introduction shear stress equation, assumptions made, distribution of shear stresses over various sections, such as rectangular, circular and I L & T sections, Simple numerical problems.

7 **Deflection of Beams:** Introduction Strength and stiffness of beam curvature of bent beam, Derivation of equation for slope and deflection of beam in case of cantilever and simply supported beam loaded with point loads U.D.L. and combination. Simple numerical problems. Importance of deflection and practical applications.

8 **Torsion of Shaft:** Definition of torsion relation between stress, strain and angle of twist assumptions made strength of solid and hollow circular shaft, polar moment of inertia. Calculation of shaft diameter on the basis of strength and stiffness for the given horse power transmitted torsional rigidity. Maximum torque comparison of solid and hollow shaft size of a shaft for a given torque.

9 **Spring:** Definition types and use of springs, leaf spring, helical and spiral springs, Stiffness of a spring and maximum shear stress, defection of spring . Spring Classification based on size shape and load.

10 **Columns and struts:** Definitions crippling load different end conditions, slenderness ratio, equivalent length, Euler's theory Rankine's formulae, radius of gyration, Rankine constant for different materials Limitations of Rankine formula simple problem B.I.S. code for columns.

11 **Stresses in Frames:** Definition of frame, perfect, deficient and redundant frame. Assumptions made in finding stress in method of sections and graphical method Bows notation, solution of problems using three methods.

12 **Thin Cylinders and Spheres:** Hoop stress longitudinal stress on inclined plane subject subjected to direct, shell, volume strain change in value, cylindrical vessels subjected to internal pressure, simple numerical problems.

LIST OF EXPERIMENTS

1. Study and demonstration of Universal Testing Machine & its attachments
2. Tension Test on mild steel, Aluminium & compression test on cast iron on Universal Testing Machine.
3. Direct Shear Test of mild steel on Universal Testing Machine.
4. Brinell Hardness Test on Mild Steel.
5. Rockwell hardness Test on Hardened Steel.
6. Izod & Charpy - Impact tests of a standard specimen
7. Torsion Test on Mild steel bar.
8. Drawing sheet on shear force & bending Moment diagrams for a given loading (At least four problems.).
9. Estimation of principal stresses and maximum shear strain for a given combined loading by analytical & Mohr's circle method. (At least two problems.).

REFERENCES:

1. Strength of Materials. by B.C. Punmia.
2. Strength of Materials . by R.S. Khurmi.
3. Strength of Materials by Sadhu Singh.
4. Strength of Materials by K.D. Sexena.
5. Strength of Materials by S. Ramamuruthan.
6. Strength of Materials by I.B. Prasad.
7. Strength of Materials by Ryder.

8. Strength of Materials by Timo shanko & young
9. Laboratory Experiments In Strength of Materials by B.D. Sharma.
10. Dravya Samarthya (Hindi) by K. D. Saxena (Deepak Prakashan, Morar Gwalior)

DME-306 PROFESSONAL ACTIVITIES

RATIONALE:

Professional Activities is not a descriptive course, as per conventional norms; therefore specific content for this course cannot be prescribed. It is a group of open-ended activities; where in variety of tasks are to be performed, to achieve objectives. However general guidelines for achieving the target and procedure for its assessment are given under the course content.

As the student has to practice this course in all the six semesters, the guidelines given therein are common and applicable to each semester.

OBJECTIVES:

- To allow for professional development of students as per the demand of engineering profession.
- To provide time for organization of student chapter activities of professional bodies) i.e. Institute of engineers, ISTE or Computer Society of India etc.)
- TO allow for development of abilities in students for leadership and public speaking through organization of student's seminar etc.
- To provide time for organization of guest lectures by expert engineers/eminent professionals of industry.
- To provide time for organization of technical quiz or group discussion or any other group activity.
- To provide time for visiting library or using Internet.
- To provide time for group discussion or solving case studies.
- To provide time for personality development of students.
- To provide time for working for social cause like awareness for environmental and ecology etc.

DETAILED INSTRUCTIONS TO CONDUCT PROFESSIONAL ACTIVITIES

A. Study hours, if possible should be given greater time slot with a minimum of two hrs/week to a maximum of four hrs/week.

B. This course should be evaluated on the basis of grades and mark sheet of students, should have a separate mention of the grade awarded. There will be no pass/fail in professional activities (PA).

C. Following grade scale of evaluation of performance in PA has been established.

Grades	Level of performance
A	Excellent
B	Good
C	Fair
D	Average
E	Below Expectations

D. Grades once obtained in a particular examination shall become final and no chance of improvement in grades will be given to the students.

E. Assessment of performance in PA is to be done internally by the Institution, twice in a Semester/Term through a simultaneous evaluation of the candidate by a group of three teachers, of the deptt. Concerned. Group of teachers will jointly award the grade to candidate in the assessment. Best of the grades obtained by the student in these two assessments shall be finally taken on the mark sheet of the respective Semester/Term.

Candidate abstaining from the prescribed course work and/or assessment planned at the Institute shall be marked ABSENT in the mark sheet, instead of any grade.

F. While awarding the grades for performance in PA, examining teacher should reach the final consensus based on the attendance, punctuality, interest, presentation skills in seminar on the topic assigned (collection of relevant data, observations, analysis, findings/conclusion) and its written report, awareness of latest developments in the chosen programme of study.

G. Institution shall maintain the record of grades awarded to all the students in PA for a period of 1 year.

H. It shall be mandatory for students to submit a compendium for his PA in the form of a Journal.

I. Compendium shall contain following:

I. Record of written quiz.

II. Report/write up of seminar presented.

III. Abstract of the guest lectures arranged in the Institution.

IV. Topic and outcome of the group discussion held.

V. Report on the problems solved through case studies.

VI. Report on social awareness camps(organized for social and environmental prevention).

VII. Report on student chapter activities of professional bodies like ISTE, IE (India), CSI etc.

J. PA is not a descriptive course to be taught in the classroom by a particular teacher. Various activities involved in the achievement of objectives of this course should be distributed to a number of teachers so that the talent and creativity of group of teacher's benefit the treatment of the course content. These activities should preferably be conducted in English language to maintain continuity and provide reinforcement to skill development.

Small groups shall be formed like in tutorials, group discussion, case studies, seminar, project methods, roll play and simulation to make the development of personality affective.

Treatment of PA demands special efforts, attention, close co-operation and creative instinct on the part of teachers of department concerned. Since this course is totally learner centered, many of the activities planned under this course shall come out from the useful interaction of student, among themselves and with the teachers. The guide teacher/s shall best

act as a facilitator of these creative hunts/ exercises, which unfold many of the hidden talents of the students or bring out greater amount of confidence in them, to execute certain activity.

SEMESTER-IV
DME-401 FUILD MECHANICS AND HYDRAULIC MACHINES

RATIONALE:

This course is intended to introduce basic principles of fluid mechanics. It is further extended to cover the application of fluid mechanics by the inclusion of fluid machinery especially water turbine and water pumps. Now a days the principles of fluid mechanics find wide applications in many situations directly or indirectly.

The use of fluid machinery, turbines pumps in general and in power stations in getting as accelerated fill up. Thus there is a great relevance for this course for mechanical technicians.

The Mechanical technicians have to deal with large variety of fluids like water, air, steam, ammonia and even plastics. The major emphasis is given for the study of water. However the principle dealt with in this course will be applicable to all incompressible fluids.

COURSE CONTENTS:

1. Fundamentals of Fluid Flow : Definition of fluid, ideal and practical, compressible and incompressible fluids, fluid properties- density, specific weight, specific gravity, dynamic and kinetic viscosity, types of flow- laminar and turbulent, steady and unsteady, uniform and non-uniform. Continuity equation, Simple numerical problems on continuity equation.
2. Pressure and Its Measurement: Concept of pressure, intensity of pressure, Pascal's law, pressure head, gauge pressure, vacuum pressure, absolute pressure, manometers- Piezometer, U-tube manometer inclined manometer, differential manometer ,inverted U- tube manometer Pressure gauges, Bourdon tube pressure gauge. Simple numerical problems on differential manometers.
3. Basic Equation of Fluid Flow: Various form of energies applicable to fluid flow, potential energy, kinetic energy, pressure energy, total energy of fluid flow, Concept of datum pressure, velocity and total head of a fluid particle in motion. General steady flow energy equation, Bernaulli's theorem, assumptions made in deriving Bernaulli's theorem and derivation of Bernaulli's theorem, practical applications of Bernaulli's equation: venturimeter, orifice- meter, pitot tube, flow nozzle- Their construction, working and limitation. Simple problems on venturimeter, orifice meter, pitot tube.
4. Flow Through Orifices and Mouth Pieces and flow measurement: Definition and types of orifices, Vena contracta, coefficient of contraction., velocity, discharge and resistance . Torricell's theorem experimental determination of Cc, Cv and Cd. Head loss due to sudden enlargement, contraction and obstruction in pipe. Mouth pieces, Time of emptying vessel by orifice (cylindrical, conical) Flow from one vessel to another large orifices. Flow measurement by Rota meter, Volume flow meter
5. Flow Through Notches and Weirs : Weirs and notches definition, Classification, flow over rectangular weir with and without velocity of approach, calibration of rectangular weir, different formula for large rectangular weir. Time required to empty a reservoir with rectangular weir, V-notch. Advantages of triangular notch over rectangular notch. Trapezoidal notch. Broad crested and submerged weirs. Practical application of weirs. Spillway and Siphon spillway, guage weir.

6. Flow Through Pipes : Laminar and turbulent flow, Raynold's number, differentiation of laminar and turbulent flow on the basis of Reynold's number, loss of head due to friction in pipes, Darcy's formula and Chezy's equation. Hydraulic gradient and total energy line. Flow through long pipes, pipes in series and parallel simple problems based on above formulae water hammer and its effect surge tank.
7. Impact of Jets : Impact of Jet on flat and curved plates stationary and moving, work done by Pelton wheel, velocity triangle, simple numerical problems on axial, radial flow.
8. Water Turbines : Meaning Classification Impulse and reaction turbine, Comparison description and working of Pelton, Francis and Kaplan turbines, Fanlaws specific speed & Selection of turbines.
9. Water Pumps : Centrifugal and reciprocating- principle construction, working classification and layout. Comparison of centrifugal and reciprocating pumps. Specific speed, selection of pumps. Use of air vessels in reciprocating pump, indicator diagram, horse power calculation in case of reciprocating pump. Horse power calculation in case of centrifugal pump. Operating characteristics.
10. Model Analysis : Geometric, Kinetic and dynamic similarity. Simple Problems.
11. Hydel Power Station : Schematic diagram, function of various elements, advantage over other power stations.

LIST OF EXPERIMENTS:

1. To measure the pressure of water in pipe by (a) Piezometer (b) different types of monometers.
2. To verify Bernaulli's equation.
3. To determine discharge through a given venturimeter.
4. To determine discharge through a given orifice meter.
5. To determine discharge through a Pitot tube.
6. To determine Cc, Cv and Cd for different types of orifices and mouth pieces.
7. To determine loss of head due to : (a) Sudden enlargement. (b) Friction in pipes.
8. To determine discharge through different types of notches.
9. Study of Pelton wheel, Francis turbine, and Kaplan turbines.
10. To determine performance characteristics.
11. Study of reciprocating pump.
12. To determine h.p. of reciprocating pump.
13. Study of centrifugal pump.
14. To determine operating characteristics of centrifugal pump.

REFERENCE BOOKS:

1. A text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines. by Khurmi (S. Chand & Co.)
2. Fluid Machines by M. Manohar

3. Hydraulics & Hydraulic Machines by Dr. Jagdish lal (Metropolitan)
4. Hydraulics & Hydraulic Machines by Priyani.
5. Fluid Machines With Engineering Applications by R.L. Draught lery & A.C. Jugersoll. (McGraw Hills)
6. Journal of experiments in Hydraulic Laboratory by V. N. Rao & Husan New Heights.
7. Fluid Mechanics by Dr. M.L. Mathur (Std. Publications).
8. Taral Yantriki Avum Machinery (Hindi) by G.B. Bamanker. (Deepak Prakashan, Gwalior).

DME-402 THERMAL ENGINEERING

RATIONALE:

Mechanical engineers have to work with various power producing & power absorbing devices like boilers, turbines, compressors, pumps etc. In order to understand the principles, construction & working of these devices, it is essential to understand the concept of energy, work, heat & conversion between them .Hence it is important to study the subject of Thermal Engineering which is a core subject. It includes the study of various sources of energy, basic laws & concept of thermodynamics, gas laws, properties of steam & generation. Heat transfer forms the basis for different power engineering application. Boilers find application in different process industries. Steam turbines and condensers are the major component of any steam power plant. Mechanical engineer should understand working and application of these devices.

OBJECTIVES: THE STUDENTS SHOULD BE ABLE TO:

1. Know various sources of energy & their applications.
2. Apply fundamental concepts of thermodynamics to thermodynamic systems.
3. Understand various laws of thermodynamics.
4. Apply various gas laws & ideal gas processes to various thermodynamic systems.
5. Calculate properties of two phase system by using steam tables/ Mollier charts.
6. Explain construction & working of boilers, mountings & accessories.
7. Understand the working of I. C. Engines and its components.
8. Understand the working of steam turbine and use of nozzles and condensers.

COURSE CONTENT:

1. Dimensions and systems of units: Basic and Derived units for common engineering variables and properties like mass, length, time, temperature, area, volume, velocity, acceleration, force, pressure, work, heat, energy, power etc.
2. Sources of energy: Brief description of energy sources Classification of energy sources, Renewable, Non-Renewable, Fossil fuels, including CNG, LPG; Solar Energy- Its nature, merits and demerits, potential; Flat plate and concentrating collectors & their application. Solar Water Heater, Solar Air Heater, Photovoltaic Cell, Solar Distillation; Wind, Tidal, Geothermal, Biogas, Biomass, Bio-diesel, Hydraulic, Nuclear, Fuel cell - list of fuel cells
3. Basic Concepts of thermodynamics: Definition and importance of thermodynamics, thermodynamic system open, closed and Isolated system, boundary and surrounding forms of energy. Point and path functions, properties of system intensive and extensive properties thermodynamic state, thermodynamic process, cycles thermodynamic definition of work, heat and thermodynamic equilibrium, Zeroth law of thermodynamics, Quasi-static process, work done during Quasi Static process.
4. First Law of Thermodynamics: Concept of heat reservoir, heat source and heat sink, Statement of first law, Mathematical representation, applications of first law to open and closed system. Concept of internal energy and its calculation, relationship between heat transfer, work transfer and change in internal energy. Differentiation between shaft work, flow work and displacement work; Steady

flow energy equation and its application to various units such as boiler, nozzle, turbine compressor enthalpy.

5. Second Law of Thermodynamics: Limitation of first law. Statements of second law Kelvin, Planck and Clausius statements, Concept of heat pump, refrigerator and heat engine thermal efficiency. Parameters affecting thermal efficiency, means of increasing efficiency, COP. Equivalence and irreversible processes. Factors which make a process irreversible. Reversible cycle. Carnot cycle its efficiency and limitation ; Carnot theorem Clausius Inequality, concept of entropy, Principle of increase of entropy, determination of increase of entropy, principle of increase of entropy, determination of increase of entropy, Statement of third law of thermodynamics.

6. Ideal Gases and Gas Processes: Definition of an ideal gas, gas law, characteristics gas equation, specific and universal gas constants specific heat constant pressure and specific heat, constant volume. Ideal gas processes- isobaric isothermal, isentropic, polytropic and throttling process as applied to open and closed systems. Representation of these processes on P-V, T-S and H-S diagrams. Computation of change in enthalpy, entropy and internal energy. Net heat transfer and work done.

7. Thermodynamic Cycles: Air Standard cycles- definition and purpose standard efficiency, Carnot, Otto Diesel dual and Brayton cycles, their representation on P.V. & T.S. Diagrams. Derivation of air Standard efficiency and their comparison and limitation of each cycle. Vapour power cycle - Carnot cycle its limitation, Rankine cycle modified Rankine cycle- their representation on P.V.T.S. and H.S. Planes, derivation of expression for thermal efficiency.

8. Two Phase System: Pure substance phase, phase changes steam as a two phase system steam formation and its representation on temp- enthalpy plane. Properties changes, representation of wet dry and saturated and superheated steam on P.V., T.S. and H.S. planes. Dryness fraction of steam, methods of determination of dryness fraction separation and throttling calorimeter. Use of steam tables and Mollier's diagram . Determination of change in properties such as entropy enthalpy internal energy and work and heat transfer in the following processes- isobaric, isochoric, isothermal, isentropic, polytropic, throttling, and representation of various processes on P.V. and H.S. planes.

9. Steam Generators: Definition, classification, working of Babcock and Wilcox Boiler and Lancashire, Boiler Mountings and accessories.

10. Steam Nozzle, Condensers and Turbines: Steam nozzle and its use, Condenser-Classification, construction and working of surface condenser, Classification, working principle of steam turbines, difference between impulse and reaction turbine, compounding of steam turbine, velocity diagram (introductory and its use) Governing of steam turbine.

11. Internal Combustion Engines: Introduction, classification I.C. Engine Components and their function, working of two stroke and four- stroke cycle engines and their comparison. Indicator diagram, Calculation of IHP, BHP thermal efficiency, Mechanical efficiency and relative efficiency, Governing, Cooling and lubrication of I.C. Engines.

12. Heat Transfer: Modes of heat transfer; Conduction convection and Radiation. Fourier's law of heat conduction, temperature gradient, expression for determination of heat transfer across a flat plate, thermal conductivity and

thermal resistance. Newton's law for heat transfer by convection, free and forced convection. Heat transfer by radiation Stefan-Boltzmann Law of thermal radiation.

Define the terms- absorptivity, reflectivity and transmissivity; black body, emissive power, grey body.

Heat exchanger; Shell and tube, Plate type and their applications.

LIST OF EXPERIMENT:

1. Study and trial on solar water heating system.
2. Report on visit to wind power generation plant / biogas plant / hydraulic power plant.
3. Trace the flue gas path and water-steam circuit with the help of boiler model and write a report.
4. Study or Report on visit to sugar factory / Dairy / steam power plant with specifications of boiler and list of mountings and accessories..
5. Study of separating and throttling calorimeter.
6. Study of steam turbine.
7. Study of different types of I.C. engines (four stroke and two stroke C.I. and S.I.)
8. Study of various systems of I.C. engines.
    a. Fuel supply system
    b. Cooling system
    c. Ignition system
    d. Government system.
    e. Lubrication system
9. Study of
    a. Fuel pump
    b. Fuel injector
    c. Carburetor.
10. Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc.
11. Numerical on vapour processes and ideal gas processes (minimum two problems on each)
12. Two phase systems equilibrium diagram on p-v , T-s, h-s plane
13. Study of flow of heat in natural environment at least 10 cases and relation to second law of thermodynamics

REFERENCE BOOK:

1 Engineering Thermodynamics by P. K. Nag, Tata McGraw Hill Ltd.

2 Engineering Thermodynamics, C. P. Gupta, Rajendra Prakash.

3 Thermal Engineering by P.L. Ballani. (Khanna Publisher's N. Delhi).

4 A Course in thermodynamics And Heat Engines by Kothanandran, Khajuria and Arora (Dhanpat Rai & Sons Delhi).
5 Treatise On Heat Engineering by Vasandani & Kumar (Metropocitan Book Co. Ltd, New Delhi).
6 Thermodynamics by G.T. Van Wylen (john Wiley & Sons).
7 Thermodynamic And Heat Engines Vol . I & II by R. Yadav. (Central Book Depot, Allahabad).
8 Heat Power by Kashitish Chandra Pal (Orient Longman Hyderabad).
9 I S. 2986- 1966.
10 Tapiya Abhiyantriki (Hindi) by G.B. Bamankar (Deepak Prakashan, Morar Gwalior).

DME-403 THEORY OF MACHINES

RATIONALE:

The work of mechanical and production engineer is not only to supervise, run and plan production processes, but also include fault diagnosis and prevention of breakdowns. This can only be done, if he is familiar with the working of basic mechanism used on shop floors and in machines, how they fail and what are the loads coming on different members and different joints of the machines.

The aim of the course is to provide acquaintance of the basic mechanism and machines to the students. This will enhance their capability of fault diagnosis and of taking corrective measure, which in turn will reduce the down time.

COURSE CONTENT:

1. **Simple Mechanism:** Introduction of theory of machines, definitions- statics, dynamics, kinematics, kinetics, kinematic pair, kinematic chain, mechanism, machine inversions, relation between number of links, number of joints and number of pairs, Four bar chain and its inversion, Slider crank chain and its inversions.

2. **Velocity and Acceleration of Points and Links :** Angular and linear velocity, relative and absolute velocity, velocity in links. Instantaneous centre, locating instantaneous centre of rotation, velocity determination of four bar mechanism by relative velocity method, Acceleration of link centripetal and tangential, total relative and absolute acceleration. Velocity and acceleration diagrams for four bar and other mechanisms. Klein's construction for single slider crank mechanism. Analytical method of calculating the velocity and acceleration of piston in a reciprocating engine mechanism.

3. **Dynamic force analysis, Crank Effort Diagrams and Flywheel :**

   Dynamics of reciprocating engine mechanism. Inertia force due to reciprocating mass, piston effort crank effort, turning moment on crank shaft, Analytical and graphical methods of construction of turning moment diagrams for steam and I.C. engines. Fluctuation of energy and speed. Coefficient of fluctuation of energy and speed. Flywheel and its function . Calculation of moment of inertia. weight of flywheel for steam and I.C. engines.

4. **Brakes and Dynamometers:** Brakes - need, types, braking force, braking torque. band brakes, block brakes, internally expanded brakes, dynamometer-meaning, need and types . Simple numerical calculation on above items

5. **Power Transmission :** Drives : meaning, Classification, belt, chain, rope and gear drives. Flat and ' V ' belt, ratio of tensions . Slip length of belt calculation for open and cross belt drive. H.P. transmitted. Effect of centrifugal force, centrifugal tension, total tension maximum stress in belt. Maximum Power transmitted. Velocity for maximum H.P. condition. V-Belt drives, advantages and disadvantages of V-Belt drives. Rope Drives : Types, ratio of tensions, Designation of ropes as per B.I.S.

   Chain Drive : Classification, designation of chain drives as per B.I.S.

6. **Governors :** Functional difference with flywheel.

   Classification : Watt, porter, proell and hartnell- their contruction and working.

Sensitivity, stability, power and effort, hunting phenomenon and isochorisom of governor.

7. **Cams and Followers :** Need, Classification. motion of follower Displacement, velocity and acceleration diagrams uniform velocity, uniform acceleration and retardation. Simple harmonic motion. Cam profile for radial. offset knife edged follower.

8. **Balancing of Machine Parts:** Concept Static and dynamic balancing of rotating parts. Simple numerical problems on static balancing of several masses in single plane graphical and analytical method.

9. **Vibrations:** Introduction elements of vibration. System classification and explanation of the types of vibration according to the actuating force on the body like undamped vibration. Free damped vibration and forced damped vibration. Classification and explanation of the types of vibration according to the number of degrees of critical speed of shaft.

10. **Gear and Gear Train:** Introduction , classification of gears , gear terminology , law of gearing ,velocity of sliding , forms of teeth - cycloid profile teeth , involutes profile teeth, path of contact, arc of contact. Interference in involutes gear , minimum no of teeth in gear and pinion classification of gear train . Function of idler. Calculation of velocity ratio, train value of gear train- simple, compound epicyclic and reverted gear train, motor car gear box.

LIST OF EXPERIMENTS:

1. Study of inversions of four bar chain mechanism
2. Study of inversions of single slider crank chain mechanism (a) crank slotted lever mechanism (b) Whitworth quick return motion mechanism
3. Dynamic force analysis of single cylinder four stroke engine.
4. Study of flywheel
5. Study of governor
6. Study of different cam and follower
7. Study of different gear trains
8. Study of power transmission methods
9. Study of different types of break and dynamometer
10. Study of types of vibration and their measurement methods
11. Study of dynamic balancing procedure of rotating parts

REFERENCE BOOKS:

1. Theory of Machines by J.M. Shah & H.M. Jadhwani.
2. Theory of Machines by Abdulla Shariff
3. Theory of Machines by M.R. Malhotra & H.C. Gupta. (Technical India Pub.)
4. Theory of machines by P.L. Ballani .
5. Theory of Machines by Thomas Bevan .
6. Theory of Machines by S. S. Ratan.
7. Theory of Machines By R.S.Khurmi
8. Theory of Mechanism and Machine By Jagdish Lal.

DME-404 INDUSTRIAL MANAGEMENT

RATIONALE:

Diploma pass-outs are generally engaged in middle level management. It is found necessary to impart the diploma pass-outs at final year level certain concepts, principles, procedures and understanding of management techniques so that he is brought out to a fairly high level of competency in "supervisor-ship."

The course has two aspects - behavioral science and mathematical approach towards management.

Behavioral science includes communication skills, grievance handling, motivation, morale and leadership.

Mathematical approach includes PPC, CPM, PERT and Inventory management. It has been felt necessary to provide the students knowledge about newer trends in management like TQM, JIT, ISO and role of Computers.

It is hoped that the course will help the students to be successful in middle management role.

COURSE CONTENT:

1. **INTRODUCTION :** Definition and functions of management. Management theories - Decision, Quantitative, Mathematical and Behavioral Science.

2. **SYSTEM THINKING :** System definition and parameters. Different production and non¬production systems, system design, different types of models under system thinking.

3. **MATERIALS MANAGEMENT :** Introduction, function, purchase systems, stock turn-over, ordered quantity. Inventory, need of inventory control, EOQ and simple numerical problems on EOQ. Safety stock, different techniques of inventory control, ABC analysis (simple treatment only).

   Stores management - storing procedure and store records.

4. PRODUCTION PLANNING AND CONTROL : Production systems, characterstics of each type, production and consumption rate. PPC functions, Gantt chart, advantages and preparation of Gantt chart (simple cases only), Critical ratio scheduling.

5. VALUE ANALYSIS :Concept of cost and value, types of value, objectives and procedure of value analysis, VA test, DARSIRI method of VA.

6. PROJECT PLANNING BY NETWORK :Network definition, objectives. CPM and PERT, activity, event, network formation, Fulkerson's rule, dependency of activities, dummy activity, duration, EST, EFT, LST, LFT, EPO, LPO, Total float and Free float. Network analysis in tabular form.

7. INDUSTRIAL RELATIONS : Need, objectives and functions of personnel management, job analysis and job description, recruitment procedure, selection, difference between recruitment and selection, training and its advantages.

   Communication in industry - its need and importance, techniques and barriers of communication. Grievances - its meaning and factors responsible for grievances, procedure for handling grievances. Strikes and Lock-out. Motivation - meaning and its benefits, techniques of motivation. Morale - definition and

importance, factors responsible for high morale. Job satisfaction - factors influencing job satisfaction.

8. SUPERVISION AND LEADERSHIP : Meaning and role of Supervisor in an industry. Older workers and their supervision. Concept of Leadership, qualities of good leader, leadership styles.

9. ORGANISATIONAL DYNAMICS : Characteristics and principles of Organisation, Modern organisational approach, types of organisation, meaning and significance of various types of organisation, resistance to change, factors for reducing the resistance to change.

10. OPERATIONS RESEARCH : Definition and concept of OR, methods of OR, simple Linear Programming problem formulation and solution by Graphical method.

11. NEW TRENDS IN MANAGEMENT :

11.1 Role of computers in management, Introduction to Management Information System (MIS).

11.2 Total Quality Management (TQM) - Introduction, stages of development - Inspection, Quality Control, Quality Assurance, Total Quality Control, TQM.

11.3 Introduction to ISO-9000.

11.4 Deming's PDCA Cycle (Plan, Do, Check and Action).

11.5 Japanese Quality Management, culture, Kaizen Strategy (continuous improvement), Quality Circle, Just In Time (JIT) - concept and application.

REFERENCE BOOKS:

1. Learning Package on Industrial Management Publisher : TTTI, Bhopal.
2. CPM and PERT - Principles and Applications By L.S.Shrinath.
3. Indutrial Engg. and Management By O.P.Khanna. Khanna Publisher.
4. Industrial Organisation and Management By K.K.Ahuja.
5. Modern Production Operation Management By Buffa, Willey Eastern Ltd. (latest edition).
6. Production Operation Management By Goel B.S., Pragati Prakashan.

DME-405 ENTREPRENEURSHIP

RATIONALE:

Since long entrepreneurship has been recognized as an essential ingredient of economic development . Concept of entrepreneurship has varied from time to time to suit the changing ethos of socio-economic reality. It was applied to business for the first time in 18th century, to designate a dealer who buys and sells goods at uncertain prices. Later on an entrepreneur was considered a dynamic agent of change, or the catalyst who transformed increasingly physical, natural and human resources, into corresponding production possibilities. In recent years, managerial aspects of entrepreneurship are being emphasized. It employs innovativeness, an urge to take risk in the face of uncertainties, and intuition, i.e. a capacity of seeing things in a way which afterwards proves to be true.

The course is kept in soft core under DCS, DME and DEE/ Videography/ Arch/CDDM/ Garment/ MOM/ Prod/ RAC/ MOM/CTM/ Auto/ Comp/ ETE/ IT/ Opto/ Print/ Texttile technology to bring to surface certain common characteristics such as perception of economic opportunity, technical and organizational skills, managerial competence, and motivation to achieve result.

COURSE CONTENT:

1. INTRODUCTION TO ENTERPRENEURSHIP
    - Definition of Entrepreneur / Entrepreneur
    - Difference between Entrepreneurship / Entrepreneurship
    - Need for Entrepreneurship
    - qualities of successful entrepreneur
    - Myths about Entrepreneurship
    - Classification of entrepreneurs on the basis of different criteria
    - Reasons for the failure of entrepreneurs
2. INDUSTRIES AND BUSINESS ORGANIZATIONS
    - Concept of Industry or Enterprise
    - Classification of Industries

    (a) On the basis of capital investment
        a. Tiny (Micro) Industry
        b. Small Scale
        c. Medium Scale
        d. Large Scale

    (b) Others
        a. Rural Industry
        b. Cottage Industry

    (c) Forms of Business Organization

    (d) Proprietorship

a. Board & Co-operative
b. Partnership
c. Public Ltd.
d. Private Ltd.
e. IT Sector
f. Government Co-operative / Undertakings

(e) Tiny small scale Industry

a. Definition
b. Its significance in National Development.
c. Govt. policies for SSI promotions
d. Sector / Product for SSI.

3. INSTITUTIONAL ASSISTANCE

(a) Types of Institutional assistance

-Infra - structural assistance

-Technical Assistance

-Financial assistance

- Marketing Assistance

(b) Information / guidance & Training

- SISI - ASK
- MPCON - CSIR
- CED- MA - NRDC

(c) Infrastructure

- D/C - AVN/AKVN

(e) Finance

- SIDBI - KVIB MPFC
- NABARD - MPWDC NSIC

-M.P.A.V.V.N.

(d) Marketing

- MP- AGRO
- NSIC
- PM.LUN
- EXPORT COPPORATION
- KVIP
- MPHSVN

-MPLDC

(e) Quality Control

- BIS - FPO - MPLUN F.D.A.
- AG. MKT. Board

4. INCENTIVES / CONCESSION / FACITLITIES AVAILABLE
    - Seed money
    - Incentive / subsidies
    - Others (Phones, Lands etc)
5. PLANNING OF AN INDUSTRIAL UNIT (SSI)
    - Pre- Planning Stage
        - Scanning the environment
        - Market survey
        - Seeking information
        - product / project selection
    - Implementation Stage
        - PPR Preparation
        - DIC registration
        - Arrangement of Land
        - Arrangement of Power
        - Obtaining NOC / Licenses from various departments
        - DPR Preparation
        - Seeking financial assistance
        - Commercial Production
    - Post Implementation stage
        - Permanent registration from D.I.C.
        - Availing Subsidies
        - Diversification / Modification
        - Setting up of marketing channel / Distribution.
6. ACHIVEMENT MOTIVATION
    - Historical perspective
    - Concept of achievement motivation
    - Significance of achievement motivation
    - Development of achievement motivation
7. FINANCIAL MANAGEMENT OF AN INDUSTRIAL UNIT (SSI)
    - Tools of financial analysis
    - Ratio analysis
    - Fund Flow / Cash flow analysis
    - Working capital and concepts

- Financial accounting

PROJECT WORK/ASSIGNMENT:

1. To prepare chart to showing various factors affecting entrepreneurship.
2. To collect details related to various schemes run by the Govt. for Self-employment and Entrepreneurship.
3. To identify and select a project and conduct Market-Survey thereof.
4. To collect various formats used in industries & departments/institutions working in the field of entrepreneurship.
5. Visit few small scale industries situated in city, nearby industrial area.
6. Discuss the problems related to SSI (Small Scale Industries) with an entrepreneur.
7. Collect information about market rates quality and quantity of goods for their choice.
8. Develop logical and analytical approach to purchase the raw material / finished goods
9. To prepare case study of successful entrepreneurs.
10. Preparation of Project report for the industry/ Business they are willing to start.

REFERENCES:

1. Entrepreneurial Development Vol. I,II,III By Vasant Desai Himalaya Publication
2. CEDMAP(Center of Entrepreneurial development Madhya Pradesh).
3. Udyamita Vikas by Anand Prakashan.

SEMESTER-V

DME-501 PROCESS PLANNING, ESTIMATINGAND COSTING

RATIONALE

An engineer is supposed not only to design and produce a product in any industry, but also to give weight age for the economic factors. Knowledge of different manufacturing process only may not fulfils the need in field, but also to select the best process suiting to the technical and economic requirement of situation along with the right type of process selection. Estimation of material and manpower requirement and factors affecting the cost of production are other areas which are quite important from the production point of view. The curriculum of this course of process planning, estimating and costing has been designed to take care of these requirements.

CONTENT:

(A) PROCESS PLANNING:

1. INTRODUCTION TO PLANNING-

Process engineering, its scope and relation with product engineering and manufacturing, production system, types and characteristics.

2 SELECTING AND PLANNING THE PROCESS OF MANUFACTURE-

Function, fundamental rules for the manufacturing process, basic design of product, influence of process engineering on product design, rechecking specifications, how materials selected affect process cost, using materials more economically, material cost balance sheet, eliminating operations, combined operations, selecting the process tooling, availability of equipment, make or buy decisions.

3 DETERMINING THE MANUFACTURING SEQUENCE-

Operation, classifications and the manufacturing sequence, purpose of major process sequence.

4 OPERATION ROUTING –

Routing uses, routing descriptions.

CONTENT

1. ELEMENTS OF COSTS AND THEIR ALLOCATION :

Definition and objective of Estimating & costing, desirable conditions for a costing system, advantages of costing, elements of cost, , direct material cost, direct labour cost, direct expenses, prime cost overheads, indirect materials, indirect labour, indirect expenses administrative and selling expenses, analysis of total cost fixed cost and variable cost. Break even analysis.

2 DEPRECIATION:

Definition & Concept, causes of depreciation methods of depreciation calculation.

3 PROFIT:

Profit methods of increasing profit, effects of the methods on production, market and sales.

4 BUDGET :

Definition, departmental budget and purpose of budgetary control.

5 OVERHEAD ALLOCATION:

Definition and classification of overheads, methods of overheads allocation viz-direct material cost, direct labour cost, man hour rate and machine hour rate, selection of appropriate method limitation of various methods.

6 ACTUAL COST ESTIMATION:

Process Materials and Manpower - Terminology associated with estimation, Calculation of volume, weight and cost of materials.

7 MACHINE SHOP:

Process, Materials and Man power - Terminology used in machine shop estimation, use of standard table to determine time elements for various machining processes, use of formulas to calculate actual machining time for different operations of machine tools, Calculation of production operation time per product per cycle, batch production time.

8 WELDING SHOP:

Process, materials and Man-power Gas and Arc. Welding terminology, production operation time, labour cost, materials cost, cost elements, batch production cost.

9 FORGING SHOP:

Process, Materials and Man power - Forging gross and net weight of forging, forging losses, materials cost, labour cost and batch production cost.

10 FOUNDRY SHOP:

Process, Materials and Man- power - Pattern cost, production time for casting, material cost of casting, moulding cost, batch production time.

11 SHEET METAL SHOP ESTIMATION:

Sheet Metal shop labour cost, materials cost, production time in piece work.

REFERENCE BOOKS:

1 Cost Control by G. R. Sharma. (National Productivity Council)

2 Engineer' s Glude to Costing (Institute of cost works Accounts)

3 Mechanical Estimating And Costing by T.R. Banga and & S. C. Sharma (Khanna Pub.)

4 Mechanical Estimation and Costing by R.L. Shrimali & P.C. Jain (Jain Pub. House)

5 Mechanical Estimation And Costing. (Resource Persons of Hill Publishing Co. T.T.T.L, Madars Tata McGraw Hill)

6 Machine Shop Estimation by Nordoff .

7 Learing Packing In Costing And Estimating (T.T.T.I. Bhopal Publication)

8 Process Engineering For Manufacturing By Eary and Johnson (Prentice Hall)

9 Fundamentals of Process Engineering by Benjaman W. Nicbel, Alon & Ropy.

10 Produce Design And Process Engineering (McGraw Hill)

11 Yantriki Abhiyantriki Abhikalpan (Hindi) by K. D. Saxena. (Deepak Prakashan, Morar, Gwalior) .

DME-502 MACHINE TOOL TECHNOLOGY

RATIONALE:

The course "Machine Tool Technology" is of vital importance to practicing of exposing technicians. The course not only gives the opportunity of exposing the fundamentals, but also the latest developments. The focus has been cast to improve effectiveness of the course by introducing various industrial applications.

The accent at technical level should be upon practical and demonstration. Indeed equal emphasis has been placed on this by allocating most of the available time for this course to the practical in the workshop. The study of this course will enable the students to acquire the capability of solving complex problems in the field of manufacturing.

CONTENT:

1. INTRODUCTION :

Concept of machine tool technology, needs, area of use etc.

2. METAL CUTTING THEORY :

Stages in cutting, factors affecting cutting, types of chips, built up edge (BUE) formation conditions and effect upon surface finish, definition of cutting force, feed force, radial force with the help of merchant circle diagram. Power requirement for each type of force. Tool geometry and influence of tool angles, desirable properties of cutting tool materials and their influences on the choice of tool material.

Primary and secondary function of cutting fluids and properties of cutting fluids commonly used, types of cutting fluids. Cutting variables, tool wear and tool life. Taylor's tool life equation and cutting speed calculation. Economy of metal cutting.

3. LATHE:

Basic difference between centre, turret and Capston lathes, constructional details and specification. working principles and features of mechanical hydraulic and electrical copying system, rate of production, skill requirement, accuracy and cost of production. Working principles and types of automatic lathes, work holding and tool holding and tooling used for Capston and turret lathes, operation planning and tool layout for internal, external threading.

4 SHAPER, DRILLING & BORING MACHINE. SHAPER:

Construction, operation. application, Types of Drilling Machines, construction, operation and application, Horizontal and vertical boring machines constructional features, Jig boring machine, its construction, operation and application.

5. MILLING MACHINES:

Define milling, Classification of milling machines, Principles, parts and their functions, types of table movement in universal milling machine, specifications of milling M/C. Conventional and climb milling, different milling operations and their application, milling cutters and tool angles, specification and cutter materials, use of arbor, collets and adopters machine attachments, methods of mounting the cutter, work holding devices, dividing heads. Direct, simple and

differential indexing, selection of cutters, speed feed, procedure for setting up operations and inspections, maintenance of milling.

6. GRINDING MACHINES AND FINISHING PROCESSES :

Definition of grinding and cutting action in grinding, types of abrasive materials and their properties, binding materials, grinding wheel classification and standard marking system, conditions for selection of grinding wheels. Balancing of grinding wheels, glazing and loading, methods of dressing and tracing, Principles of working of grinding machines, types of grinding process, functions of tool and work holding devices, feed arrangement, table drive in surface and cylindrical grinders.

Types of lubricants and coolants used in grinding, grinding defects, their remedy and safety practices.

Definition of honing, lapping, super finishing methods, equipments involved, Materials used, tolerances obtained and limitations, applications of honing and lapping processes.

7. SPECIAL PURPOSE MACHINES:

Difference between forming and generation of gears, principle of gear shaping, hobbing and shaving, rate of production accuracy and limitations. Thread production : thread rolling and thread milling. Broaching Machines : Definition of Broaching, types of broaches, broaching machines, advantages and limitations.

8. JIGS AND FIXTURES :

Functions of Jigs and fixtures, 3-2-1 principle of location, Design criteria for simple jigs and fixtures.

9. MACHINE TOOL DRIVES :

Requirements of machine tools, elements of machine tools and their purpose Drive Systems : Stepped and step less drives, advantages and limitations of the gear box drives, function of feed box, types of feed gear boxes, working and advantages. Principle of straight line motion, multihandle, single lever and pre-selective control system.

10 PLASTIC MOULDING:

Types of plastic, Compression moulding, Transfer moulding , Injection moulding, Blow moulding, Vacuum forming, Extrusion.

LIST OF EXPERIMENTS:

S.No.	EXPERIMENT PRACT.
1.	Demonstration of formation of chips on a lathe, continuous, discontinuous and fractured by changing variables like rake angle, speed feed and depth of cut.
2.	Demonstration of built up edge on the finished tool point by changing speed and depth of cut while machining on a mild steel bar.
3.	Measuring of angles of a single point tool with reference to main plane with the aid of tin templates.
4.	Grinding of single point (H.S.S.) tools.
5.	Demonstration of preparing soluble oil cutting fluid and its use for improving the surface.
6.	Practice of taper turning and screw cutting on a centre lathe.
7.	Practice of making the pins or rivets of any size on a capstan lathe.
8.	Demonstration of making a flanged bush on a capstan lathe including setting.
9.	Practice of drilling, boring and reaming on a lathe.
10.	Practice of mounting cutters on the milling m/c and setting of m/s.
11.	Practice of up milling and down milling operation.
12.	Practice of cutting the spur gear on milling machine.
13.	Practice on a shaper square block on a shaper and milling machine (Comparison of surface produced).
14.	Surface grinding or tapping on a flat surface.
15.	Practice of cutting a helical gear on a milling m/c.
16.	Performance test of a lathe by making a long mandrel.
17.	Study of special purpose machines using web aid .
18.	Study of different machine tool drive using physical machines and web aid.

REFERENCE BOOKS:

1. Workshop Technology Vol. I & II by Hajra Chaudhary, (Media Promoters & Publishers Pvt. Ltd. Mumbai).
2. Workshop Technology Vol. I , II and III by W.A.J. Chapman, (ELBS).
3. Manufacturing Processes & Systems by Phillip F. Ostwald & Jairo Minoz (John Willey & Sons.).
4. Production Technology - HMT Handbook (HMT).
5. Production Technology by Jain Gupta, (Khanna Publishers, New Delhi).
6. Manufacturing Processes by Begeman Amstead, (Wiley.).
7. Manufacturing Processes by Rusinoff, (Tata McGraw Hill Publishing Co. Ltd.).
8. Advanced Manufacturing Technology by Kalpakjian (Addison Wesley).
9. Manufacturing Technology - Metal Cutting & Machine Tools by P.N. Rao(TMH).
10. Workshop Technology Vol. II by Bawa H. S. (TMH).
11. Manufacturing Science and Technology Vol. I & II. by Suresh Dalela (Umesh Publication).
12. Workshop Technology Vol. I and II by B. S. Raghuvanshi (Dhanpat Rai & Sons).
13. Production Technology by R. K. Jain (Khanna Publishers, Delhi).
14. Vijayvargiya P.N."Machine Tool" Shilp Vigyan (Hindi) (Deepak Prakashan, Morar Gwalior .)

DME-503 ENGINEERING MEASUREMENTS AND MAINTENANCE PRACTICES

RATIONALE:

This subject has earned its importance in the curriculum due to major activities of inspection department. Now a days in almost all factories search is going on for answer to the problems of production materials, design, improved machines, better way of making and assembling parts. Many of these answers are provided by Metrology through accuracy in production high standards of inspection, new and improved use of instrument etc. Metrology therefore is a fast growing, changing and increasingly significance field.

The other part of this subject is maintenance practices. Maintenance of machines prolongs their life as well as their performance. Well maintained machines minimize the breakdowns and production held-ups, thus help in achieving the production targets.

After going through this subject the students would be able to select a most appropriate instrument and make its use for particular application and also be able to maintain the production machines in healthy condition.

CONTENT:

1. INSPECTION:

Meaning and application of inspection, daily life examples of inspection, concept of inspection as applied in industries. Effect of absence of inspection in an industry. Classification of inspection, function, meaning and advantages of each concept of inspection applied to metrology. Definition & meaning of precision. accuracy and error, need of precision measurement in industry, relationship between cost and accuracy, Interchangeability and selective assembly.

2 GENERAL MEASUREMENT CONCEPT:

Limits, fits and tolerances, selection of fit, calculation of fundamental deviation, tolerance and limits, selection of limits, tolerances and allowances.

3 LINEAR MEASUREMENT:

Standards of length, classification and use of slip gauges, wringing process , precautions to be observed while using slip gauges, classification of linear measuring instrument, direct and indirect, construction and working of vernier callipers, micrometers, vernier height gauge, dial vernier and dial height gauge, finding least count, precautions. Dial gauge-types, construction, principle, accuracy and precautions, comparators - principle, types, working and field of application of Mechanical, electrical, optical and pneumatic comparators.

4 ANGULAR MEASUREMENT:

Need of angular measurement , various instruments used. Methods of measurement and field of application of protractor, angle gauges, Sine bars, spirit levels, clinometers and angle dekkor.

5 STRAIGHTNESS, FLATNESS, SQUARENESS AND ROUNDNESS TESTING:

General concept straight edge method, light gap and feeler gauge method, wedge method, use of V- Block and dial indicator for checking roundness.

6. SURFACE ROUGHNESS:

Definition of primary and secondary texture , CLA value, R.M.S value, Types of surface measuring instrument, Working principle of Tomlinson mechanical surface finish recorder .

7 SCREW THREAD MEASUREMENT:

Types of screw threads, threads nomenclatures, errors in screw thread, equipment required for measuring pitch, effective diameter and angle-procedure, advantages, limitation and precautions of each method.

8 LIMIT GAUGES:

Definition of gauge and gauging, necessity of gauging in industrial practice, types according to use (shop inspection and reference gauge), limit gauges for specific use - screw pitch gauge, template feeler gauge, working tolerance of gauges, maximum and minimum metal conditions to tolerance. Selection and specification as per IS 2251, 3455, 3484 Wear allowances and its selection for design, Taylor's principle for design of ' Go ' and ' No Go' gauges . Calculation of gauge dimensions form formula given in IS 3455 and selection of parameters necessary for calculation.

9 TRANSDUCERS:

Meaning, function, primary and secondary transducers. Classification-mechanical electrical, active, passive. Comparison of electrical and mechanical transducers, Working principle and application of resistance type, inductance type, capacitance type and piezo electric type.

10 TEMPERATURE MEASUREMENT:

Principle on which temperature measuring devices work- example of each type. Comparison of resistance thermometer and thermister. Thermocouple-Principle, material, and working. Working principle of optical and radiation pyrometers.

11. INTRODUCTION TO PLANT MAINTENANCE:

Introduction to maintenance, its need and scope, functions of the maintenance department. Different maintenance practices, procedure of corrective or break down maintenance, scheduled maintenance, preventive maintenance and predictive maintenance, methods of keeping records for condition of equipment, maintenance and replacement of parts, standard data for maintenance form, time standards (time to complete the maintenance job).

12 FAULT TRACING:

Trouble Shooting and Remedies, Sequence of activities in fault finding, methods and procedures of repair, various measures to prevent repetition of similar faults. Various remedial actions.

13 MAINTENANCE COST:

Definition, classification, Kelvin graph, procedures for obtaining cost data, maintenance cost control.

14 WEAR AND ITS EFFECT:

Definition of wear and types of wear, causes of wear, effects of wear on performance, wear reduction and component replacement.

15 LUBRICATION AND LUBRICATING SYSTEMS:

Need, properties of lubricant, selection criteria, principle of lubrication, centralized and decentralized lubrication systems, boundary, layer and hydrodynamic lubrication, use of greases and oil. Methods of preserving lubricants, handling of lubricants.

LIST OF EXPERIMENTS:

S.No. EXPERIMENT PRACT.

1. Study of application of various types of instruction.
2. Study of different type of fits with their practical application.
3. Study of Indian standareds IS: 919 recomanded for limit and fits.
4. Demonstration of selective assembly.
5. Demonstration of concept of interchangeability using different objects.
6. Measurement of diameter, length, thickness etc. Using different calipers and steel rule.
7. Measurement of various parameters of different objects using vernier caliper & Micro-meter .
8. Measurement of various parameters of different objects using combination set.
9. Build up gauage blocks to produce different dimensions.
10. Measure different angles using vernier protractor .
11. Measure of unknown angle with the help of a sine bar and a slip gauge set.
12. Measure different angles using angle gauges.
13. Check for flatness, and parallelism of an object using a dial indicator and surface plate.
14. Check for roundness of an object using a dial indicator and a V-block.
15. Examine the surface texture of the machined surface by a microscope.
16. Examine the surface roughness of a machined surface using Tomlinson surface meter .
17. Use of plug and ring gauges for checking holes and shafts.
18. Demonstration and explanation of different types of transducers.
19. Study of different types of pyrometers.
20. Visit of large/ medium/small scale industries for colleting the information regarding various measurement techniques and instruments .
21. Maintance practice on lathe and shaper m/cs .
22. Fault tracing and trouvel shooting on tube light , table fan, Room heater, hand drill m/c etc.

23. Measurement of wear on flat surfaces by Hydrostatic method.
24. Measurement of wear on cylindrical objects by micrometer and Dial indicator & V- block.
25. Lubrication practices on different machine tools.
26. Visit of large /Medium /Small scale indidustries for collecting information regarding record keeping for condition of equipment , maintenance scheduling & various practices , lubrication plan , tools & equipments used , safety measure etc.,

REFERENCE BOOKS:

1. Engineering Metrology. by R.K. Jain (Khanna Pub. Delhi).
2. Engineering Metrology. by I.C. Gupta (DANPAT RAI & SONS).
3. Inspection & Gauging by Kennedy (The Industrial Press, 93, Wortinstreet, New york).
4. Engineering Metrology by K.J. Hume. (Macdonald & Co. Ltd. London)
5. Practical Metrology by K.J. Hume. (Macdonald & Co. Ltd. London)
6. Hand book of Industrial Metrology by R.S.T.M.E. (Prentice Hall of India)
    a. Metrology & Gauging S.A.J. Parsons. . (Macdonald & Erass . Ltd. London)
7. Industrial Instrumentation by D.P. Eckman (Wiley Easter Ltd. New Delhi)
8. Measurement Techniques in Mechanical Engineering by R.J. Sweeny
    a. (jon wiley & Sons, New York Addson Wesley Pub. London)
9. Mechanical Measurement by Becjwith Buck (Addson Wesley Pub. London)
10. Instruments for Measurement Control by W.G. Holzbock (Rainold Pub. Co-operation)
11. Mechanical & Industrial Measurement R.K. Jain (Khanna Publishers New Delhi)
12. IS Code: 2986, 5979, 5876, 5939
13. Maap Vigyan Avum Yantrikaran (Hindi) by Yogendra Varshneya. (Deepak Prakashan, Morar,Gwalior)
14. Industrial maintenance - H.P. Garg (S. CHAND & Company Ltd)
15. Accident Prevention Manual For industrial Operations by Frank E. McElroy, P.E., C.S.P. Editor in Chief National Safety Council Chicago, U.S.A.
16. Accident Prevention Manual For Administration And Programs.
    a. By Frank E. McElroy, P.E., C.S.P. Editor in Chief National Safety Council Chicago, U.S.A.
17. Commentary on Factories Act with M.P. Rules by Krishanlal Sethi (The law-years Home Indore -7)
18. Industrial Accident Prevention by H.W. Heinrich (Mc Graw Hill Book Company, INC)
19. An Introducton to Safety Engineering and Management by N.V. Krishnan (CPS Pub. Pvt. Ltd. Calcutta)
20. aintenance of Industrial Equipment by B. Gelberg, G. Peklis.

21. Guide to Efficient Maintenance Management by H.V. Mstwatt.
22. Modern Maintenance Management by Miller and Bood.
23. Maintainability by Benjamin S. Blanshard, E. Edward, Lowery
24. Maintenance Engineering Hand Book by Morrow.
25. Repair of Industrial Equipment by B. G. Edberg, G. Peklis.
26. Sanyantra Anurakshan Avum Suraksha Abhiyantriki (Hindi) by Yogendra Varshney (Deepak Prakashan, Morar, Gwalior)

DME-504 MODERN PRACTICES IN MANUFACTURING AND MANAGEMENT

RATIONALE:

Innovations and improvements are a continuous process. Apart from basic understanding of principles of Engineering and conventional practices, a Diploma Engineer is also required to be exposed to recent developments and concurrent practices in the fields of manufacturing. In the recent past there has been a significant change in approach in industry in the form of emphasis on Quality systems to increase the productivity and profitability. It has now become necessary to adapt proper quality management system to compete and survive. In this course introduction to recent manufacturing practices and management approaches is outlined.

PART - I
MODERN PRACTICES IN MANUFACTURING

CONTENT:

1. Unconventional Machining Methods: Limitations of conventional machining. Working Principle, operating parameters and application of unconventional machining. Electro Chemical Machining, Chemical Machining, Electric Discharge Machining, Electron beam Machining, Ultra Sonic Machining, Abrasive Jet Machining, LASER Beam Machining, Plasma Arc Machining.
2. Coating & Deposition processes: plating & related processes, physical vapor deposition, chemical vapor deposition, Organic Coating.
3. Rapid Prototyping: Need, Fundamentals, Technologies and applications.
4. Manufacturing Automation: Introduction to Numerical control, Computer Numerical control, Direct Numerical Control, CNC Millings M/c, CNC Turning M/c, Turn mill centers, flexible manufacturing system, Preliminary idea of robotics. Introduction to G and M code as used in part programming. Use of Canned cycles. Simulation of parts, drawing generated through CAD, its modeling and transfer.
5. Flexible Manufacturing systems: Elements, Limitations, Feature & Characteristics, New development.
6. Robotics: Introduction to robotics, concept, and application, A4 level automation
7. Total Quality Management (TQM)-Evolution, definition, preparation stages in TQM implementation, Integrated TQM model, costumer satisfaction, Employee involvement. Continuous Process Improvement, 5s, Kaizen, and KANBAN, Supplier Partnership, Performance Measures. Just in Time systems (JIT) - Introduction, application and advantages
8. Total Productive Maintenance (TPM)- Introduction, Plan, New Philosophy Improvement needs, Six Major losses Life cycle costing, work groups.

PART - II
MODERN PRACTICES IN MANAGEMENT

CONTENT:

9 INTRODUCTION TO QUALITY STANDARDS:

ISO 9000- Introduction History, Indian Equivalence, System requirements for ISO 9001, 9002,9 003, steps for installation, How to apply. QS 9000 Quality Management systems.

ISO 14001- Introduction, Environment Management system, Background, vocabulary and Application.

OHSAS 18001- Occupational Health and Safety Assessment Series Introduction, scope, related terms, structure and operating features.

TS 16949 - Quality system certificate consisting following standard.

a. APQP - Advance product quality planning.

b. FMEA - Failure mode and effect analysis.

c. MSA - Measurement system analysis.

10. Lean manufacturing : System design for Lean manufacturing adopting.

11. Why Why analysis (5W 1 H) : Use of Why Why analysis to know the actual cause of failures and problems.

12. Six Sigma systems: Basics of Six Sigma, competitive advantage of implementing six sigma systems. Briefs of what, why and how six sigma works to initiate and sustain greater productivity, profitability and customer satisfaction rates.

LIST OF PRACTICALS:

S.No. PRACTICAL WORK PRACT.

1. Visit to a nearby installation / Study and practice at least two of the following:

   a. ECM

   b. CM

   c. EDM

   d. EBM

   e. USM

   f. Laser and Beam Machining

   g. Abrasive Jet Machining

   h. Plasma Arc Machining

2. Visit to a nearby installation having coating facilities/practical on coating process.

3. Visit to a nearby installation / Study and practice at least two of the following:

   a. NC

   b. CNC

   c. DNC

d. CNC Milling

e. CNC Turning

4. Manual part programming (for simple jobs) on a CNC Milling or Turning machine.
5. Visit to a nearby factory and estimation of six major losses on the critical machine.
6. Prepare a plan for getting ISO 9001 Certification for an Industry.
7. Seminar on TQM Philosophy, TPM.
8. Seminar on Six Sigma practice.

REFERENCE BOOKS:

1. Fundamentals of Manufacturing processes , G. K. Lal & S. K. Choudhary, Narosa Publishing House.
2. A Text book of production Technology (Manufacturing Processes) by P.C. Sharma, S. Chand & Co.
3. Manufacturing Technology Vol. II By P.N. Rao, Tata McGraw Hill Publishing Co.
4. Fundamentals of Modern Manufacturing By Mikell P. Groover, Wiley Student Edition.
5. Quality Management By Donna C.S. Summers Pearson Prentice Hall
6. Total Quality Management By L. Sugandhi & Anand A. Samuel Prentice Hall of India Pvt. Ltd.

DME- 505 INDUSTRIAL ENGINEERING

RATIONALE:

Industrial engineering is such a subject which can significantly contribute towards the cost-saving and help in increasing the productivity. Adequate opportunities have been planned for the technician to apply theory to solve practical/ simulated industrial problems.

The course is kept under applied technology with a view to appreciate the changes and alternation proposed by Industrial engineering for shop floor methods and process.

CONTENT:

1. **Introduction:** Definition of industry and industrial engineering, scope and role of industrial engineering fields of applications.

2. **Productivity:** Production and productivity, production systems and their impact on productivity, its significance and benefits of higher productivity. Long term and short term factors affecting productivity, productivity cycle.

3. **Work Study:** Introduction, its relation with productivity aims, objectives and application of work study, basic procedure and techniques of work study . Human factors in work study. Role of manager, supervisor and workers. Working conditions, environment of industry affecting work study.

4. **Method Study:** Definition objectives, basic procedures of methods study. Recording techniques, operation process chart, flow process chart, machine chart, flow diagrams, string diagrams, two hand process charts, questioning technique procedure to develop, install and maintain new methods.

5. **Principles of Motion Economy:** Meaning, basic rules design of efficient work place- layout, classification of human body movements and their preferred order.

6. **Material Handling and Plant Layout :** Importance and its effects on productivity, requirements of good material handling system, classification and selection of material handling equipment. Requirements of good layout.

   Effect of bad layout, Factors affecting plant layout, types of layout, advantages and limitations of each type of layout selection of layout, factors affecting the plant location.

7. **Micro Motion Study:** Definition and objectives, techniques of micromotion study, therbligs and their symbols, use of therbligs, SIMO chart and its application.

8. **Work Measurement:** Definition, Basic procedure and technique to work measurement. Stop watch time study, types of stop watch study, factors considered in selecting a job for time study, qualified and representative workers, procedure of stop watch time study, job element and their need of identification, general rules for breakdown of job into elements, work cycle, methods of time measurement, performance rating, its meaning, standard rating, rating of operators, conditions for operators variation at work place rating scales, rating factors, calculation of basic time. Allowances- purpose, types. Calculation of standard time synthesis method- meaning, data, complication, advantages and limitations.

   PMTS- Definition principle and use, calculation of standard time.

MIM - Meaning, tables and use. Application of MIM analysis for LH-RH charts, calculation of standard time.

Work/ Activity Sampling: Definition, statistical basics, determination of number of observation for given accuracy, sources of error, application and calculation of standard time.

9. **MOST Technique for work measurement:** Definition of terms, concept of the MOST, Basic MOST sequence models, Time Units, Parameter Indexing, Method Accuracy and Sensitivity, Levels of Work Measurement, Compatibility of MOST systems, Application of MOST.

10. **Job Evaluation, Wages and Incentives:** Definition, need and scope of job evaluation. Job evaluation systems and their comparative merits and demerits and limitations.

    Wage: Definition, wage components, wage fixation, real, minimum and fair wage. Financial and non- financial incentives and their examples. Wage plans- Halsey, Taylor, differential plan, Gantt task and bonus plan, 100 % premium plan.

11. **Statistical Quality Control:** Definition of quality and total quality, three stages of quality, quality control and SQC, difference between inspection and quality control, concept of variability, natural variation, its importance to quality control, classification of quality, characteristics, basic tools of SQC and their application, frequency distribution, measures of central tendency and dispersion, their need and calculations.

    Normal Curve : Definition, characteristics, calculation of area under normal curve and its application, statistical tolerance their calculation and application. Process capability meaning calculation and use.

12. **Control Charts for Variables:** Statistical basic for control Charts for variables, construction of X and R Charts- their interpretation, use of X and R chart in establishment of process capability.

13. **Control Charts for Attributes:** Limitation of X and R charts, Meaning and use of attributes, their advantages, Calculation, construction, interpretation and application of p- chart, c- chart, ph-chart. Need of calculating the revised values of mean, and control limits and their calculation.

14. **Acceptance Sampling:** Meaning different techniques procedure involved sampling inspection meaning and comparison with 100 % inspection. Factors affecting sampling and their effects. Single and double sampling plans, use of IS codes.

    O.C. Curves : Meaning, terms used, their definition, construction and use of O.C. curves. Selection of sampling plans.

15. **Reliability:** Definition quality control and reliability factors affecting reliability of product. Measures to ensure reliability of product, effect of product reliability marketing.

    M.T.B.F and M.T.T.F. Definition programme for reliability. Maintainability and availability.

LIST OF EXPERIMENTS:

S.No. EXPERIMENT PRACT.

1. Preparation of flow process chart for existing and improved process.
2. Preparation of man and machine chart for existing and improved process.
3. Preparation of L.H. and R.H. charts for existing and improved process.
4. Use of decimal minute watch.
5. Performance rating.
6. Establishing standard time for given operation using time study techniques.
7. Use of Shewharts bowl and actual production for frequency distribution.
8. Preparation of X and R charts.
9. Preparation of p- chart and c- chart.
10. Work measurement using MOST.
11. Acceptance sampling by attributes (single and double sampling plans)
12. Determination of the percentage utilization of equipment (work sampling) .
13. Application of principals of motion economy.

REFERENCE BOOKS:

1. Introduction To Industrial Engineering by Philip Hicks (McGraw Hills).
2. Productivity Means Property (Asian Productivity Organisation, Tokyo).
3. Introduction To Work Study (International Labour Office).
4. Work Study by M.D. Schmid & Subrammaniam.
5. Motion and Time Study by Ralph M. Barnes John Willey New York.
6. Work Study by Dalela.
7. Wage Administration by D.K. Roy. (N.P.C. Publication).
8. Quality Assurance Engineering by M.D. Schmid & Subramaniam.
9. S.Q.C. by E.L.Grant.
10. S.Q.C. by R.C. Gupta.
11. Industrial Engineering & Management by O. P. Khanna.
12. Industrial Engineering by Saxena.
13. MOST Work Measurement Systems, Kjell B. Zandin, Marcel Dekkar Inc. New York
14. Material Handling Equipment (N. Rudenki Place Pub).
15. Learning Package In Industrial Engineering by O.D.C. , T.T.T.I Bhopal .
16. Laboratory Manual Industrial Engineering by O.D.C. , T.T.T.I Bhopal .
17. Audyogiki Abhiyantran (Hindi) by J.C. Varshneya. (Deepak Prakashan, Gwalior).
18. Audyogik Engineering (Hindi) by K.D. Saxena . (Deepak Prakashan, Gwalior).

DME-506 PROFESSIONAL ACTIVITIES

RATIONALE:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests. While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and their attitude, in addition to basic technological concepts.The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

OBJECTIVES:

Student 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

CONTENT:

1. INDUSTRIAL VISITS:

Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries : Sugar Factory / Dairy / Chemical Industry / Thermal Power Plant .

i) Machine shop having CNC machines.

ii) ST workshop / Auto service station.

iii) City water supply pumping station.

iv) Manufacturing unit to observe finishing and super finishing processes.

2 **LECTURES BY PROFESSIONAL / INDUSTRIAL EXPERT LECTURES TO BE ORGANIZED FROM ANY TWO OF THE FOLLOWING AREAS:**

Interview Techniques.

Modern Boilers - Provisions in IBR

Applications of Sensors and Transducers

Alternate fuels - CNG / LPG , Biodiesel, Ethanol, hydrogen

Piping technology

3 **INFORMATION SEARCH :** Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic. Following topics are suggested :

(i) Engine lubricants & additives

(ii) Automotive gaskets and sealants

(iii) Engine coolants and additives

(iv) Two and Four wheeler carburetor.

(v) Power steering

(vi) Filters

(vii) Different drives/Transmission systems in two wheelers.

(viii) Types of bearings - applications and suppliers.

(ix) Heat Exchangers

(x) Maintenance procedure for solar equipment.

Tools holder on general purpose machines and drilling machines.

4. STUDENT ACTIVITIES :

The students in a group of 3 to 4 will perform any one of the following activities (others 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.

(iv) Draw orthographic projections of a given simple machine element using and CAD software.

5 SEMINAR :

Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes).

6 MINI PROJECT / ACTIVITIES : (ANY ONE)

(a) Prepare one model out of card board paper / acrylic / wood / thermocol / metal such as : (i) Elliptical Trammel (ii) Pantograph (iii) Coupling (iv) Cams and Followers (v) Geneva mechanism

(b) Dismantling of assembly (e.g. jig / fixtures , tool post , valves etc.) Take measurement and prepare drawings / sketches of different parts.

(c) Make a small decorative water fountain unit.

(d) Toy making with simple operating mechanisms.

BOOKS:

No	Author	Title of the book	Publisher
1	Marshall Cooks Adams	Time management	Viva Books
2	E.H. Mc Grath , S.J.	Basic Managerial Skills for All	Pretice Hall of India, Pvt Ltd
3	Allen Pease	Body Language	Sudha Publications Pvt. Ltd.
4	Lowe and Phil	Creativity and problem solving	Kogan Page (I) P Ltd
5	by Adair, J	Decision making & Problem	Orient Longman

		Solving	
6	Bishop , Sue	Develop Your Assertiveness	Kogan Page India
7	Marion E Haynes	Make Every Minute Count	Kogan page India
8	Steven L McShane and Mary Ann Glinow	Organizational Behavior	Tata McGraw Hill
9	Stephen P. Robbins	Organizational Behavior	Pretice Hall of India, Pvt Ltd
10	Michael Hatto	Presentation Skills	(Canada - India Project) ISTE New Delhi
11		Stress Management Through Yoga and Meditation	Sterling Publisher Pvt Ltd
12	Richard Hale ,Peter Whilom	Target setting and Goal Achievement	Kogan page India

INTERNET ASSISTANCE:

1. http://www.mindtools.com
2. http://www.stress.org
3. http://www.ethics.com
4. http://www.coopcomm.org/workbook.htm
5. http://www.mapfornonprofits.org/
6. http://www.learningmeditition.com http://bbc.co.uk/learning/courses/
7. http://eqi.org/
8. http://www.abacon.com/commstudies/interpersonal/indisclosure.html
9. http://www.mapnp.org/library/ethics/ethxgde.htm
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. http://members.aol.com/nonverbal2/diction1.htm
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. http://snow.utoronto.ca/Learn2/modules.html
14. http://www.quickmba.com/strategy/swot/

SEMESTER-VI
DME-601 DESIGN OF MACHINE ELEMENTS

RATIONALE:

The course includes the study of various aspect of design and how object fails during working. After studying this subject student must be able to design the various component of machine in actual working condition.

The aim of the course is to provide acquaintance of the basic load impacts and failure modes to the students. This will enhance their capability of fault diagnosis and of taking corrective measure, which in turn will reduce the down time.

CONTENT:

1. **Introduction to Machine Design:** Machine and machine elements, bolt, nut, axle, shaft, bearing, coupling, clutch, belt, rope, chain, gear etc. Specific purpose of piston connecting rod, crank shaft, turbine blade etc. Factors influencing design of machine elements - Strength stiffness, light weight, wear resistance minimum size, availability, processebility, safety, compliance with standards. Basic design procedure. Selection of mechanism, material, shape and size. Preliminary design, applying checks, revision of design final design. Factors influencing selection of materials. Type of failures, types of forces. Types of loading. Safe design stress and factors of safety.

2. **Design of Machine Elements Subjected to Direct and Shear Loads:** Introduction members subjected to direct loads - bolt, column, rod, cotter and knuckle joints, members subjected to shear loads rivet, cotter knuckle pin, root of threaded bolt, coupling, bolt, key. Function, application and design of knuckle and cotter joint.

3. **Design of Machine Elements Subjected to Bending Moment, Twisting Moment and Combined Bending and Twisting Moment:**

   Introduction to pure bending, fundamental equation of pure bending viz :

   $M/I = f/y = E/R$

   Design of shaft, key, flange coupling, leaf and helical spring, pulley arms, axle

4. **Design of Riveted Joint:** Type of fastening - temporary and permanent, types of riveted joint - lap and butt joint, definition of common terms like pitch, back pitch, efficiency, margin. Modes of failure of riveted joints.

5. **Design of Simple Welded Joints:** Definition of welding advantages of welding over riveted joints, types of welded joints, strength of the butt weld, types of fillet joints and strength of fillet joint problem solving.

6. **Design of Threaded Joints:** Types of threads and their proportions, Types of bolts, proportion of nut and bolt dimensions, design of bolt, designation of threads as per I.S. codes.

7. **Design of Clutch:** Pivots and Collars friction. Horse power lost assuming uniform pressure and uniform wear. Clutch- need, classification and construction and working of single and multi plate clutches, horse power transmitted by single and multi plate clutches.

8. **Selection of Rolling and Sliding contact Bearing:** Types of rolling contact bearing , Ball bearing Roller bearing, bearing designation, bearing installation.

Application of bearing. Basic principle of Hydro dynamic and Hydro static bearing. Bearing modulus and Bearing characteristics number.

REFERENCE BOOKS:

1. Machine Design by Sharma and Agrawal.
2. Machine Design by R.K. Jain.
3. Machine Design by Shigley..
4. Machine Design by R S Khurmi
5. Introduction to Machine Design by Bhandari Tata Mcgraw Hill
6. Machine Design by Pandya and Shah

OPTIONAL (ANY ONE)
DME-602 AUTOMOBILE ENGINEERING

RATIONALE:

In the last thirty years, there have been many important developments in the automotive vehicles. The automobile industry is getting momentum and requiring trained personnel. To meet the growing need of automobile industry, this course is kept under elective category of diploma in mechanical engineering based on semester system.

The Course will provide opportunities to students to understand the theoretical background of auto vehicles and will help in starting an automobile service enterprise or enter in automobile industry.

CONTENT:

1. **Introduction:** Meaning of automobile, elements of automobile, classification of automobile, layout of chassis, various operating systems used in automobile.

2. **Auto Engines**: Meaning of I.C. Engines, Classification on the basis of cycle, fuel used, ignition system, number of cylinders, number of strokes etc. Otto/ Diesel cycles. Two stroke and four stroke engines, merits and demerits, scavanging comparison of petrol and diesel engines. Cooling systems, firing order. Valve timing diagrams. Engine rating. Lubrication, factors affecting lubrication, Lubrication systems, Fuel Supply system, fuel pump - SPU electric pump. Carburettor, air fuel ratio, Solex and amal carburettor.

3. **Auto Electric System**: Wiring diagram of a car and functions of various components used in the electric circuits, function and working principle of a starter and generator, function of voltage- current regulator, ignition timing, spark plugs- their classification, gap setting and common ignition troubles, their causes and remedies . Automobile battery - construction and working, electronic ignition system of modern vehicles.

4. **Transmission System**: Clutch : necessity, function of its components, Types -single & multi plate and centrifugal clutches, cluth actuating mechanism and fluid flywheel.

   Gear Boxes : necessity, Types of gear boxes and their working. Importance of gear shifting mechanism, gear box troubles, their causes and remedies.

5. **Final Drives System**: Drive mechanism in cars, purpose and working of propeller shaft, construction of propeller shaft. Types of universal joints.

   Rear axle assembly : function of differential - constructional features and working. Arrangement of semi floating and fully floating rear axle, and their troubles.

6. **Braking system:** Introduction, classification of brakes, construction & working of mechanical brake, hydraulic brake, Electric brake , advantages and disadvantages of each type of brakes, Servo brake system.

7. **Front Axle and Steering:** Function of front axle, axle type, wheel alignment and its elements toe- in, toe -out. King pin inclination. Ackerman steering principle. Camber and castor angle . Elements of steering - types and working ,Under and over steering, power steering and advanced steering systems.

8. **Frame and Suspension**: Frames : necessity, function, Classification, suspension system, types, leaf, coil spring. Telescopic shock absorber. Air suspension, independent suspension system.

   Tyres : structure of tyre section, rating of tyres, tyre- pressure measurement, material and specification. Tyre wear and remedies.

9. Miscellaneous:

(i) Maintenance of Vehicles : need, classification maintenance procedure of engine, transmission system, electrical system, braking system and steering mechanism.

(ii) Garage and Service Station: Types, layout, equipment tools and service procedure.

(iii) Exhaust Gas, Pollutants: Their hazards and controls with reference to motor vehicle act. Motor Vehicle act, registration of vehicles, driving license and Traffic Signals.

LIST OF EXPERIMENTS:

S.No. EXPERIMENT PRACT.

1. Study of automobile chassis and function of various components.
2. Study of various components used in auto vehicles.

   (a) Engine (b) Transmission system (c) Final Drive (d) Braking system (e) Electrical system (f) Steering Mechanism.
3. Study of various elements of scooter/ car/bus servicing.
4. Engine tuning and adjustment for smooth, idle speed of a scooter/moped/ motor cycle/ car etc.
5. Starting troubles and their rectifications.
6. Rectification procedure for :

   (a) Air bleeding. (b) Brake adjustment. (c) Problems in Carburettor. (d) Wheel alignment.
7. Battery, servicing and charging.
8. Repair of punctured tyre and re-treading of tyres.
9. Study of auto servicing centre.

   (a) Layout (b) Instruments/ Tools used (c) Servicing procedures.
10. Visit of a local auto service centre and prepare a report in respect of

    (a) Layout (b) Instruments/ Tools used (c) Servicing/ Reconditioning/ Maintenance procedure.
11. Collect specifications for 2/3/4 Wheeler and prepare a comparison table and their manuals.

REFERENCE BOOKS:

1. Automobiles Engineering Vol. I & I I by Dr. Kirpal Singh. (Standard Publisher).
2. Automobiles Engineering by R.S. Gupta (Satya Prakashan).
3. Automobile machanism by Joseph Heither.
4. Automobile Engineering by R. P. Sharma (Dhanpat Rai & Sons).
5. Automobile Mechanism by William H. Crouse.
6. I.C. Engines by Dr. A.C. Rad and S.B. Bechar.
7. Automobile Engineering- T.R. Banga & Nathu Singh (Khanna Publicers).
8. Automobile Engg. - RB. Gupta.
9. Automobile Engg. - K.M. Agrawal (Vol. I & II).
10. Automobile Engineering by Prof. S.M. Pande and K.K. Jain (Deepak Prakashan, Morar Gwalior).
11. IS: 202-1602-1960 Code for testing of variable speed I.C. Engines for automobile purpose.
12. IS: 1603-1960 Performance of variable speed I.C. Engines for automobile. purpose.
13. IS : 1634-1964 Helical springs for automobile suspension.
14. IS : 2742-1964 Automobile brake lining.
15. IS : 3511-1966 Cylinder bore diameters for I.C. Engine.
16. IS : 4552-1963 Portable Jacks for automobile, Mechanical and hydraulic.
17. IS : 5423-1969 General requirements for hydraulic shock absorbes for automobile suspension, direct acting telescope type.
18. IS : 5791-1970 Technical supply conditions for piston ring for IS. Engines.
19. IS : 4974-1963 Grease nipples, small
20. IS : 844-1962 Screw drives.
21. IS : 2028-1963 Open jow Spanners.
22. IS : 2030-1971 Box Spanners.

OPTIONAL (ANY ONE)
DME- 602 CAD/ CAM

RATIONALE:

Computer based numerically controlled machine tools are increasingly finding place in industries. Further integration of the computer Aided Design Drafting (CADD), Which has been in use in the industry for some years now, with (CAM) Operations has lead to efficient product design & prototyping and shorter production runs. The need to absorb, CAD/ CAM technology for its effectives has, therefore, become imperative.

This course is being introduced as elective course of diploma programme in mechanical engineering. The course aims at developing appreciation of the use of CAD/CAM environment, its Components, their functions, and methods of using the existing CAD/ CAM software, in general, with a view to improve efficiency in drafting and designing.

CONTENT:

1. Introduction to CAD/ CAM :

(i) Automation and its types

(ii) Definitions : CAD,CAAD CAM, CIM and CAE

(iii) Concept of CAD/CAM

(iv) Computers in industrial Manufacturing

(v) General Design procedure and application of computers in it.

(vi) Benefits of CAD/CAM.

2. Hardware of CAD/CAM System:

(i) Basic structure

(ii) Hardware components of CAD workstations and their functions: CPU, Memory devices, input devices, display devices, output devices and storage devices

(iii) Hardware components of CAM system and their functions: CNC controller and CAD interfacing, CNC components. Conveyers and robot units.

(iv) Functions of each hardware unit in CAM.

(v) Block diagram of integrated CAD/CAM system.

3. Introduction to CAD software:

(i) Block diagram of graphics software configuration.

(ii) Functions of a graphic package.

(iii) 2D transformation translation, rotation and scaling with numerical examples.

(iv) 3D Modeling: Wire frame and solid type.

4. Introduction to Conventional Numerical Control:

(i) Definition of NC

(ii) Basic components of an NC system : Program, MCU and Machine tools

(iii) The NC procedure

(iv) NC coordinate systems, fixed zero and floating zero, Absolute and incremental positioning

(v) NC motion control systems

(vi) Components of MCU, Open and closed loop axis positioning systems

(vii) Applications of numerical control in Machine Tools

(viii) Advantages of NC systems

5. Introduction to NC Programming:

(i) NC Part program and different codes used in it: N,G,M,F,S,T codes and co-ordinates

(ii) Writing Program blocks using NC program codes

(iii) Manual and Computer assisted part programming

(iv) Introduction to NC part programming languages like APT Different statements in APT language and writing program through it

6. NC Control technology:

(i) Different type of computer controls : CNC, DNC and Adaptive

(ii) General Configuration, functions, and advantage of CNC, straight and hybrid CNC

(iii) General Configuration, types, functions, and advantage of DNC, BTR and Special Machine control unit DNC

(iv) Introduction, types and benefits of adaptive control, ACC and ACO systems

LIST OF EXPERIMENTS:

1. Study of CAD Hardware system using physical and visual aid.
2. Auto CAD commands and their applications in various types of designs/ drawings. ten/fifteen experiments.
3. Solid modeling using parametric software
4. Demonstration of CNC machine for identifying machine zero, drive systems, safety precautions, and dry run of demo part programme
5. Tool setting, Job setting , part programme execution on CNC machine.
6. Material job handling using Robot system and conveyor assembly.

REFERENCE BOOKS:

1. CAD/CAM Computer- Aided Design and Manufacturing by M.P. Groover, & E.W. Zimmer, Sr. (Prentice-Hall of India pvt. Ltd. (EEE), New Delhi, 1986).
2. Inside Auto CAD by Deniel Raker and Harbest Rice (BPB Publications, Delhi (Latest edition).
3. Introduction to Computer Aided Drafting by Donald D. Voisinet (2nd fd.) McGraw Hill.
4. BPB Publications, Delhi. by Mastering Auto CAD (BPB Publications, Delhi).
5. Illustrated Auto CAD by T.W. Berghauser and P.L. Schlieve.

6. Numerical Control by Marthin (E.L.B.S.).
7. Understanding CAD/CAM- Design with Computer by D.J. Bowman, and R.N. MC-Dougal (BPB Publications, Delhi).
8. Numerical Control . by Child.
9. CAD/CAM by Kuldeep Sareen & Chandadeep Grewal (S,Chamd & Co, Delhi).
10. Computer-Aided Design Engineering & Manufacturing (CRC Press).

OPTIONAL (ANY ONE)
DME-603 REFRIGERATION & AIR CONDITIONING

RATIONALE:

Now-a-days more emphasis is being given for the thermal environmental control for:

1. Providing comfort to people in homes, offices, shops, industries and traveling in cars, railways, buses etc.
2. Storing food-stuff vegetables, fruits, milks medicines, blood etc.
3. Production of commodities like beverages, wines, bakery products and chemicals.
4. Liquefaction of gases.
5. Food preservation for longer period.
6. Air conditioning for computers.
7. Manufacturing processes like precision, machining, printing textiles etc.
8. Cryogenic surgery.
9. Production of low temperature (150°K) cryogenic temperatures.

With the advancement of science and technology, the use of refrigeration, air conditioning and production of low temperature is getting momentum and has become of paramount importance. The course in "Refrigeration and Air Conditioning" is introduced as an elective subject with the objective to provide enough training to mechanical engineering technicians, so that when they go in field, they can take up the task related to refrigeration and air conditioning without much difficulty.

CONTENT:

1. **Introduction to Refrigeration:** History of refrigeration, meaning and need of refrigeration, difference between refrigeration and Cryogenics, production of refrigeration by various methods. Refrigeration systems and their classification on the basis of use, size and application.
2. **Thermodynamics of Refrigeration:** Revision of I and II law of thermodynamics, comparison between heat engine, heat pump and refrigerator using heat reservoir, heat source, sinks & work. Unit of refrigeration, refrigeration effect, work input, co-efficient of performance, Reversed carnot cycle with gas and vapour as working substance. P-V, T-S and schematic diagrams. Calculation of refrigeration effect, work C.O.P and Heat rejection. Practical difficulties with carnot cycle. with gas and vapour as working substance. Vapour compression refrigeration cycle its schematic diagram and representation on P-V,T-S and P-H diagrams. Wet, dry and superheated vapour compression. Use of tables and charts of common refrigeration for calculating work input, refrigeration effect and C.O.P deviation of actual vapour compression system form, theoretical cycle and reasons for deviation. Effect of sub-cooling and superheating on vapour compression system.
3. **Basic Components of Vapour Compression Refrigeration Systems:** Basic components of vapour compression refrigeration system and their function-compressor, condensor, expansion device and evaporator.

Compressor : Classification, reciprocating- open and hermetically sealed rotary, and their field of application. Working of single and double acting reciprocating compressor. Working of hermetically sealed compressor.

Condensor : Types (Water cooled, air- cooled evaporative) and their field of application and brief description.

Expansion: Types of evaporators (Dry expansion and flooded type, and principle of their working and application.

4. **Vapour Absorption Refrigeration System:** Comparison between vapour compression and vapour absorption system, the theoretical and practical vapour absorption system, Lithium bromide- water absorption system. Three fluid system. (Electrolux systems)

5. **Properties of Commonly Used Refrigerants:** Definition, primary and secondary refrigerants, designation of refrigerant, examples of each type. Desirable properties of good refrigerant Azeotropic mixtures. Environmental problems related to halogenated hydrocarbons as refrigerants. New developments.

6. **Refrigeration Plants**: Layout and working of Ice plant, cold storage. Water cooler and household refrigerator.

7. **Refrigeration Fittings, Tools, Charging and Leak Detection**: Tubing, Materials heat treatment specifications.

   Tools: Use and types of cutter, spring and mechanical bender- flaring and swaging tools pinch of tool, wrenches, Pliers etc.

   Fittings: Flared tube fittings, unions, elbows tee.

   Joints: Making soldered and brazed joints. Installation and removal of servicing gauge and testing manifold: Working of suction and discharge compressor service values.

   Charging of Refrigerant: evacuating a refrigeration system, removing, refrigerant form a refrigeration system leak detection methods.

8. **Introduction to Air Conditioning** : Meaning of air conditioning, application of Air conditioning in theatres, community halls, industry, restaurants, hospitals and windows air conditioner.

9. **Psychometry:** psychometric - definition, terminology, psychometric charts and tables, using psychometric charts for solving simple problems.

10. **Air Conditioning Systems:** Central and unit air conditioning, residential and commercial air conditioning system. Types of fans and ducts - air distribution systems. Thermal insulator, methods and insulation cladding.

11. **Maintenance and Repairing of Refrigeration and Air Conditioning Units:** Fault location in vapour compression system and air conditions. Repair and maintenance of house hold refrigerators. Water coolers and air conditioners. 05

LIST OF EXPERIMENTS:

1. Handling and use of tools such as- Tube cutter, tube bender, (Spring and mechanical type). Flaring and Swaging tool, wrenches, pliers, service valves, service gauges, preparation of soldered and brazing joints.
2. Study of water cooler with respect to
   (a) Refrigerant used and flow path.
   (b) Electric circuit
   (c) Water flow path
   (d) Specification of main components used.
   (e) Capacity of the unit.
3. Study of packaged/ Window/ Air conditioner with respect to-
   (a) Capacity.
   (b) Electric circuit
   (c) Air flow path.
   (d) Specification of main components used.
   (e) Refrigerant used.
4. Study of Ice-plat/ refrigeration cold storage with respect to-
   (a) Electric circuit
   (b) Refrigerant used and its flow path.
   (c) Capacity.
   (d) Specification
5. Leakage detection using ;
   (a) Soap and water.
   (b) Halide torch.
   (c) Vacuum method.
   (d) Pressure method.
6. Operating service valves and gauge manifold.
7. Removing refrigerant from systems.
8. Charging/Recharging the system refrigerator, water cooler, air conditioner.
9. Determination of refrigeration capacity.

   Power input, C.O.P of the given unit available in the institution.
10. Testing refrigeration and air conditioning system control components for proper functioning and replacement.
    (a) Capacitor
    (b) Starting and running windings of hermetically sealed compressor.
    (c) Overload
    (d) Relay

(e) LP and HP

(f) Thermostat.

REFERENCE BOOKS.

1. Refrigeration and Air Conditioning by C.P. Arora (Tata Mc Graw Hill)
2. Ashrae Guide and Data Book by Ashrae (Ashrae)
3. Andels Refrigeration and Air Conditioning Guide. by E.P. Anderson (Tarapowala)
4. Practical Refrigeration
5. Refrigeration and Air Conditioning by A.S. Sarao & P.C. Gaabi (Satya Prakashan)
6. Modern Refrigeration Practice by G.P. King (McGraw Hill)
7. A Course in Refrigeration & Air Condition by S. Lomkkundwar & S.C. Arora (Dhanpat Rai & Sons).
8. Refrigeration and Air Conditioning by R.C. Jorden & S.B. Priester (Prentice Hall)
9. Basic Refrigeration and Air Conditioning by D. Hazre & D.N. Chakravarty (Dhanpat Rai & Sons).
10. Principles of Refrigeration by R. W. Marsh (Taraporwala)
11. Refrigeration and Air Conditioning by P.L . Ballancey. (Khanna Publishers)
12. Principles of Refrigeration by D.P. Gupta Rajdhani.
13. I.S. : 1476 - 1971 Specification for Domestic Refrigerators (Mechanically Operated) by Indian Standard Institution, Manak Bhawan, 9 Bhadur Shah Zafar Marg, New Delhi-1 (I.S.I)
14. I.S. 1391-1960 Room Air Conditioner by Indian Standards Institution, Manak Bhawan, 9 Bhadur Shah Zafar Marg, New Delhi -1 (I.S.I)
15. I.S. : 1474-1959 Comm. Refrigerator . by Indian Standards Institution, Manak Bhawan, 9 Bhadur Shah Zafar Marg, New Delhi-1 (I.S.I)
16. I.S. : 1474-1971 Self Contained . by Indian Standards Institution, Manak Bhawan, 9, Bhadur Shah Zafar Marg, New Delhi-1 (I.S.I)
17. I.S. Drinking Water Coolers. by Indian Standards Institution, Manak Bhawan, 9 Bhadur Shah Zafar Marg, New Delhi-1 (I.S.I).
18. Refrigeration & Air Conditioning. by R.C. Patel.

OPTIONAL (ANY ONE)
DME-603 POWER PLANT ENGINEERING

RATIONALE:

The power demand in the country is increasing at a very fast pace. In fact,

power production is not able to keep pace with the demand. More and more steam power plants are coming up in the public sector. Nuclear Power plants and gas turbine power plants are also being set up. Also industries in public and private sectors are being permitted to establish their own captive steam and diesel power plants.

This course is aimed at providing at insight in to the systems of power generation, and the principles of the equipments used there in.

CONTENT:

1. **Steam Power Plant:** Energy conversion in a thermal power station. Limitations on conversion of heat into work, direct conversion devices, central power station, industrial power station, captive power station, advantages. Classification of power station on the basis of prime-movers.

   Elements of steam power plant, function of each element- generating unit, prime mover, auxiliary equipment and turbo generator. Revision & Improvement of thermal efficiency of Rankine cycle by lowering exhaust pressure, increasing boiler pressure and superheating of steam. Simple problems on Rankine efficiency. Reheat cycle: Representation on T-S and H-S planes, flow diagram and advantages. Simple regenerative cycle: flow diagram, representation on T-S and H-S planes, bleeding and feed water heating and pumping.

2. **Steam Generators**: Classification according to working pressure Accessories - Super heater, economizer, pre-heater and draft equipment, superheat control methods, pulverized fuel- necessity, storing system.

   High pressure boiler in modern steam power plant need, features and functions of Velox, Benson, Lamaunt, Leoffler high pressure boiler.

3. **Steam Primemover**: Steam nozzle-Types, velocity of steam at outlet, weight of discharge, area of cross- section at throat and outlet, critical pressure ratio, nozzle efficiency, concept of primemover, steam turbine- Revision of steam turbine in terms of principle of working, methods of compounding and governing, losses in steam turbines, lubrication system of steam turbines.

4. **Condensing Unit**: Steam Condenser, functions, type-jet and surface. Limitations and advantages, elements of condensing unit-cooling towers.

5. **Steam Power Station Control and Safety**: Effect of load variation on shaft speed, steam admission, valve opening, steam flow rate, steam pressure and combustion control system.

   Necessity of controlling factors in load variation, control system (area system, centralized control system) functions of annunciator panel system, basic elements of control system, controls and instruments located in a modern central station. Control room, records and their purpose, log sheets or log book.

6. **Nuclear Power Stations: Nuclear reactions** : fission, fusion, mass defect, binding energy, chain reaction, types of nuclear materials - fissile materials, fertile materials, process of conversion of fertile materials, breeding moderation.

Nuclear reactor - Function- elements of a nuclear reactor- Reacted core, moderator, **thermal** - Shielding reflector, reactor vessel, fuel, coolant flow, control roads, biological shielding coolants (Caseansnon-boiling liquid, boiling liquid) **Fluids -** Helium, Co2 , O2 under pressure, pressurised water (Ordinary, heavy) liquid metals (Li, Si, Pb, Na) and their alloys, boiling water. **Operation -** Fast reactors, thermal reactor, breeding reactor. **Nuclear fuel -** Heterogeneous, Homogeneous.

Moderator: Water moderator, heavy water moderator, graphite moderator and Berylling moderator. **Health hazards in nuclear power station-** Unit of radiation safe and dangerous zones of radiations, safety precautions in a nuclear power station- Medical requirements. **Entry requirements**: In contamination zones, precaution during changing of fuel. Nuclear waste disposal.

7. **Diesel Power Plants**: Advantages and disadvantages as a primemover for power generation, essential components of diesel power plant and function. Cooling and lubrication system, fuel injection system- Basic requirements, fuel injection system -common rail system, individual pump system, distribution system, data recording, performance.

8. **Gas Turbine Powers Plants**: Advantages of gas turbines over I.C. Engine as prime movers, Brayton or Joule cycle, schematic diagrams for open and closed cycles, representation of cycle on P.V. and T.S. diagram. Thermal efficiency in terms of terminal temperature and pressure, effect of pressure ratio on thermal efficiency, advantages and disadvantages of open and closed cycle gas turbines, important components of a gas turbine power plant, methods of improving thermal efficiency, essential auxiliaries and controls of a gas turbine power plant, fuels for gas turbines.

9. **Hydro Electric Plants**: Types, Comparison of low, medium and high heat plants, elements of hydro power plants, governing of turbines, performance of water turbines, site selection.

LIST OF EXPERIMENTS:

1. Study of constructional and working details of :
   - (a) Simple steam power plant.
   - (b) Nuclear power plant.
   - (c) Gas power plant.
   - (d) Diesel power plant.
   - (e) Hydro electric plant.
2. Study of controls provided in power plants listed above.
3. Draw balance sheet for diesel engine.
4. Performance and characteristics of steam/ hydraulic turbines.
5. Visits of various power plants located in Madhya Pradesh and submit report in terms of :
   - (a) Detailed layout
   - (b) Capacity.
   - (c) Elements of each unit.

(d) Control systems provided.

(e) Berometers which are being controlled.

(f) Doses occuring in various units.

(g) Maintenance of schedule.

(h) Lubrication systems, uses.

REFERENCE BOOKS:

1. Course in Power Plant Engineering By S.Domkundwar.
2. A Course in Power Plant Engineering By T. Morse.
3. A Course in Power Plant Engineering By Nagpal.
4. A Course in Power Plant Engineering By Agrawal.

DME-604 PROJECT

RATIONALE:

The necessity of the project work has been emphasized on group work. Proper group functioning is a prerequisite for maximising output form a problem-solving group in work environment, proper organisation of project work should be able to simulate such a situation that the students may be able to effectively work in groups and thus gain confidence to effectively take up responsibilities in their careers. The students will prepare a final project report.

CONTENT:

1. Specification on Minor Projects : To prepare a write up or feasible report containing not more than 1500 words, using appropriate diagrams & Illustrations, and in simple language to be understood by non- technical readers, about an engineering topic.

   Suggested Topics : Feasibillty of non conventional sources of energy for a particular application.

   Solar heaters (Gobar gas Plant)

   Technicians role in village feasibility of certain projects.

2. Prepare a comparative study report about alternative materials available for a particular application.

   Suggested Topics : Electrical conductors.

   Cutting tools for high speed, machining.

   Furniture making.

   Cooking utensile.

3. Prepare a technical paper to be read to the rest of the class, about the process of conversion of raw material in to a finished product.

   Suggested Topics : Rubber tyres.

   Production of mechanical engineering products.

   Lubricating oils

   Production of plastic buckets.

   Production of stainless steel products.

   Detergents.

   Products involving special welding or costing processes.

4. Prepare a survey of equipment, available for a particular engeering situation, make a comparative study and suggest a suitable choice.

   Suggested Topics : Material handling equipment

   Machine tool for given product.

   Measuring instruments.

5. Prepare a simple machine or component as per given drawing specification. Suggested Jobs: A simple drilling machine model.

A punching Machine.

An inexpensive hardness tester.

Simple materials testing equipment.

6. Reclaiming a worn out component or equipment and putting it to use. Suggested Job : A worn out cam shaft bearing assembly. A rejected I.C. Engine used in a motor cycle. Re- conditioning a discarded pump.

7. Contruction of simple laboratory equipment/ teaching aids.

MAJOR PROJECT:

1. Design and Make Type Projects :

Suggested Projects : Lab equipment to demonstrate and verify the principle of conservation of momentum either linear angular with an accuracy of 5%

A lathe tool dynamometer to measure cutting forces.

A working model of a variable speed drive, which when given a fixed r.p.m. input, will be able to give a stepless variable output r.p.m., within the range of 3 times the in put to 1/3 times the input.

A Sheet metal cutting machine, useful to village blacksmiths in preparing articles like hand pums, funnels, containers etc.

A Wood working machine, hand or pedal operated to be useful in a village situation.

Equipment to provide hotwater in your hostal, using solar energy.

A suitable hand operated press for producing ornamental tiles.

A device to utilise energy from the wind, for drawing water from a well for irrigating a small farm.

A Design and development of hand operated grinder/juicer.

Design and development of special furniture, e.g. for hospitals, handicapped persons etc.

Material handling equipment to suit the needs of a local industry.

Design and development of jigs / fixture for a live production situation.

2. Investigation Projects :

Suggested Themes : Selection of a suitable machine tool to produce a given component with specified tolerances, economically.

Analysing the causes and suggesting remedial steps for a machine which is functioning erratically.

Causes of bearing failure in a given situation.

Investigation in to the cutting forces set up on a lathe for different feeds, speeds and materials.

Determining the most economical, running conditions for an. I.C. engine. Investigation in to the different methods of measurements of flow/ temperature/ pressure with a view to suggest a suitable method for a live situation.

Installing, commissioning and fault rectification of a test/ measuring set up or a machine.

3. Feasibility Studies :

Suggested Products : Packaging material.

Household utensils.

Furniture, Match boxes, Wire nails, Vulcanising unit. Time Piece components, plastic buckets, Aluminium anoidised tittin boxes, Raxine bags, folders etc. Washing soap, Instrument boxes for schools.

LIST OF SUGGESTED SKILLS TO ACQUIRE

S.No.	SUGGESTED SKILLS
1.	Participate effectively in group work.
2.	Analyse, synthesise and evaluate at technician level while dealing with engineering situations.
3.	Apply his knowledge in practical situations.
4.	Be able to plan ahead.
5.	Be able to take appropriate decisions.
6.	Maintain good human relations, by possessing social skills and tolerance.
7.	Be able to arrive at creative solutions to problems.
8.	Demonstrate self reliance and self discipline.
9.	Understand and accept his own strengths and limitations
10.	Adapt readily to changing environments.
11.	Have a sense of purpose and pride of achievement.
12.	Demonstrate his initiative.
13.	Reliably work independently.
14.	Be able to seek, select, use and present information's.

PROJECT WORK:

S.No. The following points, concerning the project should be noted:

1. A record of all calculations, drawings and designs must be kept.
2. Student will work either individually or in a group or 2, 3, or
3. A Written report must be available to the supervisor at the end of the course. This report should be neatly written and produced in a suitable folder which bears the name of the polytechnic, the title of the projectand the name of the contributor and the dates of the work. Although the reports will obviously vary from project to project, yet, they should in general, confirm to the following pattern :

   (a) **Summary:** A summary of the report which should not exceed one page in

length.

(b) **Index:** The report should be logically indexed.

(c) **Introduction:** This should introduce the reader to the objectives of the exercise.

(d) **Main body:** this will vary considerably from project to project and will contain all design calculations, drawings. results etc.

(e) **Conclusion:** This will state the main conclusions of the exercise.

(f) **Bibliography:** A list of all references used.

In general, you will find that a well presented brief concise and logical report will score a higher assessment than a badly presented, lengthy muddled and illogical report.

PROJECT WORK:

S.No. The following points, concerning the project should be noted :

1 The examiners will look for the following points when assessing your project

(a) The way in which you have applied existing knowledge to your project.

(b) Mental skill in manipulations of formulas etc.

(c) The quality of physical skills in the manufacture and assembly of apparatus and test pieces etc.

(d) Analysis of test results to produce a conclusion.

(e) The ability to produce a complete project from all the individual elements.

(f) Skill in evaluating between, for instance, various design alternatives.

(g) The way in which the initial specifications are interpreted and translated in to a finished project.

(h) The quality of the creative aspect of the design to meet the given specifications.

(i) The quality of the written content of the report.

(j) The quality to the graphical content of the report.

The assessment of your project will count towards your final diploma, and the accompanying marking grid shows how the marks are allotted in your particular case.

Remember that this is your project. The supervisor is there to give guidance if and when it is necessary. He will start you off on the right lines but will only intervene at the later stages, if asked.

DME-605 PROFESSIONAL ACTIVITIES

RATIONALE:

Most of the diploma holders join industries. Due to globalization and competition in the industrial and service sectors the selection for the job is based on campus interviews or competitive tests. While selecting candidates a normal practice adopted is to see general confidence, ability to communicate and attitude, in addition to basic technological concepts. The purpose of introducing professional practices is to provide opportunity to students to undergo activities which will enable them to develop confidence. Industrial visits, expert lectures, seminars on technical topics and group discussion are planned in a semester so that there will be increased participation of students in learning process.

OBJECTIVES:

Student 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.

CONTENTS:

01 INDUSTRIAL VISITS:

Structured industrial visits be arranged and report of the same shall be submitted by the individual student, to form a part of the term work.(2 visits)

Following are the suggested types of Industries/ Fields -

(i) Automobile manufacturing / auto component manufacturing units to observe the working of SPM

(ii) Refrigeration and air conditioning manufacturing / servicing units / industries / workshops

(iii) Automobile service stations for four wheelers

(iv) Co-ordinate measuring machine to observe its construction working specifications and applications.

(v) Auto Engine Testing unit to gather details regarding the testing procedures/parameters etc.

(vi) Wheel Balancing unit for light and/or heavy motor vehicles.

(vii) Food processing unit.

(viii) Textile industry machinery manufacturing / servicing units.

(ix) Hydro electric and Thermal power plants.

(x) Engine testing, exhaust gas analysis and vehicle testing

(xi) PWD workshop.

02 THE GUEST LECTURE/S:

From field/industry experts, professionals to be arranged (2 Hrs duration), minimum 4 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of Term work

(a) Electronic fuel injection systems

(b) Exhaust gas analysis.

(c) Vehicle testing.

(d) Transducer application in automobiles.

(e) Environmental pollution & control.

(f) Vehicle aerodynamics & design.

(g) Earth moving machines.

(h) Automobile pollution, norms of pollution control.

(i) Biotechnology

(j) Nanotechnology

(k) Rapid prototyping

(l) Programmable logic controllers

(m) TQM

(n) MPFI

(o) Hybrid motor vehicles

(p) Packaging technology

(q) Appropriate technology (r) Six sigma systems

(s) LPG / CNG conversion kit.

03 GROUP DISCUSSION :

The students should discuss in group of six to eight students and write a brief report on the same, as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are (any one)-

(i) CNG versus LPG as a fuel.

(ii) Petrol versus Diesel as a fuel for cars.

(iii) Trends in automobile market.

(iv) Load shading and remedial measures.

(v) Rain water harvesting.

(vi) Trends in refrigeration Technology.

(vii) Disaster management.

(viii) Safety in day to day life.

(ix) Energy Saving in Institute.

(x) Nano technology.

04 SEMINAR : (ANY 2 TOPICS)

Seminar topic should be related to the subjects of fifth semester / topics from guest lectures. Students shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes for a group of 2 students)

05 INDIVIDUAL ASSIGNMENTS :

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 , sheer 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 following materials - a. Ceramics, b. fiber reinforcement plastics,c. thermo plastic plastics d. thermo setting plastics,e. 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 mal nutrition, 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.

06 MINI PROJECTS : (IN A GROUP OF 4-5 STUDENTS):

(1) Design / drawing of simple jigs, fixtures

(2) Thermocouple based temperature controller.

(3) Pump on / off timer

(4) Models of jigs / fixtures

(5) Layout design of SSI units / factory / workshop of the institute Models of material handling route systems

OR

Modular Course on any one of the suggested or alike relevant topic be undertaken by a group of students :

(a) LPG/CNG conversion of vehicles

(b) Advance features in CAD - CAM

(c) basics of PLC programming

(d) die design

(e) JIT techniques

(f) Non traditional manufacturing methods

(g) jigs and fixture design

(h) 3D Modeling

(I) finite element method

(j) Mechatronics

(k) Advanced computer programming

(l) maintenance of home appliances

(m) value stream mapping n) piping technology

07 STUDENT ACTIVITIES:

Students in a group of 3 to 4 shall perform ANY TWO of the following activities (Other similar activities may be considered) and write a report as a part of term work.

ACTIVITIES :

1. Collection of data regarding loan facilities or other facilities available through different organizations / banks to budding entrepreneurs
2. Survey and interviews of successful entrepreneurs in nearby areas3. Survey of opportunities available in thrust areas identified by Government or DIC.
4. Measuring Screw thread parameters on floating carriage dial micrometer and select the optimum diameter of wire.
5. Survey of data regarding different types of pumps with specifications from manufacturers catalogue, local markets, end users (any other engineering products may be considered for survey)
6. Survey of farm implements used by farmers.

LEARNING RESOURCES:

BOOKS:

Sr. No	Author	Title of the book	Publisher
1	Mark Ratner and Daniel Ratner	Nanotechnology	Pearson Education, New Delhi
2	Yoram Korem	Computer Control of Manufacturing System	Mcgraw Hill Publication
3	Sunil Chopra, Peter Meindl	Supply Chain Management	Pearson Education, New