

## 5.1 PRODUCTION MANAGEMENT

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### RATIONALE

Diploma holder in this course is responsible for controlling production and quality of the product on the shop floor as well as for production planning and control. He is also required to supervise erection, installation and maintenance of equipment including material handling and undertake work-study for better utilization of resources. For this purpose, knowledge and skills about these topics need to be imparted to them. This subject aims at development of competencies to prepare material, equipment schedule and production control schedules and maintain required quality levels. In addition, it will also help in developing skills in erection, installation and testing of equipment.

### DETAILED CONTENTS.

1. Production Planning and Control (PPC) (06 hrs)
  - 1.1 Introduction.
  - 1.2. Objectives and factors affecting PPC
  - 1.3. Functions(Elements) of PPC - Planning, Routing, Loading, scheduling, dispatching, progressing and inspection
  - 1.4. Types of production system - Flow or continuous production, Intermittent Production
  - 1.5. Production Control - Objectives and fields of production control, Production control system
  - 1.6 Break even analysis and Gantt chart.
  
2. Plant Location, Layout and Material Handling (12 hrs)
  - 2.1 Definition and Factors affecting the plant location, Rural versus Urban Plant sites.
  - 2.2 Definition and importance of Plant layout, Factors affecting plant layout.
  - 2.3 Types of Plant layout- Process, product, combination and fixed position layout..
  - 2.4 Methods of plant layout - Process flow charts, layout analogues Travel chart, distance, volume matrix.,
  - 2.5. Plant layout procedure and work station design.
  - 2.6. Material Handling- Definition, Significance and objectives of material handling, Principles of economic material handling,. Types of material handling equipment - Characteristics and classification of material handling equipment, Hoisting and conveying equipment (different types), Safety requirements while using material handling equipment

3. Work Study (12 hrs)
  - 3.1 Production System and Productivity(Introduction and definitions), Difference between Production and productivity, Measures to improve productivity
  - 3.2 Definition, advantages and procedure of work study
  - 3.3 Method study – Definition, Objectives and Procedures, Process chart symbols, outline process chart, Flow process charts, Two handed processes charts, Multiple activity chart(Mn-Machine charts), Flow diagram, string diagram.
  - 3.4 Principles of motion economy, Therblig symbols, SIMO chart.
  - 3.5. Work Measurement :- Definition and objective, Work measurement technique, Time Study- Definition, objectives and procedure, Calculation of basic time, performance rating and its techniques, normal time, allowance and its types, standard time (simple numerical problems)
  
4. Inventory Control (10 hrs)
  - 4.1 Definition and objectives of inventory control.
  - 4.2 Inventory types
  - 4.3 Procurement and carrying cost, EOQ, lead time, reorder point (simple numerical problems)
  - 4.4 Inventory Classification - ABC Analysis, VED Analysis, FMS Analysis
  - 4.5 Standardization and Codification - Objective and advantages of standardization, Levels and types of standards, .Objective and advantages of codes. Coding systems-. National and International Codes, ISO-9000 Concept and Evolution
  - 4.6. Concept of Just-In-Time (JIT)
  
5. Repair and Maintenance (06 hrs)
  - 5.1. Objectives and importance of Maintenance
  - 5.2. Different types of maintenance- Corrective or Breakdown maintenance, Scheduled Maintenance, Preventive Maintenance, Predictive Maintenance
  - 5.3. Nature of maintenance problems
  - 5.4. Range of maintenance problems
  
6. Value Engineering (04 hrs)
  - 6.1. Introduction, Concept
  - 6.2. Objectives of value engineering

- 6.3. Value Analysis Procedures
  - 6.4. Benefits of value analysis
  - 6.5. Technique of value engineering
7. Cost Estimation and Control: (14 hrs)
- 7.1 Definition and functions of cost estimation
  - 7.2 Estimation procedure
  - 7.3 Elements of cost, ladder of costs (simple numericals)
  - 7.4 Overhead expenses and its distribution
  - 7.5 Depreciation -: Concept and Definition, Methods of calculating depreciation,. Straight line method, Diminishing Balance Method, Sinking fund method (Numerical problems).
  - 7.6 Cost control- definition and objectives, Capital cost control (planning and scheduling), operating cost control.
  - 7.7. Cost estimation for machining processes like turning, drilling, and milling. Cost estimation of forming processes like forging, pattern making, and casting .

### **INSTRUCTIONAL STRATEGY**

1. Teacher should put emphasis on giving practical problems related to plant location and plant layout
2. Students should be taken to industrial units to give an exposure of production environment, plant layout and material handling
3. Live problems may be given to students to carry out case studies in teams under guidance of teacher

### **RECOMMENDED BOOKS**

1. Industrial Engineering and Management by T.R. Banga and SC Sharma; Khanna Publishers, Delhi.
2. Industrial Engineering and Management by O.P. Khanna; Dhanpat Rai and Sons, New Delhi.
3. Production Management by C.L. Mahajan; Satya Parkashan Company Limited, New Delhi.
4. Mechanical Costing, Estimation and Project Planning by CK Singh; Standard Publishers, New Delhi.
5. A Text Book of Reliability and Maintenance Engineering by A Manna, Prentice Hall of India
6. Production Management by K. P. S. Chouhan, Eagle Parkashan, Jalandhar.

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	06	08
2	12	20
3	12	20
4	10	15
5	06	10
6	04	05
7	14	22
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.2. REFRIGERATION AND AIR CONDITIONING

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### RATIONALE

The diploma holder of Mechanical Engineering are responsible for supervising and maintenance of RAC system. For this purpose, the knowledge and skill covering basic principles of refrigeration and air conditioning is required to be imparted to the students. Moreover, RAC industry is expanding and employment opportunities in this field are good.

### DETAILED CONTENTS

#### REFRIGERATION

1. Fundamentals of Refrigeration (02 hrs)  
Introduction to refrigeration, and air conditioning, meaning of refrigerating effect, units of refrigeration, COP, difference between COP and efficiency, methods of refrigeration, Natural system and artificial system.
2. Vapour Compression System (12 hrs)  
Introduction, principle, function, parts and necessity of vapour compression system, T-  $\phi$  and p- H charts, dry, wet and superheated compression. Effect of sub cooling, super heating, mass flow rate, entropy, enthalpy, work done, Refrigerating effect and COP. actual vapour compression system
3. Refrigerants (04 hrs)  
Functions, classification of refrigerants, properties of R - 717, R – 22, R–134 (a), CO<sub>2</sub>, R – 11, R – 12, R – 502, Properties of ideal refrigerant, selection of refrigerant
4. Air Refrigeration System (08 hrs)  
Introduction, advantages and disadvantages of air-refrigeration system over vapour compression system, bell – Collemann cycle, calculation of mass flow rate, work done and COP
5. Vapour Absorption System (06 hrs)  
Introduction, principle and working of simple absorption system and domestic electrolux refrigeration systems. Solar power refrigeration system, advantages and disadvantages of solar power refrigeration system over vapour compression system.,

6. Refrigeration Equipment (12 hrs)
- 6.1 Compressors- Function, various types of compressors
  - 6.2 Condensers - Function, various types of condensers
  - 6.3 Evaporators- Function, types of evaporators
  - 6.4 Expansion Valves - Function, various types such as capillary tube, thermostatic expansion valve, low side and high side float valves, application of various expansion valves
  - 6.5. Safety Devices-Thermostat, overload protector LP, HP cut out switch.

## **AIR CONDITIONING**

7. Psychrometry (08 hrs)
- Definition, importance, specific humidity, relative humidity, degree of saturation, DBT, WBT, DPT, sensible heat, latent heat, Total enthalpy of air.
8. Applied Psychrometry and Heat Load Estimation. (12 hrs)
- Psychrometric chart, various lines, psychrometric process, by pass factor, room sensible heat factor, effective room sensible heat factor, grand sensible heat factor, ADP, room DPT.
- Heating and humidification, cooling and dehumidification, window air-conditioning, split type air-conditioning, car air-conditioning, central air-conditioning.

## **LIST OF PRACTICALS**

1. Identify various tools of refrigeration kit and practice in cutting, bending, flaring, swaging and brazing of tubes.
2. Study of thermostatic switch, LP/HP cut out overload protector filters, strainers and filter driers.
3. Identify various parts of a refrigerator and window air conditioner.
4. To find COP of Refrigeration system
5. To detect trouble/faults in a refrigerator/window type air conditioner
6. Charging of a refrigerator/ window type air conditioner.

7. Disassembly and assembly of single cylinder open type compressor
8. Visit to an ice plant or cold storage plant. or central air conditioning plant

### INSTRUCTIONAL STRATEGY

1. Teaches should take the students to industry and explain the details of refrigeration and air-conditioning systems and their components.
2. While imparting instructions, focus should be on conceptual understanding.
3. Training slides of “Carrier Fundamentals of Refrigeration Air Conditioning” to be shown to students.

### RECOMMENDED BOOKS

1. Refrigeration and Air Conditioning by Domkundwar; Dhanpat Rai and Sons, Delhi.
2. Refrigeration and Air Conditioning by CP Arora; Tata McGraw Hill, New Delhi.
3. Refrigeration & Air conditioning by G.S. Aulakh, Eagle Parkashan, Jalandhar
4. Refrigeration and Air Conditioning by R.S Khurmi and J.K. Gupta; S Chand and Company Limited, New Delhi.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	02	04
2	12	20
3	04	06
4	08	12
5	06	10
6	12	18
7	08	12
8	12	18
<b>Total</b>	<b>64</b>	<b>100</b>

### 5.3 THERMODYNAMICS-II

L T P  
4 - 2

#### RATIOANLE

A diploma holder in this course is supposed to know about testing of IC Engines, fuel supply, ignition system, cooling and lubrication of engines and gas turbines. Hence this subject

#### DETAILED CONTENTS

1. IC Engines (09 hrs)
  - 1.1 Introduction
  - 1.2 Working principle of two stroke and four stroke cycle, SI engines and CI engines, Otto cycle, diesel cycle and dual cycle
  - 1.3 Location and functions of various parts of IC engines and materials used for them
  
2. Fuel Supply and Ignition System in Petrol Engine (08 hrs)
  - 2.1 Concept of carburetion
  - 2.2 Air fuel ratio
  - 2.3 Simple carburetor and its application
  - 2.4 Description of battery coil and magneto ignition system, fault finding and remedial action in ignition system
  
3. Fuel System of Diesel Engine (06 hrs)
  - 3.1 Components of fuel system
  - 3.2 Description and working of fuel feed pump
  - 3.3 Fuel injection pump
  - 3.4 Injectors
  
4. Cooling and Lubrication (10 hrs)
  - 4.1 Function of cooling system in IC engine
  - 4.2 Air cooling and water cooling system, use of thermostat, radiator and forced circulation in water cooling (description with line diagram)
  - 4.3 Function of lubrication
  - 4.4 Types and properties of lubricant
  - 4.5 Lubrication system of engine
  - 4.6 Fault finding in cooling and lubrication and remedial action
  
5. Testing of IC Engines (09 hrs)
  - 5.1 Engine power - indicated and brake power
  - 5.2 Efficiency - mechanical, thermal. relative and volumetric
  - 5.3 Methods of finding indicated and brake power



- 5.4 Morse test for petrol engine
  - 5.5 Heat balance sheet
  - 5.6 Concept of pollutants in SI and CI engines, pollution control, norms for two or four wheelers - EURO - 1, EURO - 2, methods of reducing pollution in IC engines, alternative fuels like CNG, LPG, Hydrogen
6. Steam Turbines and Steam Condensers (10 hrs)
- 6.1 Function and use of steam turbine
  - 6.2 Steam nozzles - types and applications
  - 6.3 Steam turbines - impulse, reaction, simple and compound, construction and working principle
  - 6.4 Governing of steam turbines
  - 6.5 Function of a steam condenser, elements of condensing plant
  - 6.6 Classification - jet condenser, surface condenser
  - 6.7 Cooling pond and cooling towers
7. Gas Turbines and Jet Propulsion (12 hrs)
- 7.1 Classification, open cycle gas turbine and closed cycle gas turbine, comparison of gas turbines with reciprocating IC engines, applications and limitations of gas turbine
  - 7.2 Open cycle constant pressure gas turbines - general layout, PV and TS diagram and working of gas turbine
  - 7.3 Closed cycle gas turbines, PV and TS diagram and working
  - 7.4 Principle of operation of ram-jet engine and turbo jet engine - application of jet engines
  - 7.5 Rocket engine - its principle of working and applications
  - 7.6 Fuels used in jet propulsion

### **LIST OF PRACTICALS**

1. Dismantle a two stroke engine, note the function and material of each part, re-assemble the engine.
2. Dismantle a single cylinder diesel engine. Note the function of each part, re-assemble the engine.
3. Dismantle Solex, Amal carburetor, locate and note down the functions of various parts, and re-assemble.
4. Study of battery ignition system of a multi-cylinder petrol engine stressing ignition timings, setting, fixing order and contact breaker; gap adjustment.
5. Study of cooling of IC engine.
6. Study of lubricating system of IC engine.

7. Determination of BHP by dynamometer.
8. Morse test on multi-cylinder petrol engine.
9. Local visit to roadways or private automobile workshops.
10. Study of steam turbines through models and visit.
11. Study of steam condensers through model and visits.

### **INSTRUCTIONAL STRATEGY**

1. Use computer based learning aids for effective teaching-learning
2. Expose students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

### **RECOMMENDED BOOKS**

1. Elements of Heat Engines by Pandey and Shah; Charotar Publishing House, Anand.
2. Thermodynamics-I by G.S. Aulakh, Eagle Parkashan, Jalandhar.
3. Thermal Engineering by PL. Ballaney; Khanna Publishers, New Delhi.
4. Engineering Thermodynamics by Francis F Huang; McMillan Publishing Company, Delhi.
5. Engineering Thermodynamics by CP. Arora; Tata McGraw Hill Publishers, New Delhi.
6. Thermal Engineering by RK Purohit; Standard Publishers Distributors, New Delhi.

### **SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	09	15
2	08	12
3	06	10
4	10	15
5	09	15
6	10	15
7	12	18
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.4 WORKSHOP TECHNOLOGY - III

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### RATIONALE

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various machining processes and modern machining methods is required to be imparted. Hence the subject of workshop technology.

### DETAILED CONTENTS

- |    |  |          |
|----|--|----------|
| 1. | Milling  | (18 hrs) |
|    | <ul style="list-style-type: none"> <li>1.1 Specification and working principle of milling machine</li> <li>1.2 Classification, brief description and applications of milling machines</li> <li>1.3 Details of column and knee type milling machine</li> <li>1.4 Milling machine accessories and attachment – Arbors, adaptors, collets, vices, circular table, indexing head and tail stock, vertical milling attachment</li> <li>1.5 Milling methods - up milling and down milling</li> <li>1.6 Identification of different milling cutters and work mandrels</li> <li>1.7 Work holding devices</li> <li>1.8 Milling operations – face milling, angular milling, form milling, straddle milling and gang milling.</li> <li>1.9 Cutting speed and feed, simple numerical problems.</li> <li>1.10 Indexing on dividing heads, plain and universal dividing heads.</li> <li>1.11 Indexing methods: direct, Plain or simple, compound, differential and angular indexing, numerical problems on indexing.</li> <li>1.12 Thread milling</li> </ul> |          |
| 2  | Grinding   | (14 hrs) |
|    | <ul style="list-style-type: none"> <li>2.1 Purpose of grinding</li> <li>2.2 Various elements of grinding wheel – Abrasive, Grade, structure, Bond</li> <li>2.3 Common wheel shapes and types of wheel – built up wheels, mounted wheels and diamond wheels. Specification of grinding wheels as per BIS.</li> <li>2.4 Truing, dressing, balancing and mounting of wheel.</li> <li>2.5 Grinding methods – Surface grinding, cylindrical grinding and centreless grinding.</li> <li>2.6 Grinding machine – Cylindrical grinder, surface grinder, internal grinder, centreless grinder, tool and cutter grinder.</li> <li>2.7 Selection of grinding wheel</li> <li>2.8 Thread grinding.</li> </ul>  |          |

3. Gear Manufacturing and Finishing Processes (08 hrs)
  - 3.1 Gear hobbing
  - 3.2 Gear shaping
  - 3.3 Gear finishing processes
  
4. Modern Machining Processes (08 hrs)
  - 4.1 Mechanical Process - Ultrasonic machining (USM): Introduction, principle, process, advantages and limitations, applications
  - 4.2 Electro Chemical Processes - Electro chemical machining (ECM) – Fundamental principle, process, applications, Electro chemical Grinding (ECG) – Fundamental principle, process, application
  - 4.3 Electrical Discharge Machining (EDM) - Introduction, basic EDM circuit, Principle, metal removing rate, dielectric fluid, applications
  - 4.4 Laser beam machining (LBM) – Introduction, machining process and applications
  - 4.5 Electro beam machining (EBM)- Introduction, principle, process and applications
  - 4.6 Plasma arc machining (PAM) and welding – Introduction, principle process and applications
  
5. Metallic Coating Processes (08 hrs)
  - 5.1 Metal spraying – Wire process, powder process, applications
  - 5.2 Electro plating, anodizing and galvanizing
  - 5.3 Organic Coatings- oil base paint, rubber base coating
  
6. Metal Finishing Processes (08 hrs)
  - 6.1 Purpose of finishing surfaces.
  - 6.2 Surface roughness-Definition and units
  - 6.3 Honing Process, its applications
  - 6.4 Description of hones.
  - 6.5 Brief idea of honing machines.
  - 6.6 Lapping process, its applications.
  - 6.7 Description of lapping compounds and tools.
  - 6.8 Brief idea of lapping machines.
  - 6.9 Super finishing process, its applications.
  - 6.10 Use of super finishing attachment on center lathe.
  - 6.11 Polishing
  - 6.12 Buffing.

## **PRACTICAL EXERCISES**

### **Advance Turning Shop**

1. Exercise of boring with the help of boring bar
2. Exercises on internal turning on lathe machine
3. Exercises on internal threading on lathe machine
4. Exercises on external turning on lathe machine
5. Resharpener of single point cutting tool with given geometry

### **Machine Shop**

1. Produce a rectangular block by facing on a slotting machine
2. Produce a rectangular slot on one face with a slotting cutter
3. Produce a rectangular block using a milling machine with a side and face cutter
4. Prepare a slot on one face using milling machine
5. Job on grinding machine using a surface grinder
6. Prepare a job on cylindrical grinding machine.
7. Exercise on milling machine with the help of a form cutter
8. Exercise on milling machine to produce a spur gear
9. Grinding a drill-bit on tool and cutter grinder
10. Exercise on dressing a grinding wheel

## **INSTRUCTIONAL STRATEGY**

1. Teachers should lay special emphasis in making the students conversant with concepts, principles, procedures and practices related to various manufacturing processes.
2. Focus should be laid in preparing jobs using various machines/equipment in the workshop.
3. Use of audio-visual aids/video films should be made to show specialized operations.

## **RECOMMENDED BOOKS**

1. Manufacturing Technology by Rao; Tata McGraw Hill Publishers, New Delhi.
2. Workshop Technology-III by K.P.S. Chouhan, Eagle Parkashan, Jalandhar.
3. Manufacturing Technology by M. Adithan and A.B. Gupta; New Age International (P) Ltd., New Delhi.
4. Workshop Technology Vol. I, II, III by Chapman; Standard Publishers Distributors, New Delhi.
5. Practical Handbook for Mechanical Engineers by Dr. AB Gupta; Galgotia Publications, New Delhi.
6. Production Technology by HMT; Tata McGraw Publishers, New Delhi.
7. Production Engineering and Science by Pandey and Singh; Standard Publishers Distributors, New Delhi.
8. Modern Machining Processes by Pandey; Tata McGraw Publishers, New Delhi.
9. A Text Book of Production Engineering by P.C. Sharma; S. Chand and Company Ltd., New Delhi.
10. Workshop Technology Vol-III, by R.P. Dhiman, Ishan Publications Jalandhar

**SUGGESTED DISTRIBUTION OF MARKS**

<b>Topic No.</b>	<b>Time Allotted (Hrs)</b>	<b>Marks Allotted (%)</b>
1	18	32
2	14	20
3	08	12
4	08	12
5	08	12
6	08	12
<b>Total</b>	<b>64</b>	<b>100</b>

## 5.5 THEORY OF MACHINES

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### RATIONALE

A diploma holder in this course is required to assist in the design and development of prototype and other components. For this, it is essential that he is made conversant with the principles related to design of components and machine and application of these principles for designing. The aim of the subject is to develop knowledge and skills about various aspects related to design of machine components.

### DETAILED CONTENTS THEORY

1. Simple Mechanisms (06 hrs)
  - 1.1 Introduction to link, kinematic pair, lower and higher pair, Kinematic chain, mechanism, Inversions.
  - 1.2 Different types of mechanisms ( with examples )
  
2. Friction (10 hrs)
  - 2.1 Definition and its necessity
  - 2.2 Horizontal force required to move a body on an inclined plane both upward and downward
  - 2.3 Frictional torque in screws , both for square and V threads
  - 2.4 Screw jack ( Derivation and Numericals)
  - 2.5 Different types of bearings and their application
  
3. Power Transmission (14 hrs)
  - 3.1 Introduction to Belt and Rope drives
  - 3.2 Types of belt drives and types of pulleys
  - 3.3 Concept of velocity ratio, slip and creep; crowning of pulleys (simple numericals)
  - 3.4 Flat and V belt drive: Ratio of driving tensions, power transmitted, centrifugal tension, and condition for maximum horse power (simple numericals)
  - 3.5 Different types of chains and their terminology
  - 3.6 Gear terminology, types of gears and their applications; simple and compound gear trains; power transmitted by simple spur gear
  
4. Flywheel (08 hrs)
  - 4.1 Principle and applications of flywheel
  - 4.2 Turning - moment diagram of flywheel for different engines

- 4.3 Fluctuation of speed and fluctuation of energy - Concept only  
 4.4 Coefficient of fluctuation of speed and coefficient of fluctuation of energy
5. Governor (10 hrs)
- 5.1 Principal of governor  
 5.2 Simple description and working of Watt, Porter and Hartnel governor (simple numerical based on watt and porter governor)  
 5.3 Hunting, isochronism, stability, sensitiveness of a governor
6. Balancing (06 hrs)
- 6.1 Concept of balancing  
 6.2 Introduction to balancing of rotating masses (simple numericals)
7. Vibrations (10 hrs)
- 7.1 Types-longitudinal, transverse and torsional vibrations (simple numericals)  
 7.2 Dampening of vibrations  
 7.3 Causes of vibrations in machines, their harmful effects and remedies

### INSTRUCTIONAL STRATEGY

1. Use teaching aids for classroom teaching
2. Give assignments for solving numerical problems
3. Arrange industry visits to augment explaining use of various machine components like belt, rope, chain, gear drives, action due to unbalanced masses, brake clutch, governors, fly wheels, cams and gear drives
4. Video films may be used to explain the working of mechanisms and machine components like clutch, governors, brake etc.

### RECOMMENDED BOOKS

1. Theory of Machines by D.R. Malhotra; Satya Prakashan, New Delhi.
2. Theory of Machines by Harpreet Singh, Eagle Parkashan, Jalandhar.
3. Theory of Machines by V.P Singh; Dhanpat Rai and sons, New Delhi.
4. Theory of Machines Jagdish Lal; Metropolitan Publishers, New Delhi.

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	10
2	10	15
3	14	22
4	08	12
5	10	16
6	06	10
7	10	15
<b>Total</b>	<b>64</b>	<b>100</b>



## 5.6 COMPUTER AIDED DRAFTING

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1. Introduction to AutoCAD commands (6 drawing sheets)
  - 1.1 Concept of AutoCAD, Tool bars in Auto CAD, coordinate system, snap, grid, and ortho mode (Absolute, Relative and Polar)
  - 1.2 Drawing commands – point, line, arc, circle, ellipse,
  - 1.3 Editing commands – scale, erase, copy, stretch, lengthen and explode.
  - 1.4 Dimensioning and placing text in drawing area
  - 1.5 Sectioning and hatching
  - 1.6 Inquiry for different parameters of drawing entity
  
2. Detail and assembly drawing of the following using AUTOCAD (4 sheets)
  - 2.1 Plummer Block
  - 2.2 Wall Bracket
  - 2.3 Stepped pulley, V-belt pulley
  - 2.4 Flanged coupling
  - 2.5 Machine tool Holder (Three views)
  - 2.6 Screw jack or knuckle joint
  
3. Isometric Drawing by CAD using Auto CAD (one sheet)
 

Drawings of following on computer:

  - Cone
  - Cylinder
  - Isometric view of objects
  
4. Modelling (01 sheet)
 

3D modelling, Transformations, scaling, rotation, translation
  
5. Introduction to other CAD softwares;
 

(Pro Engineer/CATIA / Inventor/Unigraphics/Solid Work: Salient features, simple drawing of components (2 D and 3D)(At least one software)

### INSTRUCTIONAL STRATEGY

1. Teachers should show model or realia of the component/part whose drawing is to be made.
2. Emphasis should be given on cleanliness, dimensioning, & layout of sheet.
3. Teachers should ensure use of IS codes related to drawing.

**RECOMMENDED BOOKS**

1. Engineering Drawing with AutoCAD 2000 by T. Jeyapooran; Vikas Publishing House, Delhi.
2. AutoCAD for Engineering Drawing Made Easy by P. Nageswara Rao; Tata McGraw Hill, New Delhi.
3. AutoCAD 2000 for you by Umesh Shettigar and Abdul Khader; Janatha Publishers, Udupi.
4. Auto CAD 2000 by Ajit Singh, TMH, New Delhi.
5. Designing with Pro Engineer, Sham Tickoo by Dream Tech Publications, New Delhi.
6. Designing with CATIA, by Sham Tickoo, Dream Tech. Publications, New Delhi.

## **PERSONALITY DEVELOPMENT CAMP**

This is to be organized at a stretch for two to three days during fifth or sixth semester. Extension Lectures by experts or teachers from the polytechnic will be delivered on the following broad topics. There will be no examination for this subject.

1. Communication Skills
2. Correspondence and job finding/applying/thanks and follow-up
3. Resume Writing
4. Interview Techniques: In-Person Interviews; Telephonic Interview' Panel interviews; Group interviews and Video Conferencing etc.
5. Presentation Techniques
6. Group Discussions Techniques
7. Aspects of Personality Development
8. Motivation
9. Leadership
10. Stress Management
11. Time Management
12. Interpersonal Relationship
13. Health and Hygiene