Rationale:

Water and heat management are back bone of any developing country. These managements cover the full utility of water and heat. It should be basis on environmental safety and pollution free management.

Objective:

Student should able to:-
(A) Analyse the capability of water and heat power in the form of energy.
(B) Use of hydraulic machines and steam engines, and I. C. engines.
(C) Use of these machines as prime movers.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
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</thead>
<tbody>
<tr>
<td>01</td>
<td>Water Turbines.</td>
<td>(12)</td>
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<tr>
<td>02</td>
<td>Water Pumps.</td>
<td>(07)</td>
</tr>
<tr>
<td>03</td>
<td>I. C. Engines.</td>
<td>(16)</td>
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<tr>
<td>04</td>
<td>Steam Condenser &amp; Steam Nozzles.</td>
<td>(08)</td>
</tr>
<tr>
<td>05</td>
<td>Steam Engines &amp; Turbines.</td>
<td>(10)</td>
</tr>
<tr>
<td>06</td>
<td>Compressors.</td>
<td>(07)</td>
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</table>

Total : (60)
# CONTENTS:

## TOPIC: 01 – WATER TURBINES:

01.01 Pelton turbine: Construction and working principle with velocity triangles, work done.
01.02 Design Consideration of Pelton turbine.
01.03 Radial flow Reaction Turbine: Main parts of radial flow reaction turbine, Inward and outward reaction turbine, velocity triangle, work done.
01.04 Francis Turbine: Construction and working principle with velocity triangle work done.
01.05 Kaplan Turbine: Construction and working principle with velocity triangle work done.
01.06 Draft Tubes: Types of draft tube, draft tube theory, efficiency of draft tube.

## TOPIC: 02 – WATER PUMPS:

02.01 Centrifugal Pumps: Main parts of centrifugal pump and working principle, Cavitation.
02.02 Definitions of heads and efficiencies of centrifugal pump.
02.03 Minimum speed for stating of centrifugal pump.
02.04 Multistage of centrifugal pump.
02.05 Reciprocating Pump: Working principle, discharge, work done, power required to drive the pump, slip indicator, diagram and air vessels.

## TOPIC: 03 – I. C. ENGINES:

03.01 I. C. Engines.
03.01.01 Definition and classification of I. C. Engines.
03.01.02 Working of Petrol Engine.
03.01.03 Working of Diesel Engines.
03.01.04 Comparison between two-stroke and four-stroke engine.
03.01.05 Comparison between Petrol and Diesel Engine.
03.01.06 Testing and performance of I. C. Engine.
03.01.07 Value setting Diagram of I. C. Engine.
03.02 Fuel and combustion in I. C. Engine.
03.02.01 Flame propagation.
03.02.02 Pre-Ignition.
03.02.03 Ignition delay.
03.02.04 Detonation and Knocking.
03.02.05 Factors affecting detonation.
03.02.06 Octane and Cetane value of petrol and diesel fuels.
03.03 Carburation.
03.03.01 Concept of Carburation.
03.03.02 Air fuel ratio.
03.03.03 Working of simple carburetor and its limitations.
03.03.04 Zenith carburetor.
03.04 Ignition system of Petrol Engine.
03.04.01 Introduction and types of Ignition System.
03.04.02 Brief description of a Battery coil ignition system.
03.04.03 Brief description of a magneto ignition system.
03.05 Fuel Injection system of a Diesel Engine.
03.05.01 Introduction.
03.05.02 Components of fuel injection system.
03.05.03 Description and working of fuel injection pump.
03.05.04 Description and working of injector.
03.05.05 Description and working of Fuel filter.

**TOPIC: 04 – STEAM CONDENSER & STEAM NOZZLES:**

04.01 Advantages of condenser.
04.02 Classification of condenser.
04.03 Jet, Parallel flow, counter flow and surface condenser.
04.04 Vacuum and condenser efficiencies.
04.05 Types of steam nozzles.
04.06 Flow through nozzles, nozzle efficiencies.
04.07 Condition of minimum discharge, critical pressure ratio.

**TOPIC: 05 – STEAM ENGINES & TURBINES:**

05.01 Classification of steam engines and working principle.
05.02 Mean Effective Pressure, indicator diagram, diagram factor, power developed by steam engine.
05.03 Steam Impulse and Reaction turbines with velocity diagram.
05.04 Combined velocity diagram of steam turbine.
05.05 Delaval and curtis turbine.
05.06 Effect of friction on combined velocity triangle.
05.07 Velocity and pressure Compounding of steam turbine.
05.08 Calculation of work done and power.

**TOPIC: 06 – COMPRESSORS:**

06.01 Rotary air compressor : Root blower, Vane blower and Centrifugal compressor (Only working principle).
06.02 Calculation of work done for centrifugal compressor.
06.03 Reciprocating Compressor-Construction details.
06.04 Work input for reciprocating compressor during various processes in single and double stage.
06.05 Intercooling, Perfect intercooling and different types of efficiencies.
Books Recommended:

1. Hydraulic Machine - Dr. J. Lal
2. Fluid Mechanics and Machines - Dr. R. K. Bansal
6. Heat Engine - Karmchandami
8. Saral Ushma Engine, - S. L. Tak & R. Shamu
9. Refrigeration and Air Conditioning, Dhanpat Rai & Sons. - S. Domkumdwar

Reference Books:

2. A Course in Thermodynamics and Heat Engines (Thermal Engineering), Dhanpat Rai & Sons. - Domkundwon, Kothanda Raman Khajuria and Arora
7. Hydraulic Machinery. -
### Scheme of Examination for Final Examination

<table>
<thead>
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<th>Types of Questions</th>
<th>DISTRIBUTION OF MARKS</th>
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The above table refers to the annual examinations only.
Mechanics of Structure

Subject Code: 15303

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Full Marks: 100
Annual Exam.: 80
Internal Exam.: 20

Rationale:

The subject forms an important part of Mechanical Engineering and deals with the basic concept of the behaviour of material used in machine parts and in practice in different structures. In fact, this subject may be considered as the key of the engineering subjects dealing with materials.

Objective:

The student will be able to:

(i) Understand the various properties of materials used.
(ii) Understand & analyze the effect of various forces acting on the component of machine and resistance offered by these components.
(iii) Judge the suitability of a particular material in the design.

<table>
<thead>
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<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
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<td>Principal Stresses and Strain.</td>
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<td>02</td>
<td>Strain Energy.</td>
<td>(04)</td>
</tr>
<tr>
<td>03</td>
<td>Slope &amp; Deflection of Beam.</td>
<td>(07)</td>
</tr>
<tr>
<td>04</td>
<td>Torsion of Shaft.</td>
<td>(06)</td>
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</tbody>
</table>
CONTENTS:

TOPIC: 01 – PRINCIPAL STRESSES AND STRAIN:  [07]

01.01 Normal and Tangential stresses on oblique planes, resultant stress.
01.02 Principal planes and principal stresses & strain.
   (Analytical and graphical solution) (Simple problems)
01.03 Theory of elastic failure. (Simple problems)

TOPIC: 02 – STRAIN ENERGY:  [04]

02.01 Definition and concept of strain energy, Different types of loading.
02.02 Stresses developed due to gradual, sudden and impact load.
   (Simple problems)

TOPIC: 03 – SLOPE & DEFLECTION OF BEAM:  [07]

03.01 Relation between slope, deflection and radius of curvature.
03.02 Slope and deflection calculation for cantilevers & simply supported beam subjected to concentrated and uniformly distributed load.
03.03 Macaulay’s Method and its application for determining slopes and deflections.
TOPIC: 04 – TORSION OF SHAFT:

04.01  Theory of pure torsion, Moment of Resistance, Torsional Equation, Assumption in the theory of pure torsion, Polar modulus, Torsional rigidity. (Simple Problems)

04.02  Power Transmitted by a shaft. (Simple Problems)

TOPIC: 05 – SPRING:

05.01  Close Coiled Helical Springs, Determination of deflection, angle of twist and stiffness under axial loading and twisting. (Simple Problems)

05.02  Leaf springs, Determination of Central deflection, number of leaves and proof load on elliptical section of spring. (Simple Problems)

TOPIC: 06 – COLUMNS AND STRUTS:

06.01  Concept of columns, Euler’s Analysis for various end conditions of long column. Limitation of Euler’s formula, Equivalent lengths of columns.

06.02  Buckling load, Crushing load, Slenderness Ratio.

06.03  Ranking formula for column.

TOPIC: 07 – STRESSES IN BEAM:

07.01  Theory of Simple Bending, Position of neutral axis, Moment of resistance, General bending equation of a beam subjected to pure bending. (Simple Problems).

TOPIC: 08 – COMBINED DIRECT BENDING STRESSES:

08.01  Concept of Direct and Eccentric load.
08.02 Symmetrical Column Sections (Rectangular & Circular) with Eccentric loading about one axis, Stress distribution.
08.03 Core or Kernel of sections. (Simple Problems)
08.04 Columns and Chimney subjected to horizontal wind pressure.

TOPIC: 09 – THIN CYLINDERS AND SPHERES: [05]

09.01 Failure of a cylindrical shell due to an internal pressure, Circumferential and longitudinal stress.
09.02 Changes in dimensions, Changes in Volume due to internal pressure. (Simple Problems)

Books Recommended:

2. Strength of Materials - Surendra Singh
   (M. K. S. & S.I. Units)

SCHEME OF EXAMINATION FOR FINAL EXAMINATION F.M. : 80

<table>
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The above table refers to the annual examinations only.
Manufacturing Technology-II

Subject Code 15304

<table>
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Full Marks : 100
Annual Exam. : 80
Internal Exam. : 20

Rationale:

The modern trend in Engineering field i.e. in industrial production is very competitive owing to the new business policies being adopted by world traders. In a competitive marketing the product needs higher accuracy together with man production at lower price to suit the pocket of the consumers. This has resulted in need for adoptions of new machine tools, new processes and techniques automation and controls. The need of higher strength of materials being used in aero-space and other alike field, still requires advance technique of machining.

The Diploma holders being employed in supervisory capacity in different industrial concern must be conversant with essential traditional machine tools and processes and the modern technique & controls being adopted in developed and developing countries.

The introduction of this revised curriculum on subject named Manufacturing Technology-II is a very balanced effort to extend our technicians a comprehensive knowledge of traditional machine tools and techniques being adopted by modern industries.
Objective:

After completion of the course a student will be able to :-

- Classify Milling Machines and Milling operations.
- Select milling cutter.
- Give specification of milling machine.
- Know the different processes of gear manufacturing.
- Select best gear manufacturing method.
- Know the grinders.
- Select wheels for different grinding operations.
- Know the precision finishing operation.
- Develop knowledge in handling of broaches.
- Know the presses, classify, different press operation, dies and punches and their accessories.
- Develop design skill of jigs and fixtures and their applications.
- Know the different special purpose machines and operations carried on.
- Develop basic concept of C. N. C. machines and C. A. M.
- Understand the principle of modern machinery methods.

<table>
<thead>
<tr>
<th>S.No.</th>
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<tbody>
<tr>
<td>01</td>
<td>Milling Process.</td>
<td>(08)</td>
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<tr>
<td>02</td>
<td>Gear Manufacturing.</td>
<td>(08)</td>
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<tr>
<td>03</td>
<td>Grinding.</td>
<td>(08)</td>
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<tr>
<td>04</td>
<td>Super Finishing Process.</td>
<td>(07)</td>
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<tr>
<td>05</td>
<td>Broaching.</td>
<td>(05)</td>
</tr>
<tr>
<td>06</td>
<td>Press Work.</td>
<td>(10)</td>
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<tr>
<td>07</td>
<td>Jigs &amp; Fixtures.</td>
<td>(07)</td>
</tr>
<tr>
<td>08</td>
<td>Modern Machining Method.</td>
<td>(07)</td>
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</tbody>
</table>

**Total :** (60)
CONTENTS:

**TOPIC: 01 – MILLING PROCESS:** [08]

Introduction, Classification, Important parts and its functions, Mechanism, Work and cutter holding devices, Attachments, Types of Milling cutters, Different milling process.

**TOPIC: 02 – GEAR MANUFACTURING:** [08]

Introduction, Different methods, Indexing and dividing heads, Form cutters, Gear generating processes, Gear hobbing, Shaving, burnishing, grinding.

**TOPIC: 03–GRINDING:** [08]

Introduction, Classification, Grinding m/c, its parts and functions, Different types of grinding m/c centreless grinding, Work holding devices, Dry and wet grinding, Allowances and tolerances, Grinding Wheels, marking system, selection, binding glazing, loading, dressing & mounting of grinding wheels.

**TOPIC: 04 – SUPER FINISHING PROCESS :** [07]

Introduction, working Principle, application, advantages and limitations of Lapping, Honing, Polishing, Electroplating and Metal Spraying.

**TOPIC: 05 – BROACHING:** [05]

Introduction, broach and its types, Different broaching methods, broaching machines, fixtures for different operations, advantages and limitations.
TOPIC: 06 – PRESS WORK:

Introduction, different operations, Press classification, selection, size, press tools-punch and die, die accessories, types of dies, clearance, feeding mechanism, Power press, main parts and working, driving mechanism. Operation performed on press :-

- Notching,
- Piercing,
- Blaming,
- Shearing,
- Nibbling,
- Perforating etc.

TOPIC: 07 – JIGS & FIXTURES:

Introduction, difference between jig and fixture, advantages and limitations, design principles, Elements of jigs and fixtures, principle of location, drilling jigs, milling fixtures.

TOPIC: 08 – MODERN MACHINING METHOD:

Introduction, need, applications, advantages, limitation, working principles of electric discharge machining (EDM), Ultrasonic Machining (USM), Electrochemical Machining (ECM), Abrasive Jet Machining (AJM). Numerical Control (NC) and Computerized Numerical Control (CNC) Machines.
Books Recommended:

1. Workshop Technology - Hazra & Choudhary
2. Workshop Technology - Raghuvanshi
4. Workshop Technology, HMT Publication -
5. A Text Book of Production Engineering, S. Chand & Co. Ltd., Delhi - P. C. Sharma
6. Modern Machining Methods - M. Adittam

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

<table>
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Rationale & Objective:

By studying industrial management paper, diploma students will become acquainted with skills of management, have knowledge about site selection, plant layout, purchasing, stores, material handling, safety management, maintenance and problem control.

<table>
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<th>S.No.</th>
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<th>Periods</th>
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<tbody>
<tr>
<td>01</td>
<td>Functions of Management.</td>
<td>(05)</td>
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<tr>
<td>02</td>
<td>Business organisation.</td>
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<td>03</td>
<td>Site Selection &amp; Plant layout.</td>
<td>(06)</td>
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<tr>
<td>04</td>
<td>Purchase Management.</td>
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<td>05</td>
<td>Inventory Control.</td>
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<td>06</td>
<td>Material Management.</td>
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<td>07</td>
<td>Safety Management.</td>
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<td>Environmental Pollution Control.</td>
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<td>Plant Maintenance.</td>
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CONTENTS:

TOPIC: 01 – FUNCTIONS OF MANAGEMENT: [05]

01.01 Definition, objective, importance, classification, functions of management planning, organising authority and responsibility communicating, directing, co-ordinating, control, motivation, decision-making.

TOPIC: 02 – BUSINESS ORGANISATION: [05]

02.01 Introduction, necessity, classification line, functional line and staff, organisation-advantages and disadvantages, organisation chart, Project organisation, public, private and joint sector enterprises.

TOPIC: 03 – SITE SELECTION & PLANT LAYOUT: [06]

03.01 Importance of site selection, factors affecting plant location, Rural Vs. Urban location. Plant layout, objectives, advantages of good plant layout, classification, comparison between product layout and process layout.

TOPIC: 04 – PURCHASE MANAGEMENT: [05]

04.01 Purchasing, objective, function, classification of purchasing organisation, purchase procedure.

TOPIC: 05 – INVENTORY CONTROL: [06]

05.01 Introduction, importance, classification, advantage, economic order quantity (EOQ), A-B-C analysis, numericals. Function of Stores Management, Centralised and decentralized stroes.
TOPIC: 06 – MATERIAL MANAGEMENT:

06.01 Introduction, definition, principles and function, types, selection of material handling equipments, handling of hazardous materials, relation to plant layout.

TOPIC: 07 – SAFETY MANAGEMENT:

07.01 Introduction, importance, steps for safety, functions, compensation for injury.

TOPIC: 08 – ENVIRONMENTAL POLLUTION CONTROL:

08.01 Introduction, factors affecting environment, effects of pollution on ecology, air pollution control, water pollution control, solid waste management, noise pollution control.

TOPIC: 09 – PLANT MAINTENANCE:

09.01 Objective, importance, duties, function and responsibilities of plant maintenance department, types and disadvantages, plant maintenance schedule.

Books Recommended:

1. Industrial Engineering & Management - O. P. Khanna
2. Industrial Engineering & Management - S. K. Sharma & S. Sharma
3. Organisation and Management - Banga & Sharma
SCHEME OF EXAMINATION FOR FINAL EXAMINATION  

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Rationale:

This course is aimed at further reinforcing and enhancing the knowledge skill acquired in the earlier courses. The exercise included in the course would provide the students such experiences which he would encounter later in his professional life.

The day to day function carried out in the drawing and design department of an industry are multifarious. Some of these functions are planning, sketching, deciding specification, determining factors and providing dimensions etc.

This course is so designed as to provide the students such experiences where he can apply his knowledge acquired from various subjects.

Objective:

A student will be able to :-
(i) Read and understand drawing.
(ii) Prepare assembly and desassembly drawings.
(iii) Design machine parts.
(iv) Prepare working drawing.
(v) Develop skill to draw sketches of simple machine parts, assembly machine parts.
(vi) Impart ideas, convey information and specify shape through drawing.
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<td><strong>Machine Drawing</strong></td>
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<td><strong>Part-II</strong></td>
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<td><strong>Machine Design</strong></td>
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<td>Design of Machine Parts.</td>
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<td>Design of Fasteners.</td>
<td>01(Half Size)</td>
<td>(09)</td>
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<tr>
<td>05</td>
<td>Design of Keys and Couplings.</td>
<td>01(Half Size)</td>
<td>(09)</td>
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<tr>
<td>06</td>
<td>Design of Power Screws.</td>
<td>01(Half Size)</td>
<td>(09)</td>
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<tr>
<td>07</td>
<td>Design of Springs.</td>
<td>01(Half Size)</td>
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<td>Design of Power transmission.</td>
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**N.B.** - One design on half drawing sheet or two design on full drawing sheet.
PART-I
MACHINE DRAWING

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**TOPIC: 01 – ASSEMBLY OF MACHINE PARTS:**

- 01.01 Feed Check valve.
- 01.02 Lathe Slide Rest
- 01.03 Machine Vice (plain & Swivel)
- 01.04 Tool head of shaping machine.
- 01.05 Tail stock of a Lathe.
- 01.06 Drilling jig
- 01.07 Ball and Roller bearing.
- 01.08 Hydraulic expansion joint.
- 01.09 Connecting rod of I. C. Engine.
- 01.10 Automiser.
- 01.11 Cam Profile.
- 01.12 Gears in mesh (Spur gears/Bevel gears/Worm & Worm Wheel)

**TOPIC: 02 – WORKING DRAWING:**

- 02.01 Working Drawing of designed machine part.
**PART-II**

**MACHINE DESIGN**

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**TOPIC: 03 – DESIGN OF MACHINE PARTS:**

03.01 Cotter Joint.
03.02 Kunckle Joint.

**TOPIC: 04 – DESIGN OF FASTENERS:**

04.01 Rivetted Joint (Lap & Butt).
04.02 Welded Joints.

**TOPIC: 05 – DESIGN OF KEYS AND COUPLINGS:**

05.01 Protected type flange coupling.
05.02 Pin type flexible coupling.
05.03 Univesal Coupling.

**TOPIC: 06 – DESIGN OF POWER SCREWS:**

06.01 Screw Clamp and nut.
06.02 Screw Jack.

**TOPIC: 07 – DESIGN OF SPRINGS:**

07.01 Close Coiled Hellical valve spring.
07.02 Carriage spring.
TOPIC: 08 – DESIGN OF POWER TRANSMISSION: [01] [09]

08.01 Single plate clutch.
08.02 Spur gear used in speed reduction in lathe (Co-axial).

TOPIC: 09 – DESIGN OF BEARING: [01] [06]

09.01 Solid Journal Bearing.
09.02 Plumber Block.
09.03 Ball and Roller Bearing.

Books Recommended:

7. Machine Design - Vijay Vargeya

SCHEME OF EXAMINATION FOR FINAL EXAMINATION F.M. : 80

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The above table refers to the annual examinations only.
Rationale:

A mechanical engineering diploma holder is in demand as maintenance supervisor. In the capacity of a supervisor he has to take the problem of installation and commissioning of machines. He is responsible for the maintenance and upkeep of the machine and equipments under his charge. He is expected to plan maintenance schedule and keep machines in operating condition. He has to take on the spot decision about replacement, restoration and recovery of machine parts.

The subject has been designed to develop sufficient knowledge which will help in developing & skill and attitude in students so that when engaged in any industry he may be able to discharge his duties with confidence.

Objective:

A student after successful completion of the subject will be able to:

- Understand the problem in installation of machine and equipment.
- Organise the maintenance activities.
- Develop the knowledge of methods of determining wear.
- Select repair methods of worn parts and their sequence.
- Understand the common defects and their repair resonation and/or removal in machine parts.
- Ensure a non interrupted production-flow
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<tr>
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<td>(07)</td>
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<tr>
<td>02</td>
<td>Generalised procedure of Installation.</td>
<td>(08)</td>
</tr>
<tr>
<td>03</td>
<td>Maintenance and Repair of Guide Surfaces.</td>
<td>(05)</td>
</tr>
<tr>
<td>04</td>
<td>Corrosion-its Control and Chemical Cleaning.</td>
<td>(06)</td>
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<td>05</td>
<td>Lubrication and Lubricants.</td>
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<td>06</td>
<td>Pumps and Air Compressors.</td>
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<td>07</td>
<td>Material Handling.</td>
<td>(04)</td>
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<tr>
<td>08</td>
<td>Seals, Packings and Gaskets.</td>
<td>(04)</td>
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**CONTENTS:**

**TOPIC: 01 – MAINTENANCE & MAINTENANCE PLANNING:** [07]

01.01 Objectives of Maintenance and its policies.
01.02 Types of Maintenance (Scheduled, Predictive, Preventive and Breakdown), Advantages of Preventive maintenance.
01.03 Organisational set-up for maintenance department.
01.04 Maintenance Planning-planning and scheduling.
01.05 Repair Cycle and Repair Complexity.
01.06 Maintenance and Reliability.

**TOPIC: 02 – GENERALISED PROCEDURE OF INSTALLATION:** [08]

02.01 Location and layout of Machines.
02.02 Positioning of Machines.
02.03 Foundation, Levelling, and Alignment.
02.04 Grouting, Fitting of Other Parts.
TOPIC: 03 – MAINTENANCE AND REPAIR OF GUIDE SURFACES:

03.01 Types of guide ways.
03.02 Causes of Mechanical wear on guide surfaces.
03.03 Methods of Measuring the extent of wear.
03.04 General method of repairing Guide surfaces.

TOPIC: 04 – CORROSION-ITS CONTROL AND CHEMICAL CLEANING:

04.01 Types of Corrosion-Galvanic, Intergranular, Erosion and Stress Corrosion.
04.02 Methods for Protection Minimisation in Corrosion-Electroplating, Galvanising, Aluminium Coating, Thermo-plastic Coating etc.
04.03 Chemical Cleaning-Classification of Cleaning activities.

TOPIC: 05 – LUBRICATION AND LUBRICANTS:

05.01 Functions of lubrication.
05.02 Properties and types of lubricants, selection of lubricants.
05.03 Mode of lubrication, Boundary lubrication, Fluid film lubrication, Mixed lubrication.
05.04 Types of lubrication System.

TOPIC: 06 – PUMPS AND AIR COMPRESSORS:

06.01 Introduction to basic elements of Centrifugal and reciprocating pumps.
06.02 Pumping units, Connection of pumps with suction lines and discharge lines, Direction or rotation of pump.
Different types of Troubles with Centrifugal pumps and their causes.

Air Compressor : Types of Compressor, selection of Compressor, Site selection and storing of Compressor, fitting and positioning of important accessories and Components.

**TOPIC: 07 – MATERIAL HANDLING:**

- **07.01** Methods of Material Handling.
- **07.02** Lifting and lowering devices- Block and tackle, Elevator, pillar Crane, overhead crane.
- **07.03** Transporting Devices : Wheel barrow, hand truck, lift truck, Crane truck, Conveyors-belt, elevating, Roller screw, pipe line and Cable Conveyors.

**TOPIC: 08 – SEALS, PACKINGS AND GASKETS:**

- **08.01** Introduction.
- **08.02** Classification of Seals-Static and Dynamic.
- **08.03** Applications of labyrinth seal, Gasket seals on fixed joints on reciprocating parts.

**TOPIC: 09 – MISCELLANEOUS MAINTENANCE:**

- **09.01** Pipe Materials and Pipe fitting.
- **09.02** Major Causes of faults-Leakages, Swaying of pipes, Water hammer, Corrosion.
- **09.03** Dust Collectors/Separators-Types of dust separators, Mechanical and Electrostatic precipitators.
Books Recommended:

1. Installation, Servicing and Maintenance, S. Chand & Sons Co. Ltd. - S. N. Bhattacharya
2. Industrial Maintenance, S. Chand & Sons Co. Ltd. - H. P. Garg
4. Maintenance Management, I. S. T. E., Mysore. -

SCHEME OF EXAMINATION FOR FINAL EXAMINATION

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Rationale:

Every industrial unit may it be public or private sector stands for service to humanity. In the same course they either have to manage things on no-profit no loss basic or for handsome profit. In all cases the technician engaged in the job must be well conversant with need of the market and the purchasing capacity of the consumers. Again these two factors must have collaboration with the feasibility and economy with which the production should be affected. Therefore, the technician engaged in such works must have sound knowledge of production, planning market survey, cost and quality control sale promotion etc. Introduction of this subject will enable student learning about all relevant topics giving knowledge as said above. This course will also fulfil the one the measure activities of a technician i.e. cost consciousness. It is expected from a technician to perform every activity in an economical way.

Objective:

After covering the courses a student will be able to :-

- Learn all the elements of production, planning and control to develop the skill.
- Plan a work schedule and complete the work in given time.
- Develop basic concept & knowledge of market research.
• Define and understand the elements involved in workstudy and apply it towards product economy.
• Define and understand jobs evaluation and their merit ratings.
• Understand different terms associated with work sampling and its application towards quality control.
• Understand the distribution channels, advertisement.
• Develop skill of sales.
• Develop knowledge of foreign trade.
• Break cost into elements for cost analysis.
• Correspondence promotion.
• Knowledge of depreciation and skill for calculation of Cost of depreciation.
• Estimate & Calculate different matching time.
• Develop skill to find the cost of a product & fix up selling price.

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<td>Production, Planning &amp; Control.</td>
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<td>02</td>
<td>Sales Forecasting.</td>
<td>(06)</td>
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<tr>
<td>03</td>
<td>Job evaluation &amp; Merit Rating.</td>
<td>(05)</td>
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<td>04</td>
<td>Time &amp; Motion Study.</td>
<td>(05)</td>
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<td>Salesmanship.</td>
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<td>Elements of Cost.</td>
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<td>Depreciation.</td>
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<td>08</td>
<td>Estimation of Machining time.</td>
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<tr>
<td>09</td>
<td>Costing for Metal forming and Fabrication Process.</td>
<td>(08)</td>
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*Total: (50)*
CONTENTS:

**PART-A**

**TOPIC: 01 – PRODUCTION, PLANNING & CONTROL:** [08]

<table>
<thead>
<tr>
<th>01.01</th>
<th>Types of production, their advantages &amp; disadvantages.</th>
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<tbody>
<tr>
<td>01.02</td>
<td>Productivity, Method of increasing productivity, Difference between production and productivity, Economic Batch quality.</td>
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<td>01.03</td>
<td>Types of Production planning, Production planning procedures.</td>
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<tr>
<td>01.04</td>
<td>Routing, Scheduling, Dispatchings, &amp; follow-up.</td>
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**TOPIC: 02 – SALES FORECASTING:** [06]

<table>
<thead>
<tr>
<th>02.01</th>
<th>Definition, Concept and need of sales forecasting.</th>
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<tbody>
<tr>
<td>02.02</td>
<td>Sales forecasting technique : Market Survey, Forecasting by past average, forecasting by Moving average.</td>
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**TOPIC: 03 – JOB EVALUATION & MERIT RATING:** [05]

<table>
<thead>
<tr>
<th>03.01</th>
<th>Methods of job evaluation : Ranking method, Classification method, factor comparison method, point method,</th>
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<tbody>
<tr>
<td>03.02</td>
<td>Merit Rating : Introduction, definition and its objectives, Methods of merit rating.</td>
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**TOPIC: 04 – TIME & MOTION STUDY:** [05]

<table>
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<tr>
<th>04.01</th>
<th>Work study-its objectives and advantages, Elements of work study.</th>
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<tbody>
<tr>
<td>04.02</td>
<td>Method study-Elements and procedure of method study operation chart &amp; flow process chart.</td>
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</table>
TOPIC: 05 – SALESMA NSHIP: [04]

05.01 Duties of Sales engineer, Distribution Channel, advertisement, sales correspondence.
05.02 Selling concepts V/S Marketing Concept.

PART-B

TOPIC: 06 – ELEMENTS OF COST: [05]

06.01 Determination of Material cost & Labour Cost.
06.02 Expenses : Direct & Indirect expenses, factory expenses, administrative Expenses, Selling expenses, Distribution expenses.
06.03 Cost of product.

TOPIC: 07 – DEPRECIATION: [04]

07.01 Definition & Concept, Causes of depreciation.
07.02 Calculation of Depreciation : Straight line method, Annuity method and Sinking fund method.

TOPIC: 08 – ESTIMATION OF MACHINING TIME: [05]

08.01 Cutting speed, feed and depth of cut for different machining operations.
08.02 Concept of unit time, Cycle time and total time.
08.03 Calculation of Machining time for different machining operation.
TOPIC: 09 – COSTING FOR METAL FORMING AND FABRICATION PROCESS

09.01 Concepts of different types of welding & Welded joints.
09.02 Calculation of welding time & welding cost.
09.03 Concepts of forging and forging operation, estimation of forgoing cost.

Books Recommended:

1. Production & Costing, Khanna Publisher, Delhi-6 - G. S. B. Narang & V. Kumar
2. Mechanical Production & Costing, Khanna Publisher, Delhi-6 - T. R. Banga & S. C. Sharma
5. Production & Costing. - Dadan & Karmendra
6. Time and Motion Study. - Dalela

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The above table refers to the annual examinations only.
Automobile Engineering

Subject Code
15309

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No. of Periods in one session
50

Full Marks : 100
Annual Exam. : 80
Internal Exam. : 20

Rationale :

Automobile Engineering though a specialised subject, is a branch of Mechanical Engineering. In India there are few places where a separate diploma course in automobile engineering is existing. To cater to the choice of aspiring young engineers and meet the growing need of automobile industry, it is desirable to teach the subject in the curriculum of mechanical engineering diploma course. Hence the subject is need-based of industry and the individual technician. It will also provide the basic theoretical background for those who would like to start on automobile service enterprise after completing the Diploma.

Objective:

The student will be able to :-

- Know about an automobile.
- List the main components of automobile vehicles.
- Classify automobile vehicles.
- Sketch different types of automobile chasis.
- Describe function of various chasis component.
- List the various operating system.
• Explain I. C. Engine as power unit.
• Understand the meaning of ‘scavenging’.
• Know the necessity of engine cooling.
• Classify the cooling system.
• Know firing order.
• Draw value timing diagrams.
• Know the various engine rotations.
• List the various engine rotations.
• Know about engine lubrication.
• Understand the Ignition system, fuel Injection system.
• Hydraulic system, breaking system, lighting system.

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<td>(03)</td>
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<td>03</td>
<td>Valves and Ports.</td>
<td>(02)</td>
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<td>Cooling System.</td>
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<td>Lubrication.</td>
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<td>Fuel Supply System.</td>
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<td>Carburetor.</td>
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<td>08</td>
<td>Transmission System.</td>
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<td>Front Axle &amp; Steering.</td>
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<td>Frame &amp; Suspension.</td>
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**Total :** (50)
CONTENTS:

**TOPIC: 01 – INTRODUCTION:**

01.01 Classification of Automobile Vehicles.
01.02 Description of different components of Automobile vehicles.

**TOPIC: 02 – AUTO ENGINES:**

02.01 Concept of Petrol (S.I.) and Diesel (C.I.) engines and their difference.
02.02 Working principle of two stroke and four stroke engines and their difference.
02.03 Various components of an engine, their materials and functions.

**TOPIC: 03 – VALVES AND PORTS:**

03.01 Functions and construction.
03.02 Function and construction of cam and camshaft. Description of follower, Push rod and rocker arm.

**TOPIC: 04 – COOLING SYSTEM:**

04.01 Necessity, types- air cooling and water cooling.
04.02 Radiator, Water jacket, Water pump, fan, thermostat- brief description, coolant used in modern vehicles.

**TOPIC: 05 – LUBRICATION:**

05.01 Necessity, types of lubricating system.
05.02 Factors affecting lubrication, characteristics of good lubricant.
05.03 Car lubricating system.
TOPIC: 06 – FUEL SUPPLY SYSTEM:  

06.01 Necessity, types.
06.02 Description of mechanical fuel pump, S. U. Electric fuel pump.
06.03 Description of mechanical fuel injection pump and Nozzle and their working principle.

TOPIC: 07 – CARBURETOR:  

07.01 Carburation process, operation.
07.02 Types of carburetor, Simple Carburetor, Working principle, Constructional details.
07.03 Defects in simple carburetor & their remedies.
07.04 Need and function of choke, idling compensation, air bleed jet compensation, submerged jet system.
07.05 Improved carburetor- Zenith S. U. carburetor- Construction and advantage over simple carburetor.

TOPIC: 08 – TRANSMISSION SYSTEM:  

08.01 CLUCH
08.01.01 Necessity, types- single and multiple plate clutches.
08.01.02 Requirement of good clutch facing, clutch lining and good qualities of lining materials.
08.02 GEAR BOX.
08.02.01 Necessity, types- sliding mesh, constant mesh, synchromesh gear box- construction and working principle.
08.02.02 Automatic gear change on different loads and speed-working principle.
08.03 Universal joint- construction & function.
08.04 Propeller shaft- construction & function.
08.05 Differential- construction and function.
08.06 Rear axle- construction, function, types- plain, semi-floating & fully floating axle.
08.07 WHEEL & TYRES
08.07.01 Wheel- function and requirements.
08.07.02 Type of wheel tyres, desirable properties, Tubeless tyre, radial ply tyre.
08.07.03 Tyre materials, factors affecting tyre life.
08.07.04 Tubes- function and construction, valve pin, Air pressure for different vehicles & their measurement.

**TOPIC: 09 – FRONT AXLE & STEERING:**

09.01 Function of axle, axle load, function of king-pin, stub axle assembly, steering principle toe-in and toe-out, principle of caster and its effects, camber effect, steering gears- types & working, power steering.

**TOPIC: 10 – FRAME & SUSPENSION:**

10.01 Frame- Necessity and construction.
10.02 Classification of suspension system, their types-Telescopic shock absorber, Air suspension, independent suspension.

**TOPIC: 11 – BRAKES:**

11.01 Concept and requirement of brakes.
11.02 Classification of brakes- working of mechanical, hydraulic, Vacuum/Air assisted brakes.
11.03 Bleeding of brakes, brake adjustment, material for brake lining with requirement.
TOPIC: 12 – INTAKE & EXHAUST SYSTEM:

12.01 Intake manifold in S. I. and C. I. engines.
12.02 Exhaust manifold, different types of muffler and tailpiece.
12.03 Supercharger, Turbo charger in C. I. engine.

TOPIC: 13 – ELECTRICAL SYSTEM:

13.01 Concept of ignition, working of condenser, Ignition coil, distributor, C. B. point, principle of firing order.
13.02 Construction and function of storage battery and its maintenance.
13.03 Battery charging and testing.
13.04 Starter motor, Bendix drive- brief description.
13.05 Need and function of magneto system.
13.06 Need and function of Dynamo, Alternator, cut-out, control of voltage and current.
13.07 Different lighting and signaling points, horn, audio equipments, Wiper.
13.08 Brief idea of Air conditioning.

TOPIC: 14 – MISCELLANEOUS:

14.01 Spark plug cleaning and gap setting.
14.02 Measurement of lubricant level in engine sump, gear box and differential.
14.03 Cleaning of air filter, float chamber jets etc.
14.04 Use of grease gun, location of grease nipples.
14.05 Description of short-circuited spark plug, faulty float pin, lightening of fan belt.
14.06 Break down maintenance of vehicles & their components.
14.07 Analysis of exhaust gases. Certification of Bharat Stage I, Bharat Stage II and Bharat Stage III.
Books Recommended:

3. Automobile Mechanics - Joseph Heitner
5. Internal Combustion Engines - A. C. Roa and S. B. Beohar

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Rationale:

Non-conventional energy sources have become the most urgent sources for replacement of conventional energy source because of rising cost, decreasing availability and causing pollution to environment. Knowledge of new technologies will enrich the technical know how of students and the increase their employment opportunities in upcoming sector of renewable energy.

Objective:

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<td>Wind Energy.</td>
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<td>02</td>
<td>Biomass Energy.</td>
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<tr>
<td>03</td>
<td>Geothermal Energy.</td>
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<td>04</td>
<td>Energy from Ocean.</td>
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<td>05</td>
<td>Fuel Cells.</td>
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<td>Hydrogen Energy.</td>
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<td>Energy Storage.</td>
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<td>08</td>
<td>Energy Conservation.</td>
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**Total**: (60)
CONTENTS:

**TOPIC: 01 – WIND ENERGY:**

Introduction, Principle, wind energy conversion systems, types of wind machines, its performance, advantages and limitation.

**TOPIC: 02 – BIOMASS ENERGY:**


**TOPIC: 03 – GEOTHERMAL ENERGY:**

Introduction, geothermal sources, classification, compressed resources, exploration, environmental implications, applications, advantages and disadvantages.

**TOPIC: 04 – ENERGY FROM OCEANS:**

Introduction, Ocean thermal energy conversion, site-selection, utilization, tidal power energy conversion. Ocean waves, mini and micro hydel plants.

**TOPIC: 05 – FUEL CELLS:**

Introduction, Classification, Principles, performance, application, advantages and limitations.

**TOPIC: 06 – HYDROGEN ENERGY:**

Introduction, production, storage, transportation, safety, utility, comparison with other automobile fuels.
TOPIC: 07 – ENERGY STORAGE:  

Introduction, classification, application, advantages, disadvantages of mechanical, electrical, chemical and thermal energy storage systems.

TOPIC: 08 – ENERGY CONSERVATION: 

Introduction, Conservation of thermal and electrical energy in agriculture, industry, transport and home sector, Present energy scenario in India, Energy audit.

Books Recommended: 

1. 
2. 
3. 
4. 
5. 
6. 
7. 

SCHEME OF EXAMINATION FOR FINAL EXAMINATION 

<table>
<thead>
<tr>
<th>Types of Questions</th>
<th>DISTRIBUTION OF MARKS</th>
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The above table refers to the annual examinations only.
Rationale and Objective:

Refrigeration and air-conditioning is essential for comfort of human being for increasing the efficiency of daily work. It is widely used in automotive Engg and medicine to maintain the refined temperature and humidity.

Diploma technicians need to know the knowledge of this subject to supply the suggestions about the above.

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<th>S.No.</th>
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<td>02</td>
<td>Air Refrigeration System.</td>
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<td>Simple Vapour Compression Refrigeration System.</td>
<td>(08)</td>
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<td>Vapour absorption and Electrolux Refrigeration System.</td>
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<td>05</td>
<td>Refrigerant and its properties.</td>
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<td>06</td>
<td>Refrigeration equipments and application of refrigeration.</td>
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<td>07</td>
<td>Psychrometry.</td>
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<td>08</td>
<td>Comfort air-conditioning.</td>
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<tr>
<td>09</td>
<td>Cooling Load Calculation.</td>
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<td>Air Conditioning equipments and its application.</td>
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<td>Maintenance of Refrigeration and air-conditioning system.</td>
<td>(03)</td>
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Total: (60)
CONTENTS:

**TOPIC: 01 – METHOD OF REFRIGERATION:**

- 01.01 Ice Refrigeration.
- 01.02 Evaporative Refrigeration.
- 01.03 Dry Ice Refrigeration.
- 01.04 Steam Jet Refrigeration.
- 01.05 Unit of Refrigeration, engine, Refrigeration and heat pump.

**TOPIC: 02 – AIR REFRIGERATION SYSTEM:**

- 02.01 Reversed Cornot Cycle and most efficient refrigeration.
- 02.02 Bell Coleman Refrigeration, Calculation of C. O. P.
- 02.03 Advantages and disadvantages of air-refrigeration system.
- 02.04 Necessity of cooling the aeroplane.
- 02.05 Limitations, merit and compactions of air refrigeration system (Numerical problems).

**TOPIC: 03 – SIMPLE VAPOUR COMPRESSION REFRIGERATION SYSTEM:**

- 03.01 Vapour Compression Refrigerator.
- 03.02 T-ϕ, H-ϕ and P-H diagram for Vapour Compressions Refrigeration System.
- 03.03 Analysis of Vapour Compression System.
- 03.04 Wet versus dry compression.
- 03.05 Advantages of Vapour Compressions over air refrigeration System.
- 03.06 C. O. P. Calculation by analytically and by the help of tables & numerical problems.
TOPIC: 04 – VAPOUR ABSORPTION AND ELECTROLUX

REFRIGERATION SYSTEM:

04.01 Basic absorption system.
04.02 Actual ammonia absorption system with block diagram.
04.03 Electrolux refrigeration System with block diagram & working principle.
04.04 Comparison of compression and absorption refrigeration system.

TOPIC: 05 – REFRIGERANT AND ITS PROPERTIES:

05.01 Classification of Refrigerants.
05.02 Physical properties of CO₂, SO₂, F-12 & F-22.
05.03 Antifreeze solutions.

TOPIC: 06 – REFRIGERATION EQUIPMENTS AND APPLICATION OF REFRIGERATION:

06.01 Compressors, Condensers and Cooling towers.
06.02 Evaporators, Electric motors.
06.03 Industrial, medical and comfort air conditioning.

TOPIC: 07 – PSYCHROMETRY:

07.01 Introduction.
07.02 Meaning of air-conditioning.
07.03 Psychrometer properties and relations.
07.04 Psychrometer chart and processes.
07.05 Summer, Winter and Year round air-conditioning –Numerical problem.
TOPIC: 08 – COMFORT AIR-CONDITIONING:  

08.01 Requirement of Comfort air-conditioning.  
08.02 Thermodynamics of human body.

TOPIC: 09 – COOLING LOAD CALCULATION:  

09.01 Different heat sources.  
09.02 Conduction heat, radiation heat of sun, occupant and equipment load.  
09.03 Infiltration air load.  
09.04 Fresh air load. (Numerical Problems)

TOPIC: 10 – AIR CONDITIONING EQUIPMENTS AND ITS APPLICATION:  

10.01 Air cleaning and air filters.  
10.02 Humidifiers and dehumidifiers.  
10.03 Fan and blowers.  
10.04 Grills and registers.  
10.05 Heating and cooling coil.

TOPIC: 11 – MAINTENANCE OF REFRIGERATION AND AIR-CONDITIONING SYSTEM:  

11.01 Charging of refrigeration unit air conditioning system.  
11.02 Causes of faults and their remedies.
Books Recommended:


Reference Books:

2. Refrigeration and Air - Manohar Prasad.
10. Refrigeration and Air Conditioning in the light of latest development, I. S. T. E.
## SCHEME OF EXAMINATION FOR FINAL EXAMINATION

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The above table refers to the annual examinations only.
CAD/CAM

Subject Code
15310C

Theory

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No. of Periods in one session
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Rationale:

Objective:

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**Computers, The Foundation Of CAD/CAM**

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**Computer-Aided Design**

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<td>Hardware in Computer-Aided Design.</td>
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<td>06</td>
<td>Computer Graphics Software &amp; Data Base.</td>
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**Numerical Control, The Beginnings**

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<td>09</td>
<td>Computer Controls in NC.</td>
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<td>Industrial Robots.</td>
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<td>11</td>
<td>Robot Applications.</td>
<td>(07)</td>
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</table>

Total: (60)
CONTENTS:

TOPIC: 01 – INTRODUCTION:  [03]

01.01 CAD/CAM Defined.
01.02 The Product Cycle and CAD/CAM.
01.03 Automation and CAD/CAM.

COMPUTERS, THE FOUNDATION OF CAD/CAM

TOPIC: 02 – COMPUTER TECHNOLOGY:  [06]

02.01 Introduction.
02.02 Central Processing Unit (CPU).
02.03 Types of Memory.
02.04 Input/Output.
02.05 Date Representation.
02.06 Computer Programming Languages.
02.07 Operating the Computer System.

TOPIC: 03 – MINI COMPUTERS, MICRO COMPUTERS AND PROGRAMMABLE:  [05]

03.01 Introduction.
03.02 Mini Computers.
03.03 Micro Computers.
03.04 Programmable Controllers.
### COMPUTER-AIDED DESIGN

**TOPIC: 04 – FUNDAMENTALS OF CAD:**

- 04.01 Introduction.
- 04.02 The design process.
- 04.03 The Application of Computers for Design.
- 04.04 Creating the Manufacturing Data Base.
- 04.05 Benefits of Computer-Aided Design.

**TOPIC: 05 – HARDWARE IN COMPUTER-AIDED DESIGN:**

- 05.01 Introduction.
- 05.02 The Design Workstation.
- 05.03 The Graphics Terminal.
- 05.04 Operator Input Devices.
- 05.05 Plotters and Other Output Devices.
- 05.06 The Central Processing Unit.
- 05.07 Secondary Storage.

**TOPIC: 06 – COMPUTER GRAPHICS SOFTWARE & DATA BASE:**

- 06.01 Introduction.
- 06.02 The Software Configuration of a Graphics System.
- 06.03 Functions of a Graphics Package.
- 06.04 Constructing the Geometry.
- 06.05 Transformations.
- 06.06 Data base structure & Content.
- 06.07 Wire frame versus Solid modeling.
- 06.08 Other CAD Features & CAD/CAM Integration.
NUMERICAL CONTROL, THE BEGINNINGS

**TOPIC: 07 – CONVENTIONAL NUMERICAL CONTROL:** [06]

07.01 Introduction.
07.02 Basic Components of an NC System.
07.03 The NC Procedure.
07.04 NC Coordinate Systems.
07.05 NC Motion Control Systems.
07.06 Applications of Numerical Control.

**TOPIC: 08 – NC PART PROGRAMMING:** [07]

08.01 Introduction.
08.02 The Punched Type in NC.
08.03 Type Coding and Format.
08.04 Manual Part Programming.
08.05 Computer-Assisted Part Programming.

**TOPIC: 09 – COMPUTER CONTROLS IN NC:** [03]

09.01 Introduction.
09.02 Problems with Conventional NC.
09.03 NC Controller Technology.
09.04 Computer Numerical Control.
09.05 Direct Numerical Control.
09.06 Combined DNC / CNC Systems.
09.07 Adaptive Control Machining Systems.
TOPIC: 10 – INDUSTRIAL ROBOTS:

10.01 Introduction.
10.02 Robot Physical Configuration.
10.03 Basic Robot Motions.
10.04 Other Technical Features.

TOPIC: 11 – ROBOT APPLICATIONS:

11.01 General Considerations in Robot Applications.
11.02 Material Transfer.
11.03 Machine Loading.
11.04 Welding.
11.05 Spray Coating.
11.06 Processing Operations.
11.07 Assembly.
11.08 Inspection.

Books Recommended:

1. CAD/CAM(Computer Aided Design and Manufacturing), Prentice Hall of India Pvt. Ltd., New Delhi-110 001.
   - Mikell P. Groover & Emory W. Zimmers, Jr.
2. Mastering Auto CAD, BPB Publications, B-14, Connaught Place, New Delhi
   - George Omura
3. Auto CAD
   - Sachin Raje
   - Joe Rooney and Philip.
   - Raghuram
6. AutoCAD.
   - Rice
   - Dr. Racker and H. Rice


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The above table refers to the annual examinations only.
Rationale:

Like drawing and workshop practice, knowledge and practice of communication skill are necessary for development of professional competencies of a technician-engineer. He has to be conversant with Database Management and Graphics. The course will impart to the students the basic principles of computer uses especially in Graphics.

Objective:

A student will be able to:

- Handle a micro computer independently and perform some independent works.
- Make 2 D and 3 D drawing on computer.
- Convert 2 D drawings into 3 D drawing.
- Exchange (Import and Export) data from other software.
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<td>01</td>
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<td>Basic 2 D Drafting.</td>
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<td>Advance AUTO-CAD features.</td>
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<td>Import and Export of data from other software.</td>
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CONTENTS:

**TOPIC: 01 – INTRODUCTION TO VARIOUS CADD TOOLS:** [06]

01.01 Review of basic knowledge of Computers-Input and output devices, keyboard, Digitizer, Graphic Screen, Printers and Plotters, uses of networking in CAD centres and integrated approach of concept’s design to manufacturing.

01.02 Introduction to development of Graphics from GKS, CORE, PHICS which provided subroutines for programming to specification-based tools for drawing and drafting.

01.03 Broad aspects of Mechanical CAD Designing and Analysis. Various types of CAD packages. Important Auto CAD features (Release 2004 or higher). Customizing Auto CAD.

**TOPIC: 02 – BASIC 2 D DRAFTING:** [12]

TOPIC: 03 – ADVANCE 2 D DRAFTING:


TOPIC: 04 – ADVANCE AUTO-CAD FEATURES:

04.01 Attributes and data Extraction. Advance dimensioning. Data Exchange with other applications.

TOPIC: 05 – 3 D DRAWING:


TOPIC: 06 – IMPORT AND EXPORT OF DATA FROM OTHER SOFTWARE:

06.01 Import and Export of Auto CAD Drawing from packages like Corel Draw, Photoshop etc. Drawing packages like paintbrush for colour rendering, documentation.

Books Recommended:


2. Mastering Auto CAD, BPB Publications, B-14, George Omura Connaught Place, New Delhi
3. Auto CAD - Sachin Raje
5. Computer Aided Electronic Circuit Design. - Raghuram
6. AutoCAD. - Rice
7. Inside Auto CAD, Prentice Hall of India Pvt. Ltd. - Dr. Racker and H. Rice
10. An Introduction to Digital Computer Design, - Raja Raman and Radha Krishan
11. Users Manual of Release 12. -

**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**

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Rationale:

A technician after graduating from Polytechnics has to tackle the problems of machine like refrigerator, Computer, I. C. engines. He quite often has to select, substitute the materials, and maintain quality.

He is to be conversant with the knowledge of the machine and properties of the materials. The course contents of the subject has been cast to develop sufficient skill on engine / machine performance testing as well as measurement testing as well as measurement of different properties of the materials in use.

Objective:

After completing the course a student will be able to :-

- Find out C. O. P. of the refrigerator.
- Find out the B. H. P. and fuel consumption / B. H. P. of a petrol and diesel engine.
- Find out the thermal efficiency of I. C. engines.
- Determine the impact value of materials.
- Determine the hardness of materials.
- Differentiate / distinguish various materials based on properties.
- Determine the tensile and compressive strength of materials.
CONTENTS:

Energy conversion laboratory
The following experiments will have to be conducted:

01 To find out C. O. P. of a given refrigerator. (06)
02 To find out the efficiency of a single stage reciprocating compressor. (06)
03 Performance test of petrol engine (06)
   (i) Mechanical efficiency.
   (ii) Fuel consumption / BH. P / hr
   (iii) Thermal efficiency.
04 Performance test of diesel engine (06)
   (i) Mechanical efficiency.
   (ii) Fuel consumption / BH. P / hr
   (iii) Thermal efficiency.
05 To find out efficiency of a Pelton Turbine. (06)

MATERIAL TESTING LABORATORY:

(A) Tensile test on M.S. rod. (06)
(B) Compression test on C. I. and Steel bars. (06)
(C) Torsion test of mild steel. (06)
(D) Impact test on M. S., Al., and brass. (06)
(E) Hardness test on Rockwell and Brinnel machine of Mild Steel Tools sheet and brass. (06)

SCHEME OF EXAMINATION FOR FINAL EXAMINATION F.M. : 40
Workshop Practice

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Rationale:

The workshop practice is a subject which gives ample opportunity to the students to work and achieve proficiency in skill and brings attitudinal change among them towards the work with hand constant practice on different machine will no doubt generate sufficient confidence in the students.

It will help them in developing into a quality technician. Through the contents of the courses the students will be learning highly skilled operation on machines. They will be encouraged to maintain, overhaul the machines they use besides the domestic and mechanical appliances.

Objective:

The students will be able to develop skill to :-

- Prepare jobs involving higher skill on lathes, milling machines, shapers and grinders.
- Prepare job of fitting involving close tolerances.
- Prepare jobs with help of gas welding and cutting equipments.
- Handle measuring instruments and gauges for precision measurements.
- Overhaul maintain & repair Workshop machines.
- Overhaul maintain & repair domestic appliances.
- Overhaul maintain & repair mechanical devices.

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<td>03</td>
<td>Welding shop work</td>
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<td><strong>Total:</strong></td>
<td></td>
<td>(150)</td>
<td></td>
</tr>
</tbody>
</table>
## CONTENTS:

### SECTION A

## WORKSHOP PRACTICE

### TOPIC: 01 – MACHINE SHOP WORK:

<table>
<thead>
<tr>
<th>Code</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.01</td>
<td>Study and use of precision measuring, tools and gauge.</td>
</tr>
<tr>
<td>01.02</td>
<td>Grinding: -</td>
</tr>
<tr>
<td></td>
<td>(i) Mathing Turning Tool.</td>
</tr>
<tr>
<td></td>
<td>(ii) Parting tool.</td>
</tr>
<tr>
<td>01.03</td>
<td>A job involving work on C. N. C.</td>
</tr>
<tr>
<td></td>
<td>(Computersied numerical control) lathe or a job on automatic lathe if C. N. C. lathe is not available)</td>
</tr>
<tr>
<td>01.04</td>
<td>A job involving eccentric turning.</td>
</tr>
<tr>
<td>01.05</td>
<td>A job involving drilling, boring, internal threading on centre lathe.</td>
</tr>
<tr>
<td>01.06</td>
<td>Milling-Gear cutting, Tee Slot cutting.</td>
</tr>
<tr>
<td>01.07</td>
<td>Shaper- V-block, key way on shaft.</td>
</tr>
</tbody>
</table>

### TOPIC: 02 – ADVANCE FITTING:

<table>
<thead>
<tr>
<th>Code</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>02.01</td>
<td>Male-female Joint.</td>
</tr>
<tr>
<td>02.02</td>
<td>Lap Joint.</td>
</tr>
<tr>
<td>02.03</td>
<td>Hexagonal Nut (Threading by tap).</td>
</tr>
</tbody>
</table>

### TOPIC: 03 – WELDING SHOP WORK:

<table>
<thead>
<tr>
<th>Code</th>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>03.01</td>
<td>Making M. S. Flat grill 1’ × 1’.</td>
</tr>
</tbody>
</table>
TOPIC: 04 – PRESS WORK: [09]

04.01 Making Trey.
04.02 Making Saucer.

TOPIC: 05 – BUFFING / ANODIZING / FROSTERING: [09]

SECTION B

MAINTENANCE

TOPIC: 01 – WORKSHOP MACHINE: [15]

01.01 Lathe.
01.01.01 Dismantling, cleaning, oiling and greasing of Lathes.
01.02 Shaper.
01.02.01 Dismantling, cleaning, oiling and / or Greasing of shapers.
01.03 Planer.
01.03.01 Dismantling, clearing, oiling and / or Greasing of Planer machines.
01.04 Milling Machines.
01.04.01 Dismantling, clearing, oiling and / or Greasing of milling machines.

TOPIC: 02 – HOUSE HOLD APPLIANCES: [12]

02.01 Dismantling, clearing, repair (if required) of the following:
02.01.01 Pressure cooker.
02.01.02 Geyser, Coolers.
02.01.03 Gas stoves.
02.01.04 Pressure Stoves.
02.01.05  Mixer, Grinder and Juicer.
02.01.06  Washing Machines.
02.01.07  Vacuum Cleaner.

**TOPIC: 03 – MECHANICAL DEVICES:**

03.01  Dismantling, clearing, oiling and / or Greasing.
03.01.01  Hydraulic door closer.
03.01.02  Rolling shutters.
03.01.03  Hand pumps.
03.01.04  Electrically operated sirens.
03.01.05  Electrically operated lift.
03.01.06  M/Clocks, Locks, E/fans, Water pipe fitings.

**TOPIC: 04 – AUTOMOBILE VEHICLES:**

01.01  Learn the use of tools and equipments.
01.02  Dismantling of engine components, inspection, rectification of fault and Assembly.
01.03  Finding faults in Automobile chasis and rectify them.
01.04  Inspection of wear pattern of tyre, Rectification of faults in related components and repair of tyre and tubes.
01.05  Finding starting trouble due to defects in feed line and rectify them. Find out starting trouble due to electrical faults and rectify them.
01.06  Finding defects in cooling system, lubricating system, transmission line and rectify them.

**SCHEME OF EXAMINATION FOR FINAL EXAMINATION**  F.M. : 40
Rationale:

This course is aimed at further reinforcing and enhancing the knowledge skill acquired in the earlier courses. The exercise included in the course would provide the students such experiences which he would encounter later in his professional life.

The day to day function carried out in the drawing and design department of an industry are multifarious. Some of these functions are planning, sketching, deciding specification, determining factors and providing dimensions etc. This course is so designed as to provide the students such experiences where he can apply his knowledge acquired from various subjects.

Objective:

A student overall be able to :-

(i) Read and understand drawing.
(ii) Prepare assembly and desassembly drawings.
(iii) Design machine parts.
(iv) Prepare working drawing.
(v) Develop skill to draw sketches of simple machine parts, assemble machine parts.
(vi) Impart ideas, convey information and specify shape through drawing.

CONTENTS:

Same as theory Paper [15306]
Workshop Practice

Subject Code: 15314

<table>
<thead>
<tr>
<th>Sessional</th>
<th>No. of Periods in one session</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>No. of Periods per week</th>
<th>Full Marks : 50</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>Annual Exam. : 30</td>
</tr>
<tr>
<td>T</td>
<td>Internal Exam. : 20</td>
</tr>
<tr>
<td>P/S</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

Rationale:

Same as Practical Paper (15312)

Objective:

Same as Practical Paper (15312)

CONTENTS:

Same as Practical Paper (15312)
Non-Conventional Energy Sources

Subject Code
15316(A)

Sessional

<table>
<thead>
<tr>
<th>No. of Periods per week</th>
<th>Full Marks</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>L T P/S</td>
<td>Annual Exam.</td>
<td>30</td>
</tr>
<tr>
<td>0 0 3</td>
<td>Internal Exam.</td>
<td>20</td>
</tr>
</tbody>
</table>

No. of Periods
in one session
60

Rationale:

Non-Conventional Energy Sources have become the most important sources for replacement of conventional energy sources because of latter rising cost, decreasing availability and causing pollution to environment. Knowledge of new technologies will enrich the technical know how of the students and increase their employment opportunities in upcoming sector of renewable energy.

Objective:

After performing the following experiments, the students will be able to :-

- Utilise solar energy for various purposes.
- Utilise wind energy for running chakki, water pump etc.
- Make use of Bio-gas in energies, stoves, Petromax etc.
- Save conventional energy whose sources are limited in many cases.
CONTENTS:

Study / Observation of following Systems :-

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Solar concentrating type cooker.</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Wind mill pump.</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Wind turbine electric generator.</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Bio-gas plant fixed dome type.</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Bio-gas plant floating dome type.</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Bio-gasifier.</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>12 V Battery Charging and maintenance.</td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>Performance rating of Solar lantern during different weather conditions.</td>
<td></td>
</tr>
</tbody>
</table>
Refrigeration & Air-Conditioning

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>15316(B)</th>
</tr>
</thead>
</table>

### Sessional

<table>
<thead>
<tr>
<th>No. of Periods per week</th>
<th>Full Marks</th>
<th>Annual Exam.</th>
<th>Internal Exam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>L T P/S</td>
<td>0 0 3</td>
<td>50</td>
<td>30</td>
</tr>
</tbody>
</table>

### No. of Periods in one session

- 60

### Rationale & Objective:

A diploma holder technician should be able to handle the refrigerator and air-conditioning machines to operate successfully. Fault should be detected and the better use of modification of the machines.

### CONTENTS:

**Perform at least five:-**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Determination of C. O. P. of a refrigeration.</td>
</tr>
<tr>
<td>02</td>
<td>Study of evaporator and cooling towers.</td>
</tr>
<tr>
<td>03</td>
<td>Study of house hold refrigeration.</td>
</tr>
<tr>
<td>04</td>
<td>Study of vapour absorption refrigeration system.</td>
</tr>
<tr>
<td>05</td>
<td>Determination of dry and wet bulb temperature.</td>
</tr>
<tr>
<td>06</td>
<td>Study of Spray ponds.</td>
</tr>
</tbody>
</table>

### Books Recommended:

1. Refrigeration Air Conditioning - P. L. Ballancy
2. Refrigeration Air Conditioning - R. S. Khurana
Subject Code

15316(C)

Sessional

<table>
<thead>
<tr>
<th>No. of Periods per week</th>
<th>Full Marks</th>
<th>Annual Exam.</th>
<th>Internal Exam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>L  T  P/S</td>
<td>50</td>
<td>30</td>
<td>20</td>
</tr>
</tbody>
</table>

Rationale:

Objective:

CONTENTS:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Create the manufacturing data base.</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Design processes for a simple job.</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Study the working of:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) Design Work Station.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Graphics Terminal.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Operator Input Devices.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(d) Plotter and other output devices.</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Application of Graphics Package.</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Study and Application of N. C. machine.</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Prepare manual part programming.</td>
<td></td>
</tr>
</tbody>
</table>
07 Prepare computer-assisted part programming.
08 Make job using D N C (Direct Numerical Control) / C N C (Computer Numerical Control) system.
09 Study of Robots.
**Auto CADD**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>15316(D)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sessional</strong></td>
<td></td>
</tr>
<tr>
<td>No. of Periods per week</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Full Marks</td>
<td>:</td>
</tr>
<tr>
<td>Annual Exam.</td>
<td>:</td>
</tr>
<tr>
<td>Internal Exam.</td>
<td>:</td>
</tr>
</tbody>
</table>

**Rationale:**

Like drawing and workshop practice, knowledge and practice of communication skill are necessary for development of professional competencies of a technician-engineer. He has to be conversant with Database Management and Graphics. The course will impart to the students the basic principles of computer uses especially in Graphics.

**Objective:**

A student will be able to:

- Handle a micro computer independently and perform some independent works.
- Make 2 D and 3 D drawing on computer.
- Convert 2 D drawings into 3 D drawing.
- Exchange (Import and Export) data from other software.
CONTENTS:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
<th>Periods</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Familirisation with computer and its peripherals.</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Familirisation with use of AUTOCAD R. 2004 package.</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Practice CAD techniques : Sub assemblies, blocks, inserts, layers, hierarchical approach to Drawing, entering Drawing library.</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Drawing lines, rectangles, circles, chambers, solid, infills, cross-hatching, automatic dimensioning, removal of construction lines, Edit functions, move reflection, rotation, cloning, zoom etc.</td>
<td></td>
</tr>
<tr>
<td>05</td>
<td>Prepare 3 D-models, Practice transformation techniques like swing, lift, spin, turn.</td>
<td></td>
</tr>
<tr>
<td>06</td>
<td>Convert 2-D Drawing into 3 D Drawing.</td>
<td></td>
</tr>
<tr>
<td>07</td>
<td>Practice networking and exchange of data (import and export) from other packages.</td>
<td></td>
</tr>
</tbody>
</table>

Books Recommended:

1. Inside Auto CAD, Prentice Hall of India Pvt. Ltd. - Dr. Racker and H. Rice
5. Users Manual AUTOCAD Release 2004. -
Project Work and its Presentation in Seminar

Subject Code

15317

Sessional

No. of Periods per week

Full Marks : 100

L T P/S

Annual Exam. : 60

02

Internal Exam. : 40

(in extra hours)

Rationale:

The Project work and its presentation in seminar is an important subject for a diploma holder technician. The course is designed to help a student to develop self confidence, skill in report writing to analyse, design, estimating and costing, deciding a process etc. The course will also help in developing communication skill, and learning process in student. The student will develop the skill of quality documentation in an important activity.

Objective:

The student will be able to:

- Select a Problem from industry.
- Analyse the Problem.
- Develop logical approach to solution of a Problem.
- Design a product.
- Make estimation of materials, operation and calculate the cost of product.
- Manufacture / fabricate the product in the workshop.
- Test the product for failure.
- Prepare a project report (Computer printed / typed)
- Present the paper in seminar.
CONTENTS

Design, Estimate, Costing and Production of at least one from the following:

01 Screw Jack.
02 Machine Vice.
03 Fitter’s Bench Vice.
04 Carpenter’s Bench Vice.
05 Hand Operated Air Pump.
06 Fabrication of Grill and / or Gate.
07 Desert Cooler.
08 Solar Cooker.
09 A LPG Gas Cylinder stand which should indicate weight of gas in the cylinder on graduated scale.
10 Any new utility product.

REPORT WRITING:

The report must include

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Introduction.</td>
</tr>
<tr>
<td>02</td>
<td>Design.</td>
</tr>
<tr>
<td>03</td>
<td>Estimating of materials.</td>
</tr>
<tr>
<td>04</td>
<td>Calculation of cost of the materials.</td>
</tr>
<tr>
<td>05</td>
<td>Operation time estimation.</td>
</tr>
<tr>
<td>06</td>
<td>Cost of Operation.</td>
</tr>
<tr>
<td>07</td>
<td>Process of Manufacture.</td>
</tr>
<tr>
<td>08</td>
<td>List of machines / tools / equipments used with specification.</td>
</tr>
</tbody>
</table>

OR
A project on Live Industrial Problems that may be—
- Technical
- Human Relation
- Welfare
- Safety
- Any other

The Project Report should consist of :-

01 Introduction.
02 Problem statement.
03 Background of Industry.
04 Organisational set –up.
05 Plant Layout.
06 General Environmental Problem.
07 Analysis of Problem.
08 Probable solution.
09 Best solution possible.
10 Reasons.
11 Any other.

Project Work, in ideal condition, should be done individually. If it is not possible then it can be done in a group of not more than five students. Project Work / Project Report should be presented in a seminar for developing confidence and communication skill among the students.

NOTE:-

Project work will be allotted to the students in the very beginning of the session. Each student will be give a separate work under the supervision of a teacher. Total number of students may be divided among the number of teachers available. The teacher concerned will select separate problem for each student under him and allot it to him at the beginning of the session. The work allotted should be completed within
scheduled time. i.e. by the end of the session. Problems selected should preferably conform to the syllabus. If it is outside of the syllabus then it must be within the field of Mechanical engineering.
# Inplant Training and Visit to Works

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>15318</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sessional</strong></td>
<td></td>
</tr>
<tr>
<td>No. of Periods per week</td>
<td></td>
</tr>
<tr>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td><strong>No. of Periods in one session</strong></td>
<td>4 weeks During Vacation</td>
</tr>
<tr>
<td>Full Marks</td>
<td>100</td>
</tr>
<tr>
<td>Annual Exam.</td>
<td>60</td>
</tr>
<tr>
<td>Internal Exam.</td>
<td>40</td>
</tr>
</tbody>
</table>

**Rationale:**

A student is required to develop a skill to synthesise his knowledge, skill and attitudes gained while joining through different course. It is desirable to expose the students to the world of work to be familiar with the real life situations and understand the problem there in. The “In plant training and visit to work” is being introduced for the final year diploma technicians for Mechanical Engineering with the above objective in view. This course will help the students to observe how the technical, managerial, quality control, safety and other principle are being applied in real life situation. He will be able to observe how his supervisor performs day-to-day work and coordinate shop floor activities. The course will, no doubt, be a of great help in developing skills required for a diploma holder technician, and will also help in bringing attitudinal change in him.

**Objective:**

A student will be able to:

- Understand the working of the machines, tools and equipments more clearly.
- Write specifications of the machines, tools, equipments.
- Learn to maintain office records.
- Know the process of planning, implementation and monitoring.
- Learn the skill for shop floor co-ordination.
Know the skill of office management and inventory Control.
Understand the process of production.
Know the skill of quality control.
Know the skill of maintenance management.
Know the skill of production control.
Acquire the skill of man/machine loading.
Know the organizational set-up and plant layout.
Locate the plants and industries related to Mechanical Engineering-State and Nation wise.
Find out Characteristics, Functions, and activities of those industries.
Know the source of raw materials and markets for the industries.
Find out opportunities and method of recruitment.
Find out the special characteristics of the industries.
Observe the special purpose production machines, which the student may not have seen in the institution, in production.
Learn the special testing machine / equipments which have not been provided in institution.

CONTENTS

In Plant Training

A student is required to get training in any one of the industries:-

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Steel Plant.</td>
</tr>
<tr>
<td>02</td>
<td>Engineering Industry.</td>
</tr>
<tr>
<td>03</td>
<td>Sugar Industry.</td>
</tr>
<tr>
<td>04</td>
<td>Power Plants.</td>
</tr>
<tr>
<td>05</td>
<td>Cement Factory.</td>
</tr>
<tr>
<td>06</td>
<td>Refrigeration and Air Conditioning Industry.</td>
</tr>
<tr>
<td>07</td>
<td>Automobile Industry.</td>
</tr>
</tbody>
</table>
SCHEDULE FOR TRAINING:

- Planning Department - One Week

- Shop floor-
  - Lay out Machine /Equipment (Special purpose production ways to be emphasized at) Process/Process Control.
  - In Store/Inventory Control.

- Testing/Quality Control/Stores - One Week
  - Special Test for products in Meteorological Laboratory-

Visit to Works

Visit to works of following industries (any four):

- Automobile Industry.
- Engineering Industry (both heavy and medium).
- Steel Plant.
- Thermal Power Plant.
- Hydel Power Stations.
- Cement Factory.
- Computer Manufacturing Unit.
- Financial Institution.
- Refrigeration Plant.
REPORT WRITING:

In Plant Training

This should include the following:

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Introduction.</td>
</tr>
<tr>
<td>02</td>
<td>Plant Layout and Organisation.</td>
</tr>
<tr>
<td>03</td>
<td>Planning for product.</td>
</tr>
<tr>
<td>04</td>
<td>Shop floor training (Specially those production machines which are in the curriculum but not in the institution.</td>
</tr>
<tr>
<td>05</td>
<td>Testing and Quality Control Facility (Specially those testing equipment and laboratories which are in the curriculum but not in the institution.</td>
</tr>
<tr>
<td>06</td>
<td>Conclusions.</td>
</tr>
</tbody>
</table>

Industrial Tour

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Introduction.</td>
</tr>
<tr>
<td>02</td>
<td>Name and types of Industries visited :-</td>
</tr>
<tr>
<td></td>
<td>- Their specific characteristics</td>
</tr>
<tr>
<td>03</td>
<td>Working of different industries:-</td>
</tr>
<tr>
<td></td>
<td>- Location</td>
</tr>
<tr>
<td></td>
<td>- Lay-out</td>
</tr>
<tr>
<td></td>
<td>- Raw materials used</td>
</tr>
<tr>
<td></td>
<td>- Products</td>
</tr>
<tr>
<td></td>
<td>- Organizational Structure</td>
</tr>
</tbody>
</table>
- Special Machine
- Special Tools

04 Conclusions
  - Observations
  - Typical Characteristics
  - Area of Weakness
  - Suggestions.

SCHEME OF EXAMINATION
Marks Distribution
Internal - 40 %
Regularity - 10 %
Discipline - 10 %
Report - 10 %
Viva - 10 %
External - 60 %
Report/Journal - 20 %
Viva - 40 %
GOVERNMENT OF BIHAR

DEPARTMENT OF SCIENCE & TECHNOLOGY

STATE BOARD OF TECHNICAL EDUCATION

BIHAR, PATNA

COURSE OF STUDY

FOR

PART - III Diploma

IN

Mechanical Engineering

THREE YEARS DIPLOMA COURSE
Scheme of Teaching and Examination for 3-years
PART-III DIPLOMA in MECHANICAL ENGINEERING BRANCH

THEORY

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>SUBJECTS</th>
<th>SUBJECT CODE</th>
<th>TEACHING SCHEME</th>
<th>EXAMINATION - SCHEME</th>
</tr>
</thead>
<tbody>
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<td>Periods per Week</td>
<td>Periods in one Session (Year)</td>
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<td>Energy Conversion-II</td>
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<td>3.</td>
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<td>4.</td>
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<td>8.</td>
<td>Production &amp; Costing</td>
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PRACTICAL

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<th>EXAMINATION – SCHEME</th>
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<td>Periods in one Session (Year)</td>
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(i)
## SESSIONAL

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<td>Marks of External Examiner (Y)</td>
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(ii)