

**Scheme of Teaching and Examination for
IV Semester DIPLOMA in MECHANICAL (AUTOMOBILE) ENGINEERING**

THEORY

| Sl. No. | SUBJECTS | SUBJECT CODE | TEACHING SCHEME | | EXAMINATION SCHEME | | | | | |
|-----------------|--------------------------------|--------------|------------------|------------------------|--------------------|--------------------------|-----------------------|-------------------|------------------------|---------------------------|
| | | | Periods per Week | Periods in one Session | Hours of Exam. | Terminal Exam. (A) Marks | Final Exam. (B) Marks | Total Marks (A+B) | Pass Marks Final Exam. | Pass Marks in the Subject |
| 1 | Automobile Engineering-II | 33401 | 4 | 60 | 3 | 20 | 80 | 100 | 26 | 36 |
| 2 | Manufacturing Technology - I | 25402 | 5 | 60 | 3 | 20 | 80 | 100 | 26 | 36 |
| 3 | Machine Drawing | 33403 | 9 | 120 | 4 | 20 | 80 | 100 | 26 | 36 |
| 4 | Theory of Machines | 25404 | 6 | 60 | 3 | 20 | 80 | 100 | 26 | 36 |
| 5 | Hydraulics and fluid Mechanics | 25405 | 5 | 60 | 3 | 20 | 80 | 100 | 26 | 36 |
| Total :- | | | 29 | | | | | 500 | | |

PRACTICAL

| Sl. No. | SUBJECTS | SUBJECT CODE | TEACHING SCHEME | | EXAMINATION SCHEME | | | | | |
|-----------------|-------------------------------------|--------------|------------------|------------------------|--------------------|--------------------------|--------------------------|-------------------|------------------------|---------------------------|
| | | | Periods per Week | Periods in one Session | Hours of Exam. | Marks Internal Exam. (A) | Marks External Exam. (B) | Total Marks (A+B) | Pass Marks Final Exam. | Pass Marks in the Subject |
| 6 | Workshop Practice | 25406 | 9 | 120 | 6 | 10 | 40 | 50 | 16 | 21 |
| 7 | Hydraulics and fluid Mechanics Lab. | 25407 | 4 | 60 | 3 | 10 | 40 | 50 | 16 | 21 |
| Total :- | | | 13 | | | | | 100 | | |

SESSIONAL

| Sl. No. | SUBJECTS | SUBJE CODE | TEACHING SCHEME | | EXAMINATION SCHEME | | | |
|-----------------|-------------------|------------|------------------|------------------------|--------------------------------|--------------------------------|-------------------|---------------------------|
| | | | Periods per Week | Periods in One Session | Marks of Internal Examiner (X) | Marks of External Examiner (Y) | Total Marks (X+Y) | Pass Marks in the Subject |
| 7 | Workshop Practice | 25408 | - | - | 20 | 30 | 50 | 25 |
| 8 | Machine Drawing | 33409 | - | - | 40 | 60 | 100 | 50 |
| Total :- | | | | | | | 150 | |

| | | | |
|-------------------------------|-----------|--------------------|------------|
| Total Periods per Week | 42 | Total Marks | 750 |
|-------------------------------|-----------|--------------------|------------|

AUTOMOBILE ENGINEERING - II

| | | | | | | |
|-------------------------------------|--------------------------------|----------|------------|---|----------|------------|
| Subject Code 33401 | Theory | | | No of Period in one session : 60 | | |
| | No. of Periods Per Week | | | Full Marks | : | 100 |
| | L | T | P/S | Annual Exam. | : | 80 |
| | 04 | - | - | Internal Exam. | : | 20 |

Rationale

Though the students have already studied in brief the anatomy and physiology of automobile vehicles and component parts, they are further required to study in detail about the materials working principles and their functions fuel lubricating oil and cooling principles and electrical system as they may choose career in automobile industry and repair shop.

Objectives

The students will be able to:

Describe the category of vehicles on the basis of use, Capacity wheels and axles, drive no of cylinder and single mountings.

Explain the constructions and function of each engine component parts.

Describe the types of fuel used in engine petrol and diesel.

Explain air fuel ratio chemically correct mixture, most economical A/F ratio, combustion knock, detonation, antiknock quality, octane & cetane number.

Explain the principle of carburetion, construction and function of simple carburetor.

Describe the working of spark ignition and compression ignition engine.

Explain with sketches the construction and function of the components used in fuel supply system in petrol engine.

Explain with sketches the construction and function of the elements used in fuel supply system in diesel engine.

Explain with sketches intake and exhaust system, inlet and exhaust manifold, their types and component parts.

Explain the working of supercharger and turbocharger in C.I. Engine.

Explain the need of cooling, types of cooling system, elements of cooling system, types of coolant used.

Explain need of lubrication, its classification type of lubricants and their properties and various gradings.

Describe the electrical system as a whole and explain with sketches the electrical circuits in S.I. and C.I. Engines, generation of electrical energy.

Explain the construction and function of condenser, ignition, coil distributor, C.B. points/ Dynamo/ alternator, cut-out and regulator.

Explain the starting system including Bendix drive.

Explain the working of lighting and signaling points, horn, audio equipment and wiper.

CURRICULUM

| SL | Topics | Periods |
|-----------|---|----------------|
| 1. | Review | 02 |
| 2. | Types of Automobile | 02 |
| 3. | Engines | 09 |
| 4. | Valves | 03 |
| 5. | Fuels | 04 |
| 6. | Carburetor | 03 |
| 7. | Spark Ignition Engine and Compression Ignition Engine | 03 |
| 8. | Fuel Supply System in S.I. Engines | 03 |
| 9. | Fuel Supply System in C.I. Engines | 06 |
| 10. | Intake and Exhaust System | 05 |
| 11. | Cooling System for Engines | 05 |
| 12. | Lubrication System | 03 |
| 13. | Electrical System | 12 |
| | Total | 60 |

CONTENTS

| <u>Topics</u> | <u>Content</u> | <u>Periods</u> |
|---|---|----------------|
| <u>01. Review</u> | | 02 |
| | 01.01 Review of topics covered in the paper Automobile Engineering - I. | |
| <u>02. Types of Automobiles</u> | | 02 |
| | 02.01 Types of automobile with respect to use, capacity, wheels and axles, drive number of cylinders and engine mounting. | |
| <u>03. Engines</u> | | 09 |
| | 03.01 Brief description of Diesel and Petrol engines. | |
| | 03.02 Cylinder block and liner construction and function/multi-valve cylinder. | |
| | 03.02.01 Cylinder head construction and function gasket. | |
| | 03.03 Piston gudgeon pin, function, construction. | |
| | 03.03.01 Piston rings, types, function and construction. | |
| | 03.03.02 Connecting rod, working and construction, big and small end, bush and bearing. | |
| | 03.04 Crankshaft, construction, line diagram and working, bearing (types) lubrication, connecting rod alignment, balancing of crankshaft. | |
| | 03.04.01 Flywheel - functions, construction starting ring friction surface. | |
| <u>04. Valves</u> | | 03 |
| | 04.01 Functions and Construction of Valves and their parts. | |
| | 04.02 Functions and construction of Cams and Followers. Pushrod and Rocker Arm. Camshaft - function and construction. | |
| <u>05. Fuels</u> | | 04 |
| | 05.01 Types of fuels used in automobile engines petrol, diesel, air fuel ratio, chemically correct mixture, most economical A/F ratio, combustion knock, antiknock quality, octane number, cetane number. | |
| <u>06. Carburetor</u> | | 03 |
| | 06.01 Carburetion process meaning operation. | |
| | 06.02 Simple carburetor, working theory on Bernoulli's equation, construction and working details. | |
| <u>07. Spark Ignition Engine and Compression Ignition Engine</u> | | 03 |
| | 07.01 Construction and working of Spark Ignition Engine and Compression Ignition Engine. | |
| <u>08. Fuel Supply System in S.I. Engines</u> | | 03 |
| | 08.01 Types of Fuel Feed System, Components of fuel system, Fuel tank filters and screens fuel lines, Fuel Gauges, Air-Cleaner, Fuel Pump, A.C. Mechanical fuel pump, Electric fuel pump. | |
| <u>09. Fuel Supply System in C.I. Engines</u> | | 06 |
| | 09.01 Fuel Feed System, Diaphragm type pump, Plunger type pump. | |
| | 09.02 Fuel injection pump, Nozzle and its function types, Fuel injection unit. | |
| <u>10. Intake and Exhaust System</u> | | 05 |
| | 10.01 Intake manifold (S.I. and C.I. Engine). | |
| | 10.02 Exhaust manifold, Different types of Muffler and Tailpipe. | |
| | 10.03 Supercharger, turbocharger in C.I. Engine. | |
| <u>11. Cooling System for Engines</u> | | 05 |
| | 11.01 Need of cooling engines, types of cooling systems, air and water cooling radiator - tubular and cellular types, Thermostat valve water pump, cooling fans, coolant. | |
| <u>12. Lubrication System</u> | | 03 |

12.01 Need of Lubrication.

12.02 Types of Lubrication System. Gravity Feed, Force Feed.

13. Electrical System

12

13.01 Main circuits of electrical system in S.I. and C.I. engine vehicles.

13.02 Generation of electrical energy in automobiles. Battery testing, battery charging

13.03 Condenser, Ignition Coil, Distributor C.B. Point, Firing order.

13.04 Dynamo alternator, cut-out, control of voltage and current.

13.05 Starting systems, Bendire drive.

13.06 Different lighting and signaling points, Horn, Audio Equipment, Wiper.

Recommended Books

| SL | Title/Publisher | Author |
|-----------|------------------------------------|---|
| 1. | Automobile Engineering, | Khanna Publishers, New Delhi. G.B.S. Narang |
| 2. | Automobile Engineering | R. P. Sharma |
| 3. | Automobile Engineering | Dr. Kirpal Singh |
| 4. | Automobile Engineering | J. Heitner |
| 5. | The Automobile | Rayat Harbans Singh |
| 6. | Automobile Engineering | Banga and Singh |
| 7. | Elements of Automobile Engineering | G.B.S. Narang |
| 8. | Know your Motor-cycle and Scooter | Reyat Harbans Singh |
| 9. | Automobile Engineering | K. Prasad |
| 10. | Automobile Vehicle | Newton and Steel |

MANUFACTURING TECHNOLOGY - I

| | | | | | | |
|-------------------------------------|--------------------------------|----------|------------|---|----------|------------|
| Subject Code 25402 | Theory | | | No of Period in one session : 60 | | |
| | No. of Periods Per Week | | | Full Marks | : | 100 |
| | L | T | P/S | Annual Exam. | : | 80 |
| | 05 | - | - | Internal Exam. | : | 20 |

Rationale:

A nation is strong if the industries are strong. A nation is self dependent if it produces its all requirements with its own resources and industry and should have the capacity to export materials in other countries.

A diploma holder technician has to play a vital role in industries. He has to work as a bridge in between Management and Labour.

An industry is rich if its workshop is rich. A workshop is rich if it has recent machines in good number and technical staffs (having good concepts) in sufficient no. A diploma holder technician plays a vital role in act and guidance inside a workshop.

Objective:

For building a diploma holder technician to be more practical with good concept of theories the paper Manufacturing Technology – I has been framed. With the help of this paper a person will be able to get the almost all basic concepts of workshop.

The students will be able to:

- (i) Know the basic principles of workshop.
- (ii) Select materials, tools, equipments more speedily accurately.
- (iii) Prepare a job as per requirement (either by casting or machining).
- (iv) Check the qualities and specification of job, tools and equipments.
- (v) Develop managerial skill.

| S.No. | Topics | Periods |
|-------|--|-------------|
| 01 | Workshop Management | (04) |
| 02 | Lathe | (14) |
| 03 | Shaper and Planner | (08) |
| 04 | Drilling & Boring Machines | (04) |
| 05 | General Knowledge of Different Types of Machines | (04) |
| 06 | Welding | (08) |
| 07 | Pattern Making | (08) |
| 08 | Moulding | (05) |
| 09 | Casting | (05) |
| | Total : | (60) |

CONTENTS:

TOPIC: 01 – WORKSHOP MANAGEMENT:

- 01.01 Rules and regulations of working in workshop
- 01.02 Duties and responsibilities of Foreman.
- 01.03 Algorithm or flow diagram for competing a job in different sections of workshop
- 01.04 Tools used in different section.

TOPIC: 02 – LATHE:

- 02.01 Introduction, terminology used in lathe: feed, depth of cut, cutting speed, R.P.M. of pass etc.
- 02.02 Types of lathe, centre lathe, capstan lathe, turret lathe, automatic lathe of computer guided lathe (C.N.C. lathe)02)
- 02.03 Constructional details of centre lathe.
- 02.04 Specification of lathe. Difference between centre lathe & turret lathe.
- 02.05 Operation on lathe – Turning (Cylindrical, taper), facing, drilling, boring, thread cutting, grinding etc – numericals
- 02.06 Tools for each types of operation, special attachment & accessories on lathe.
- 02.07 Sp. Operation on lathe using special attachment, indexing of turret & cross slide.

- 02.08 Faults in lathe & its remedies.
- 02.09 C.N.C. lathe – computer operation for C.N.C. lathe, merits of C.N.C over manually operated lathe.

TOPIC: 03 – SHAPER AND PLANNER:

- 03.01 Introduction. Construction details of shaper.
- 03.02 Quick return mechanism.
- 03.03 Terminology used (feed. Depth of cut, no. of pass, R.P.M. stroke length cutting speed)
- 03.04 Specification of shaper.
- 03.05 Difference between shaper and planner, Planner operation. Types of jobs prepared on shaper and planner,

TOPIC: 04 – DRILLING & BORING MACHINES:

- 04.01 Introduction, classification, specification.
- 04.02 Tools, accessories, operation, difference in drilling & boring tools.

TOPIC: 05 – GENERAL KNOWLEDGE OF DIFFERENT TYPES OF MACHINES:

- 05.01 General knowledge of slotting machine, its use.
- 05.02 Grinding machines, nomenclature of grinding wheel's abrasive material.

TOPIC: 06 – WELDING:

- 06.01 Introduction, types.
- 06.02 Description of Gas welding and electric welding, tools used in welding.
- 06.03 Precaution in welding.
- 06.04 Welding rod used in gas and electric welding.

TOPIC: 07 – PATTERN MAKING:

- 07.01 Definition of pattern. General terms used in pattern making.
- 07.02 Pattern making tools, pattern materials wood, metals like brass, aluminium, white metal, plastics etc.
- 07.03 Types of pattern – Single piece, split, loose piece, geted cope and drag and shell patterns.
- 07.04 Pattern allowance: shrinkage, finish and rapping or shake allowance.

TOPIC: 08 – MOULDING:

- 08.01 Moulding tools and equipments, their types with compositions and characteristics.
- 08.02 Moulding processes – Hand moulding and machine moulding, types of moulds, methods of moulding, bench moulding/hook moulding, pit moulding, loam moulding and mouldings.
- 08.03 Core binders, core boxes and core print, core preparation and setting of cores, core baking.

TOPIC: 09 – CASTING:

- 09.01 Melting furnaces, Electric furnace. Coke fired furnaces, oil and gas fired furnaces and cupola furnaces, factors affecting selection of furnaces, sand casting process, use of special methods of casting, centrifugal casting, die-casting, investment casting & their areas of application. Advantages and disadvantages of these casting. Defects in casting and their remedies.

Book Recommended:

- | | | | |
|----|--------------------------------|---|---|
| 1. | Karyashala Takniki (Khand – I) | - | B.S. Raghuvanshi Dhanpat Rai & Sons, New Delhi |
| 2. | | - | R.K. Jain |
| 3. | Manufacturing | - | Begman |

MACHINE DRAWING

| | | | | | | |
|-------------------------------------|--------------------------------|----------|------------|--|----------|------------|
| Subject Code 33403 | Theory | | | No of Period in one session : 120 | | |
| | No. of Periods Per Week | | | Full Marks | : | 100 |
| | L | T | P/S | Annual Exam. | : | 80 |
| | 09 | - | - | Internal Exam. | : | 20 |

Rationale

Drawing is the language of engineers. Without the knowledge and skill of drawing, an engineer is handicapped in understanding the problem of engineering right from design phase to production as well as in communication with his superior and subordinate.

The subject will develop the understanding of drawing, representation of machine parts and skill of good draftsmanship. The subject will help a technician in understanding the functioning of different machine parts, which in turn will help in maintenance and disassembly of machine parts in general and automobile parts in particular. It will generate confidence in a technician which will improve the ability of overall shop floor operation and management the technician will be able to communicate with supervision and subordinate through drawings.

Objectives

The students will be able to:

- Understand these I.S. Codes of drawing and use there in their drawing.
- Use different scales used in a drawing.
- Understand and draw the orthographic projections of different machine parts in 1st and 3rd angle projection skill with good draftsmanship.
- Draw missing views.
- Understand and draw isometric and oblique projection.
- Draw dimensional and sectional drawing 1st and 3rd full draftsmanship.
- Develop overall drawing and drafting skill and be able to apply the knowledge skill of drawing in practical field.
- Draw free hand sketches of machine component parts.

CURRICULUM

| SL. | Topics | Sheets | Periods |
|------------|--|---------------|----------------|
| 1. | Orthographic Drawing in 1st Angle and 3rd Angle Projection | 02 | 26 |
| 2. | Missing Views | 01 | 14 |
| 3. | Isometric Drawings | 01 | 18 |
| 4. | Conventions used in Machine Drawing | 01 | 18 |
| 5. | Free Hand Sketch | 01 | 22 |
| 6. | Dimensional and Sectional Drawing | 01 | 22 |
| | Total | 07 | 120 |

CONTENTS

| Topics | Content | Periods |
|---------------|---|----------------|
| 01 | Orthographic Drawing in 1st Angle and 3rd Angle Projection | 26 |
| 01.01 | Methods of projection - 1st angle and 3rd angle projection. | |
| 01.02 | Orthographic projection of simple models and from given isometric drawing of simple blocks and machine parts. | |
| 02 | Missing Views | 14 |
| 02.01 | Drawing missing view from the given true orthographic views. | |
| 03 | Isometric Drawings | 18 |
| 03.01 | Introduction of pictorial drawing, construction of Isometric scale and its use in Isometric drawing. | |
| 03.02 | Isometric drawing of simple blocks and machine parts. | |

| | | |
|-----------|---|-----------|
| 04 | Conventions used in Machine Drawing | 18 |
| 04.01 | Types of lines - Cut lines or main line or parts cutting plane lines, brake lines for short and long breaks, hidden Lines create and focus lines and dimension lines, sectioning lines. | |
| 04.02 | Conventional representation of common features in mechanical drawing like screw threads, rolled sections, Bearings sections, helical tension spring, gear, rack and pinion etc. per I.S: 696. | |
| 04.03 | Conventional representation of material as per I.S: 696 metal glass stone ware insulating and fitting materials, liquids, wood and concrete. | |
| 04.04 | Conventional Method of representation of full sectional and half sectional views of machine parts as per I.S: 696. | |
| 05 | Free Hand Sketch | 22 |
| 05.01 | Free hand sketches of bolts and nuts, locking devices such as rivet-heads, keys, and cotter. | |
| 05.02 | Free hand sketches of the following: | |
| • | Simple Muffed and universal couplings | |
| • | Socket and spigot joints. | |
| • | Bushed bearing | |
| • | Locks and fast pulleys | |
| 06 | Dimensional and Sectional Drawing | 22 |
| 06.01 | Dimensional and Sectional Drawing of: | |
| • | Bearing: Pedestal bearing, Pulmmer block. | |
| • | Machine Parts: Cotter joints, Knuckle joint. | |

Note: The sheets prepared will be treated as Sessional work.
The students are expected to know the assembly of choice machine parts also which they have drawn under dimensional and sectional drawing.

Recommended Books

| SL | Title/Publisher | Author |
|-----------|--|------------------------------|
| 1. | Machine Drawing, Tata McGraw Hill Publication. | N. Sidheshwar and P. Kanenth |
| 2. | Machine Drawing | N.D. Bhatt |
| 3. | Machine Drawing | Dear Lent |
| 4. | Machine Drawing | Perkinson |
| 5. | General Engineering Drawing | Kakkar and Chand |
| 6. | Machine Drawing | P.N. Vijay Vergia |
| 7. | A Text Book of Engineering Drawing, Katsion Publication House. | R.K. Sharan |

THEORY OF MACHINES

| | | | | | | |
|-------------------------------------|--------------------------------|----------|------------|---|----------|------------|
| Subject Code 25404 | Theory | | | No of Period in one session : 75 | | |
| | No. of Periods Per Week | | | Full Marks | : | 100 |
| | L | T | P/S | Annual Exam. | : | 80 |
| | 06 | - | - | Internal Exam. | : | 20 |

Rationale:

Technician has to understand the basic design principles of machines, mechanism and their parts. He comes across the problem of power transmission, speed control, braking, engagement and disengagement of power balancing etc.

The subject is being prescribed with a view to help the students to develop the knowledge and understanding of the mechanism and machines so that he will be able to develop skill which will help in solving the problems of design, power transmission, maintenance etc.

Objective:

The student should be able to understand:

- Different types of links & mechanisms.
- The problems of friction and their application.
- The principles of power transmission, gear, belt and rope drives.
- The braking system and their application.
- The function of different types of governors and flywheels.
- The design and working of cam.
- The principles of balancing.

| <u>S. No.</u> | <u>Topics</u> | <u>Periods</u> |
|---------------|-----------------------------|----------------|
| 01 | Simple Mechanism | (05) |
| 02 | Friction | (08) |
| 03 | Belt & Rope drives | (08) |
| 04 | Gear drive & gas trains | (08) |
| 05 | Governors | (08) |
| 06 | Turning moments & flywheels | (08) |
| 07 | Brakes & dynamometer | (06) |
| 08 | Cams | (06) |
| 09 | Vibration & Balancing | (03) |
| | | (60) |

CONTENTS:

TOPIC: 01 – SIMPLE MECHANISM:

- 01.01 Introduction, Kinematic links, types of links, structure, comparison between machine and structure.
- 01.02 Kinematic pairs, classification, types of constrained motion.
- 01.03 Kinematic pair, kinematic chain, their classification, mechanism, types of joints.
- 01.04 Inversion of mechanism, inversion of single slider crank chain, crank and slotted bar quick return and Whitworth quick return motion mechanism.

TOPIC: 02 – FRICTION:

- 02.01 Introduction, classification, limiting friction, dynamic friction, co-efficient of friction, angle of repose.
- 02.02 Friction on rough inclined plane.
- 02.03 Screw friction, screw jack, torque required to lift and to lower the load by serew jack overhauling & Self-locking serews, efficiency

TOPIC: 03 – BELET & ROPE DRIVE:

- 03.01 Introduction, classification of drives.
- 03.02 Velocity ratio of compound belt drive, slip of belt creep of belt. Length of open & cross belt drive.
- 03.03 Power transmitted by a belt, ratio of driving tension for flat belt drive centrifugal tension, condition for maximum tension in belt.
- 03.04 V-belt drive, advantages and disadvantages ratio of driving tension rope drive, numericals.

TOPIC: 04 – GEAR DRIVES:

- 04.01 Toothed Gearing, introduction, terminology, advantages and disadvantages, classification.
- 04.02 Gear trains, Simple gear trains, compound gear trains, velocity ratio.
- 04.03 Design of spur gear (to find no of teeth) simple problems.

TOPIC: 05 – GOVERNORS:

- 05.01 Introduction, function, terminology, classification, comparison with flywheel.
- 05.02 Watt governor, Porter governor.
- 05.03 Hartnell governor.
- 05.04 Effort and power of a porter governor.
- 05.05 Hunting sensitiveness and stability of governor, isochronous governor.

TOPIC: 06 – TURNING MOMENT & FLYWHEEL:

- 06.01 Fluctuation of energy, determination of maximum fluctuation energy, co-efficient of fluctuation of energy.
- 06.02 Flywheel, co-efficient of fluctuation of speed, energy stored in a flywheel. Dimensions of the flywheel rim, Numericals.

TOPIC: 07 – BRAKES:

- 07.01 Introduction, materials for brake lining, classification.
- 07.02 Single block brakes, double block shoe brake.
- 07.03 Simple band brake, Differential band brake, Band and block brake.
- 07.04 Dynamometer, & Rope Brake dynamometer. Numericals.

TOPIC: 08 – CAM:

- 08.01 Introduction, classification, terminology.
- 08.02 Displacement, velocity and acceleration diagrams when the follower moves with uniform velocity.
- 08.03 Construction of cam profile for a radial cam, profile of cam when the axis of follower passes through the axis of cam shaft.

TOPIC: 09 – VIBRATION & BALANCING:

- 09.01 Vibration, classification, natural frequency of free longitudinal and transverse vibrations.
- 09.02 Balancing, classification, balancing of single rotating mass by a single mass rotating in the same plane, balancing of a single rotating mass by two masses

HYDRAULICS & FLUID MACHINERY

| | | | | | | |
|-------------------------------------|--------------------------------|----------|------------|---|----------|------------|
| Subject Code 25405 | Theory | | | No of Period in one session : 60 | | |
| | No. of Periods Per Week | | | Full Marks | : | 100 |
| | L | T | P/S | Annual Exam. | : | 80 |
| | 05 | - | - | Internal Exam. | : | 20 |

Rationale:

Water Management has a prime importance in the development of any country. This management covers the qualities of drinking water, its viability, controlling of flow of water, its pressure calculation, different effects produced on the objects by it. The energy associated with it i.e. Hydraulic energy & its use.

Now a day it is a great task to control the flood and desert. A diploma holder technician must have the capacity to control the natural hazards occurred due to water or to develop new cultivated area from desert lands. Seeing the today's requirement this paper, fluid mechanics has been designed.

Objective:

The student should be able to:

- (i) Analyze the difference of drinking and not drinking water and should know the principles to convert not drinking water into drinking water.
- (ii) Measure pressure to ensure safe working of submerged objects.
- (iii) Calculate the specific gravity & wet of fluid on/in an object.
- (iv) Assess the requirements of service water for the house.
- (v) Maintain & regulate the flow of fluids in a pipe line. And at last should have the basic concepts of almost all types of problems related to water.

| <u>S. No.</u> | <u>Topics</u> | <u>Periods</u> |
|---------------|--|----------------|
| 01 | Basic Concepts of Fluids | (12) |
| 02 | Hydrostatic Forces on Surfaces | (06) |
| 03 | Hydro Kinematics & Dynamics | (08) |
| 04 | Orifice | (04) |
| 05 | Loss of Head | (04) |
| 06 | Mouthpieces & Pipes | (06) |
| 07 | Hydraulic Gradient | (06) |
| 08 | Branching of Pipes & Transmission of Power through Pipes | (08) |
| 09 | Impact of Jet & Water Turbine | (06) |
| | | (60) |

CONTENTS:

TOPIC: 01 – BASIC CONCEPTS OF FLUID :

- 01.01 Fluid (Definition & its types). Formula for Newtonian Fluid Concept of hydraulics/ F.M. classification of hydraulics Hydrostatics, hydro kinematics.
- 01.02 Properties of Water – Specific gravity, surface tension, viscosity, cohesion-adhesion.
- 01.03 Types of Pressures – Atmospheric gauge, vacuum, vapour etc. & its units. Pressure measuring Instruments – Barometer, Simple Manometer, Differential Manometer, Inverted manometer, Enlarged End Manometer – Numerical problems.
- 01.04 Mechanical gauges – Borden tube, diaphragm, dead weight pressure.
- 01.05 Types of flow – Stream, streak, uniform, non-uniform, steady, unsteady, laminar, turbulent, compressible, incompressible, rotational, irrotational, path line, streamline, stream tube – definition only, Reynolds No. & its application in laminar & turbulent flow over a plate.

TOPIC: 02 – HYDROSTATIC FORCES ON SURFACES:

- 02.01 Total Pressure and Centre of Pressure, pressure at a point in a liquid, centre of pressure, total for on-horizontal surface area, vertical surface area & inclined surface area. Practical application on Centre of Pressure, Pressure diagram. Resultant Pressure, Sluice gate, lock gate, masonry wall and dam.

TOPIC: 03 – HYDROKINEMATICS & DYNAMICS:

- 03.01 Equation of continuity of flow – Discharge of rate of flow & its units. Equation of continuity of flow. Potential or static head, static energy, pressure head and pressure energy, kinetic head and kinetic energy, conversion of one energy into another energy.
- 03.02 Bernoulli's theorem and its proof – Numerical problems. Practical application of Bernoulli's theorem, venturimeter, pitot tube, measurement of flow through pipes with the help of venturimeter (horizontal) Derivation of formula for the discharge, venturimeter constant, Numerical problem.

TOPIC: 04 – ORIFICE:

- 04.01 Definition & types, Vena contracta, C_C , C_V , C_D – Relation among them. Practical application – Numerical problem.

TOPIC: 05 – LOSS OF HEAD:

- 05.01 Loss of head due to sudden enlargement and sudden contraction, Derivation of formula, head loss at entrance & exit of pipe, loss of head due to obstruction in the path of flow, its practical use – Numerical problem.

TOPIC: 06 – MOUTHPIECES AND PIPES:

- 06.01 Difference between pipe and mouthpieces. Use of mouthpieces, friction loss in pipes, definition of pipes and channels, Wetted perimeter, hydraulic mean depth, loss of head due to friction in pipes. Chezy's Equation, Chezy's Constant, Darcy or Weishback Equation, Darcy's Coefficient.

TOPIC: 07 – HYDRAULIC GRADIENT:

- 07.01 Discharge through pipes, Free discharge, discharging in another vessel through simple and compound pipes. Equivalent size of compound pipes. Siphon – Numerical problem

TOPIC: 08 – BRANCHING OF PIPES & TRANSMISSION OF POWER THROUGH PIPES :

- 08.01 Pipes in parallel, discharge through each pipe, Flow through a diversion or bypass, branching of pipes. Flow through each pipe.
- 08.02 Hydraulic transmission of power through pipes, its practical uses.
- 08.03 Nozzle – definition flow through nozzle at the end of the pipe line. Transmission efficiency and maximum available H.P. Determination of dia of nozzle for supplying maximum horse power.

TOPIC: 09 – IMPACT OF JET & TURBINES:

- 09.01 Introduction force of the jet impinging normally on fixed plate, hinged plate, moving plate and on a series of moving vanes, Force of the jet on a fixed curved vanes and on a moving curved vanes – Numerical problem.
- 09.02 Petton, Francis and Kaplan turbine velocity diagram, work done, power and efficiency.
- 09.03 Centrifugal pump-working principle, velocity diagram, manometer efficiency reciprocating pump working principle only.

Books Recommended:

- | | | |
|----|---|------------------------------|
| 1. | A Text Book of Fluid Mechanics & Machines | - R.S. Khurmi, S.Chand & Co. |
| 2. | Fluid Mechanics & Hydraulic Machines | - R.K. Bansal |
| 3. | Hydraulics & Hydraulic Machines | - Dr. Jagdish Lal |

WORKSHOP PRACTICE

| | | | | | | |
|-------------------------------------|--------------------------------|----------|------------|--|----------|-----------|
| Subject Code 25406 | Practical | | | No of Period in one session : 120 | | |
| | No. of Periods Per Week | | | Full Marks | : | 50 |
| | L | T | P/S | Annual Exam. | : | 40 |
| | - | - | 09 | Internal Exam. | : | 10 |

Rationale & Objective:

A Diploma holder technician should get more opportunity to know about machines, equipments & its operations which will help to be more confident & practical.

S. No. Topics

- A Machine Shop
- B Welding Shop
- C Foundry Shop
- D Fitting Shop

CONTENTS:

TOPIC: A – MACHINE SHOP:

- A.01 Safety precautions, Machine cleaning, checking, making ready for operation. Selection of tools, preparing it in ready condition (tool sharpening)
- A.02 Lathe:
Setting of job on three jaw, four jaw check, centering, tool/tools fitting, adjustment of tail stocks (if required).
Practice of operations: Turning, facing, taper turning on sample jobs. Job configuration checking.
Preparing a job by above processes (Sessional Preparation)
- A.03 Shaper:
Study of quick return mechanism.
Repair of faults (minor) in machines.
Tool setting on Ram.
Practice of feed depth of cut, no. of pass on sample job.
Preparation of V block on a sample job.
- A.04 Drilling:
Checking of drill bit.
Making of sample blind hole.
Making hole in a tapered job/V block.

TOPIC: B – WELDING SHOP:

- B.01 Safety precautions, handling of tools & equipment.
- B.02 Gas welding: Flame adjustment, practical on welding, soldering & brazing on two parts (sample job).
- B.03 Electric welding:
(i) Flame adjustment, use of electrodes on jobs (T- shape, L-shape), Coarse & fire welding.
(ii) Preparation of chair & grill.

TOPIC: C – FOUNDRY SHOP:

- (Pattern, Moulding & Cutting)
- C.01 Tools, cope, drag. Different types of pattern – introduction & use.
- C.02 Preparation of foundry sand.
- C.03 Demonstration & handling of mould (A sample mould should be prepared by teacher/Institute)
- C.04 Preparation of different types of moulds using single piece, spit or any available pattern – at least 3 moulds should be prepared by each student.
- C.05 Taking photographs of different moulds prepared by students.
- C.06 Non-Fe Casting of one of the above.

TOPIC: D – FITTING SHOP:

- D.01 Tools – Introduction & its use.
- D.02 Different processes (Sawing, filing, drilling, tapping, dieing, scraping, reaming etc.)
- D.03 Different types of fitting – Round fitting, Square fitting, Triangular fitting etc.
- D.04 Use of above D. 02 & D.03 on sample jobs, L-shape, T-shape etc.
- D.05 Practical Use of fitting.
- D.06 Preparation of threads in pipes using tap & die – sessional preparation.

HYDRAULICS & FLUID MECHANICS LAB

| | | | | | | |
|-------------------------------------|--------------------------------|----------|------------|---|----------|-----------|
| Subject Code 25407 | Practical | | | No of Period in one session : 60 | | |
| | No. of Periods Per Week | | | Full Marks | : | 50 |
| | L | T | P/S | Annual Exam. | : | 40 |
| | - | - | 04 | Internal Exam. | : | 10 |

Rationale:

Water Management has a prime importance in the development of any country. This management covers the qualities of drinking water, its viability, controlling of flow of water, its pressure calculation, different effects produced on the objects by it. The energy associated with it i.e. Hydraulic energy & its use.

Now a day it is a great task to control the flood and desert. A diploma holder technician must have the capacity to control the natural hazards occurred due to water or to develop new cultivated area from desert lands. Seeing the today's requirement this paper, fluid mechanics has been designed.

Objective:

The student should be able to:

- (vi) Analyze the difference of drinking and not drinking water and should know the principles to convert not drinking water into drinking water.
- (vii) Measure pressure to ensure safe working of submerged objects.
- (viii) Calculate the specific gravity & wet of fluid on/in an object.
- (ix) Assess the requirements of service water for the house.
- (x) Maintain & regulate the flow of fluids in a pipe line. And at last should have the basic concepts of almost all types of problems related to water.

TOPIC: A – HYDRAULICS LABORATORY:

Following experiments to be done:

- 01 Determination of C_C , C_V , C_D of discharge through Orifice.
- 02 Determination of Metacentric height of a Ship. (Experimental method),
- 03 Verification of Bernaulli's Equation,
- 04 Friction Loss in pipes
- 05 Discharging through notch.
- 06 Hardness test of (different types of samples) water.
- 07 Conversion of non-drinking water into drinking water.

WORKSHOP PRACTICE

| | | | | | | |
|-------------------------------------|--------------------------------|----------|------------|--------------------------------------|----------|-----------|
| Subject Code 25408 | Sessional | | | No of Period in one session : | | |
| | No. of Periods Per Week | | | Full Marks | : | 50 |
| | L | T | P/S | Annual Exam. | : | 30 |
| | - | - | | Internal Exam. | : | 20 |

Rationale & Objective:

A Diploma holder technician should get more opportunity to know about machines, equipments & its operations which will help him to be more confident & practical.

Sl. No. Topics

Periods

- A Machine Shop
- B Welding Shop
- C Foundry Shop
- D Fitting Shop

CONTENTS:

TOPIC: A – MACHINE SHOP:

A.01 Safety precautions, Machine cleaning, checking, making ready for operation. Selection of tools, preparing it in ready condition (tool sharpening)

A.02 Lathe:

- (i) Setting of job on three jaw, four check, centering, tool/tools fitting, adjustment of tail stocks (if required).
- (ii) Practice of operations: Turning, facing, taper turning on sample jobs. Job configuration checking.
- (iii) Preparing a job by above processes (Sessional Preparation)

A.03 Shaper:

- (i) Study of quick return mechanism.
- (ii) Repair of faults (minor) in machines.
- (iii) Tool setting on Ram.
- (iv) Practice of feed depth of cut, no. of pass on sample job.
- (v) Preparation of V block on a sample job.

A.04 Drilling:

- (i) Checking of drill bit.
- (ii) Making of sample blind hole.
- (iii) Making hole in a tapered job/V block.

TOPIC: B – WELDING SHOP:

B.01 Safety precautions, handing of tools & equipment.

B.02 Gas welding: Flame adjustment, practical on welding, soldering & brazing on two parts (sample job)

B.03 Electric welding:

- (i) Flame adjustment, use of electrodes on jobs (T-shape, L-shape), Coarse & fire welding.
- (ii) Preparation of chair & grill.

TOPIC: C – FOUNDRY SHOP:

(Pattern. Moulding & Cutting)

C.01 Tools, cope, drag. Different types of pattern – introduction & use.

C.02 Preparation of foundry sand.

C.03 Demonstration & handling of mould (A sample mould should be prepared by teacher/Institute).

C.04 Preparation of different types of moulds using single piece, spit or any available pattern – at least 3 moulds should be prepared by each student.

C.05 Taking photographs of different moulds prepared by students.

C.06 Non-Fe Casting of one of the above.

TOPIC: D – FITTING SHOP:

D.01 Tools – Introduction & its use.

D.02 Different processes (Sawing, filing, drilling, tapping, dieing, scraping, reaming etc.).

D.03 Different types of fitting – Round fitting, Square fitting, Triangular fitting etc.)

D.04 Use of above D.02 & D.03 on sample jobs, L-shape, T-shape etc.

D.05 Practical Use of fitting.

D.06 Preparation of threads in pipes using tap & die – sessional preparation.

MACHINE DRAWING

| | | | | | | |
|-------------------------------------|--------------------------------|----------|------------|--------------------------------------|----------|------------|
| Subject Code 33409 | Sessional | | | No of Period in one session : | | |
| | No. of Periods Per Week | | | Full Marks | : | 100 |
| | L | T | P/S | Annual Exam. | : | 60 |
| | - | - | - | Internal Exam. | : | 40 |

Rationale

Drawing is the language of engineers. Without the knowledge and skill of drawing, an engineer is handicapped in understanding the problem of engineering right from design phase to production as well as in communication with his superior and subordinate.

The subject will develop the understanding of drawing, representation of machine parts and skill of good draftsmanship. The subject will help a technician in understanding the functioning of different machine parts, which in turn will help in maintenance and dismounting and annually of machine parts in general and automobile parts in particular. It will generate confidence in a technician which will improve the ability of overall shop floor operation and management the technician will be able to communicate with supervision and subordinate through drawings.

Objectives

The students will be able to:

- Understand these I.S. Codes of drawing and use there in their drawing.
- Use different scales used in a drawing.
- Understand and draw the orthographic projections of different machine parts in 1st and 3rd angle projection skill with good draftsmanship.
- Draw missing views.
- Understand and draw isometric and oblique projection.
- Draw dimensional and sectional drawing 1st and 3rd full draftsmanship.
- Develop overall drawing and drafting skill and be able to apply the knowledge skill of drawing in practical field.
- Draw free hand sketches of machine component parts.

CURRICULUM

| | |
|-----------|--|
| SL | Topics |
| 1. | Orthographic Drawing in 1st Angle and 3rd Angle Projection |
| 2. | Missing Views |
| 3. | Isometric and Oblique Drawings |
| 4. | Conventions used in Machine Drawing |
| 5. | Free Hand Sketch |
| 6. | Dimensional and Sectional Drawing |
| 7. | Practical Aspect of Drawing |
| | Total |

CONTENTS

Topics Content

01 Orthographic Drawing in 1st Angle and 3rd Angle Projection

01.01 Methods of projection - 1st angle and 3rd angle projection.

01.02 Orthographic projection of simple models and from given isometric drawing of simple blocks and machine parts.

02 Missing Views

02.01 Drawing missing view from the given true orthographic views.

03 Isometric Drawings

- 03.01 Introduction of pictorial drawing, construction of Isometric scale and its use in Isometric drawing.
- 03.02 Isometric drawing of simple blocks and machine parts.

04 Conventions used in Machine Drawing

- 04.01 Types of lines - Cut lines or main line or parts cutting plane lines, brake lines for short and long breaks, hidden lines, create and focus lines and dimension lines, sectioning lines.
- 04.02 Conventional representation of common features in mechanical drawing like screw threads, rolled sections bearings sections, helical tension spring, gear, rack and pinion etc. per I.S : 696.
- 04.03 Conventional representation of material as per I.S : 696 metal glass stone ware insulating and fitting materials, Liquids, wood and concrete.
- 04.04 Conventional Method of representation of full sectional and half sectional views of machine parts as per I.S : 696.

05 Free Hand Sketch

- 05.01 Free hand sketches of bolts and nuts, locking devices such as rivet-heads, keys, cotter and simple machine Parts.
- 05.02 Free hand sketches of the following:
 - Simple Muffed and universal couplings
 - Socket and spigot joints.
 - Bushed bearing
 - Locks and fast pulleys

06 Dimensional and Sectional Drawing

- 06.01 Dimensional and Sectional Drawing of:
 - Bearing: Pedestal bearing, Pulmmer block.
 - Machine Parts: Cotter joints, Knuckle joint.

Recommended Books

| SL | Title/Publisher | Author |
|-----------|--|------------------------------|
| 1. | Machine Drawing, Tata McGraw Hill Publication. | N. Sidheshwar and P. Kanenth |
| 2. | Machine Drawing | N.D. Bhatt |
| 3. | Machine Drawing | Dear Lent |
| 4. | Machine Drawing | Perkinson |
| 5. | General Engineering Drawing | Kakkar and Chand |
| 6. | Machine Drawing | P.N. Vijay Vergia |
| 7. | A Text Book of Engineering Drawing, Katsion Publication House. | R.K. Sharan |