

**Choice Based Credit System (CBCS)**
**Diploma IVth Sem ME**

			Periods			Evaluation Scheme						
S. No	Subject Code	Name of Subject	L	T	P	Assignment	T A	Total	ESE	Subject Total	Credit	Hours
1	7D.251	Thermal Engineering	3	0	0	20	10	30	70	100	3	3
2	7D.256	Fluid Mechanics & Machinery	3	0	0	20	10	30	70	100	3	3
3	7D.253	Theory of Machines & Mechanism	3	0	0	20	10	30	70	100	3	3
4	7D.254	Production Processes	3	0	0	20	10	30	70	100	3	3
5	6D.252	Applied Electronics	3	0	0	20	10	30	70	100	3	3
6	40D.251	Professional skills	2	0	0	20	10	30	70	100	2	2
7	40D.151	Life Skills II*										
<b>PRACTICAL/DESIGN/DRAWING/SESSIONAL</b>												
1	7DP.251	Thermal Engineering Lab			2		30	30	20	50	1	2
2	7DP.256	Fluid Mechanics & Machinery Lab			2		30	30	20	50	2	2
3	7DP.253	Theory of Machines & Mechanism Lab			2		30	30	20	50	1	2
										750	21	23

Note: - \* Non Credit Course.

**Program:** Diploma

**Semester:** Fourth

**Course:** Thermal Engineering

**Course Code:** 7D.251

L	T	P	C
3	0	0	3

**Course Objective:**

- The course deals with properties of a simple pure compressible substance, equations of state.
- To impart details about the first law and second law of thermodynamics, internal energy.
- Specific heats, enthalpy and the application of the first law to a system or a control volume are one of the most important topic for Mechanical Engineering students.
- Discussing and leading to the discovery of entropy as a property and its ramifications.

**Unit I:**

**Sources of Energy:** Brief description of energy sources. Classification of energy sources- Renewable & Non-Renewable. Fossil fuels including CNG, LPG. Solar flat plate and concentrating collectors & its application Solar Water Heater Photovoltaic Cell, Solar Distillation, Wind, Tidal, Geothermal. Biogas Biomass, Bio-diesel. Hydraulic, Nuclear: Fuel cell– list of fuel cells.

**Fundamentals of Thermodynamics:** Concepts of pure substance, types of systems, properties of systems, Extensive and Intensive properties with units and conversion like P,V, $\rho$  and temperature Point function and path function. Work and Energy-Thermodynamic definition of work, heat, difference between heat and work, P.E., K.E, Internal Energy, Flow work, concepts of enthalpy, entropy. Law of Thermodynamic Zeroth Law, Temperature measurement, principle of energy conservation, irreversibility, Second Law of Thermodynamics, Kelvin Plank, Clausius statement sand their equivalence ,Concept of perpetual motionmachine1 and 2. Application of Thermodynamic laws. Steady Flow Energy equation and its application to open system like boil engine nozzle turbine, compressor & condenser. Application of Second law to Heat Engine, Heat Pump and Refrigerator.

**Unit II:**

**Ideal Gases:** Concept of Ideal gas, Charle’s law, Boyle’s law, Avogadro’s law, equation of state, characteristic gas constant and universal gas constant. Ideal gas processes: Isobaric, Isochoric, Isothermal, Adiabatic, Polytropic, Isentropic with representation of the processes on P-V and T-S diagram (simple numerical) **Steam and Steam Boiler:** Generation of steam at constant pressure with representation non various charts such as T-H,T-S,H-S,P-H. Properties of steam and use of steam table, Quality of steam and its determination with Separating, throttling and combined Separating and throttling calorimeter (no numerical) .**Vapour Process:** constant Pressure, constant volume, constant enthalpy, constant entropy (numerical using steam table and Mollier chart), **Rankine Cycle. Steam Boilers:** Classification of boilers.–Construction and working of –Cochran, Babcock and Wilcox, La-mont and Loeffler boiler. Boiler draught, natural and Mechanical. Boiler mounting and accessories [to be covered in practical]

**Unit III:**

**Steam Turbines and Condensers:** Steam nozzle: Continuity equation, types of nozzles, concept of Mach number, critical pressure, application of steam nozzles. Steam turbine: Classification of turbines Construction and working of Impulse and Reaction turbine. Compounding of turbines Regenerative feed heating bleeding of steam, nozzle control governing (no velocity diagrams and numerical). Steam condenser: Dalton's law of partial pressure, function and classification of condensers, construction and working of surface condensers. Sources of air leakage, concept of condenser efficiency, vacuum efficiency (no numerical). Cooling Towers. Force draught, natural draught and induced draught

**Unit IV:**

**Heat Transfer:** Modes of heat transfer: Conduction, convection and radiation. Conduction by heat transfer. Fourier's law, thermal conductivity, Conduction through cylinder, thermal resistance, composite walls, combined conduction and convection (Simple numerical). Heat transfer by Radiation: Thermal Radiation, Absorptivity Transmissivity Reflectivity, Emissivity, black and gray bodies, Stefan- Boltzman's law. Heat Exchangers: Shell and tube, plate type, multi-phase heat exchangers. Materials Used and applications of heat exchangers.

***Suggested Reading:***

- 1. Thermal engineering by R K Rajput, Lakshimi Publications*
- 2. Engineering Thermodynamics – by P. K. Nag*
- 3. A Textbook of Thermal Engineering by rskhurmi*
- 4. Engineering Thermodynamics –by D.S. Kumar*

**Program:** Diploma

**Semester:** Fourth

**Course:** Thermal Engineering Lab

**Course Code:** 7DP.251

L	T	P	C
0	0	2	1

### **List of experiment**

1. To study the Cochran Boilers.
2. To study the Babcock & Wilcox Boilers.
3. To study the construction and working of various boiler mountings and accessories.
4. To study the working of various types of steam turbines.
5. To study about various types of Steam Condensers.
6. To study various types of fins.
7. To study various types of Heat Exchanger.
8. Determination of Thermal Conductivity of metal rod.

**Program:** Diploma

**Semester:** Fourth

**Course:** Fluid Mechanics & Machinery

**Course Code:** 7D.256

L	T	P	C
3	0	0	3

**Course Objective:**

- Behavior of fluid is one of the most essential part of mechanical engineering.
- The students completing this course are expected to understand the properties of fluids and its Kinematic and Dynamic behavior.
- Through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations students get to know the well-defined properties of liquid and gasses.
- The student shall be able to understand the theory of boundary layer, working and performance characteristics of various hydraulic machines like pumps and turbines.

**Unit I:**

**Properties of fluid:** Density, Specific gravity, Specific Weight, Specific Volume. Dynamic Viscosity, Kinematic Viscosity, Surface tension, Capillarity Vapour Pressure, Compressibility

**Fluid Pressure & Pressure Measurement:** Fluid pressure, Pressure head, Pressure intensity, Concept of absolute vacuum, gauge pressure, atmospheric pressure, absolute pressure. Simple and differential mano-meters Bourden pressure gauge. Total pressure, center of pressure of plane regular surfaces immersed in liquid- Horizontally, vertically and inclined.

**Unit II:**

**Fluid Flow:** Types of fluid flows, Continuity equation, Bernoulli's theorem, Venturimeter– Construction, principle of working, Coefficient of discharge, Derivation for discharge through venture-meter. Orifice meter – Construction, Principle of working, hydraulic co-efficient Derivation for discharge through Orifice- meter, Pitot tube–Construction, Principle of Working.

**Flow through Pipes:** Laws of fluid friction (Laminar and turbulent) Darcy's equation and Chezy's equation for frictional losses. Minor losses in pipes. Hydraulic gradient and total gradient line Hydraulic power transmission through pipe. Impact of jet: Impact of jet on fixed vertical, moving vertical flat plates. Impact of jet on curved vanes with special reference to turbines & pumps.

**Unit III:**

**Hydraulic Turbines:** Layout of hydroelectric power plant. Features of Hydroelectric power plant. Classification of hydraulic turbines. Selection of turbine on the basis of head and discharge available. Construction and working principle of Pelton wheel, Francis and Kaplan turbine. Draft tubes–types and construction, Concept of cavitations in turbines, Calculation of Work done of Kaplan Turbines and pelton wheel Turbine, Power, efficiency of turbine.

**Unit IV:**

**Centrifugal Pumps:**Construction, principle of working and applications. Types of casing and impellers. Concept of multistage, Priming and its methods Cavitation, Mano-metric head, Work-done, Manometric efficiency, Overall efficiency, NPSH. Performance Characteristics of Centrifugal pumps, troubleshooting. Construction, working and applications of submersible, jet pump.

**Reciprocating Pump:** Construction, working principle and applications of single and double acting reciprocating pumps. Concept of Slip Negative slip, Cavitation and separation. Use of Air Vessel. Indicator diagram with effect of acceleration head & frictional head.

***Suggested Reading:***

- 1.Fluid Mechanics & fluid power Engg. By D.S. Kumar (Metropolitan Publishers)*
- 2.Fluid Mechanics by R.K.Bansal, (Laxmi Publications)*
- 3.Fluid Mechanics by Potter & Wiggert (Cengage Learning)*
- 4.Fluid Mechanics by A.K Mohanty (PHI Learning Pvt.Ltd.)*
- 5.Fluid Mechanics and Hydraulic Machines by R.K.Rajput (Khanna Publishers)*

**Program:** Diploma

**Semester:** Fourth

**Course:** Fluid Mechanics & Machinery Lab

**Course Code:** 7DP.256

L	T	P	C
0	0	2	2

### **List of Experiment**

1. Verification of Bernoulli's theorem
2. Determination of Co-efficient of discharge for a Venturimeter.
3. Determination of Co-efficient of discharge for orifice meter.
4. Determination of meta-centric height of a boat model.
5. Verification of Reynolds law.
6. To find the efficiency of reciprocating pump.
7. To find the efficiency of centrifugal pump.
8. To determine the efficiency of hydraulic ram.
9. To determine the efficiency of Pelton Turbine.
10. To determine the impact of jet.
11. To determine the efficiency of Kaplan/Francis Turbine

**Program:** Diploma

**Semester:** Fourth

**Course:** Theory of Machines & Mechanism

**Course Code:** 7DP.253

L	T	P	C
3	0	0	3

**Course Objective:**

- On completing the course, the student will be able to understand the fundamentals of the theory of kinematics and dynamics of machines.
- Understand techniques for studying motion of machines and their components.
- To understand the specification of gears, gear trains, cams, and linkages, simultaneous graphical and analytical analysis of position, velocity, and acceleration, considering static and inertial forces.
- To understand the relative motion between the machine elements.

**Unit I:**

**Fundamentals and types of Mechanisms:** Kinematics of Machines:-Definition of Kinematics, Dynamics, Statics, Kinetics, Kinematic link, Kinematic Pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, inversion, machine and structure. Inversions of Kinematic Chain. Inversion of four bar chain, coupled wheels of Locomotive & Pantograph. Inversion of Single Slider Crank chain-Rotary I.C. Engines mechanism, Whit worth quick return mechanism Crank and Slotted lever quick return mechanism. Inversion of Double Slider Crank Chain -Scotch. Yoke Mechanism & Oldham's Coupling Common Mechanisms. Bicycle freewheel Sprocket mechanism. Geneva Mechanism. Ackerman's Steering gear mechanism. Foot operated air pump mechanism.

**Velocity and Acceleration in Mechanism:** Concept of relative velocity and relative acceleration of a point on link, angular velocity and angular acceleration, inter-relation between linear and angular velocity and acceleration. Analytical method [no derivation] and Klein's construction to determine velocity and acceleration of different links in single slider crank mechanism. Drawing of velocity and acceleration diagram of a given configuration, diagrams of simple mechanisms. Determination of velocity and acceleration of a point on link by relative velocity method [Excluding coriolis components of acceleration].

**Unit II:**

**Power Transmission:** Belt Drives-flat belt, V-belt & its applications, material for flat and V-belt, angle of lap, belt length. Slip and creep. Determination of velocity ratio, ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission (Simple numerical). Chain Drives-Advantages & Disadvantages, Selection of Chain & Sprocket wheels, methods of lubrication. Gear Drives-Spur gear terminology, types of gears and gear trains, and their selection for different application, train value & Velocity ratio for compound, reverted and simple epicyclic gear train methods of lubrication, Law of gearing. Rope Drives-Types, applications, advantages & limitations of Steel ropes.

**Flywheel and Governors:** Flywheel-Concept, function and application of flywheel with the help of turning moment diagram for single cylinder, 4-Stroke I.C. Engine (no Numerical). Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance. Governors-Types, concept, function and application & Terminology of Governors. Comparison between Flywheel



and Governor. **Brakes, Dynamometers, Clutches & Bearings:** Brakes and Dynamometers. Function of brakes and dynamometer, types of brakes and Dynamometers, comparison between brakes and dynamometer. Construction and working of i) Shoe Brake, ii) Band Brake, iii) Internal expanding shoe brake, iv) Disc Brake. Concept of Self Locking & Self energizing brakes. Numerical problems to find braking force and braking torque & band brake. Construction and working of i) Rope Brake Dynamometer, ii) Hydraulic Dynamometer, iii) Eddy current Dynamometer. Clutches and Bearing. Clutches–Uniform pressure and Uniform Wear theories. Function of Clutch and its application, Construction and working of i) Single plate clutch, ii) Multi plate clutch, iii) Centrifugal Clutch, iv) Cone clutch, v) Diaphragm clutch. (Simple numerical on single and Multi-plate clutch), Bearings–i) Simple Pivot, ii) Collar Bearing, iii) Conical pivot. Torque & power lost in friction (no derivation). Simple numerical.

#### **Unit IV:**

**Balancing & Vibrations:** Concept of balancing. Balancing of single rotating mass. Graphical method for balancing of several masses revolving same plane. Concept and terminology used in vibration causes of vibrations in machines, their harmful effects and remedies.

**Cams and Followers:** Concept, definition and application of Cams and Followers. Classification of Cams and Followers. Different follower motions and their displacement diagrams like uniform velocity, SHM, uniform acceleration and Retardation. Drawing of profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (graphical method).

#### ***Suggested Reading:***

1. *Theory of Machines* by R.S. Khurmi (S.Chand pub.)
2. *Theory of Machines and Mechanisms* by J.E. Shigley and J.J. Uicker ...
3. *Theory of Machines* by Dr. R. K. Bansal (Laxmi Publication)
4. *Theory of Machines* by S.S RATTAN (TMH)

**Program:** Diploma

**Semester:** Fourth

**Course:** Theory of Machine Lab

**Course Code:** 7DP.253

L	T	P	C
0	0	2	1

### **List of Experiment**

1. Study of Ackerman's Steering Gear Mechanism
2. Study of Watt Mechanism
3. To draw acceleration diagram of four bar mechanism.
4. To draw displacement diagram, velocity diagram & acceleration diagram of cam follower.
5. Study of Motorized Gyroscope.
6. Study of Static & dynamic Balancing Machine

**Program:** Diploma  
**Semester:** Fourth  
**Course:** Production Process  
**Course Code:** 7D.254

L	T	P	C
3	0	0	3

### Course Objective:

- Impart knowledge to students in the latest technological topics on Production and Industrial Engineering and to provide them with opportunities in taking up advanced topics in the field of study.
- Create a congenial environment that promotes learning, growth and imparts ability to work with multi-disciplinary groups in professional, industry and research organizations.
- Broaden and deepen their capabilities in analytical and experimental research methods, analysis of data and drawing relevant conclusions for scholarly writing and presentation.
- Provide guidance to students for their choices in research and professional career outlook and to encourage students to take up research.

### Unit I:

**Turning Lathe:** Angle calculations for taper turning, Cutting tool nomenclature and tool signature Cutting parameters and machining time calculation.

**CNC Lathe:** Introduction, classification, advantages, positioning system, Constructional features.

Part programming: programming format, word, statement, block, Preparatory and miscellaneous code, fixed cycles in programming –canned cycle, do–loop, subroutine.

### Unit II:

**Drilling:** Twist drill nomenclature, Cutting parameters, machining time calculation, deep hole drilling. **Milling and Gear Cutting:** Milling, Cutting parameters, machining time calculations, Milling operations– plain milling, face milling, T–slot milling slitting. Gear cutting: Gear cutting on milling machine–Dividing head and Indexing methods. Gear hobbing, Principle of operation advantage and limitations. Hobbing techniques –climb and conventional, Gear shaping principle of operation, advantages, disadvantages, Gear finishing processes – Gear shaving, Gear grinding, Gear burnishing, Gear lapping.

### Unit III:

**Grinding:** Classification of machines Grinding wheel composition types and shapes. Designation, Types of grinding operations.

**Super Finishing Processes:** Honing, Lapping, Burnishing Buffing and Polishing.

### Unit IV:

**Plastic Moulding:** Types of plastic, Compression molding, Transfer molding, Injection molding, blow molding, vacuum forming, extrusion, calendaring, rotational Moulding.

### Suggested Reading:

1. *Element of Workshop Technology Volume I and II –Hajara Chaudhary and Bose S.K, Asia Publishing.*
2. *Production Technology Volume I and II –P.N. Rao, Tata McGraw Hill Publication.*
3. *Production Technology- R.K. Jain, Khanna Publications.*
4. *Production Technology- P.C. Sharma, Khanna Publication.*
5. *Workshop Technology-Chapman W.A.J., ELBS Publication.*
6. *Production Technology- HMT, Tata McGraw Hill Publication..*

**Program:** Diploma

**Semester:** Fourth

**Course:** Applied Electronics

**Course Code:** 6D.252

L	T	P	C
3	0	0	3

**Course Objective:**

- Impart knowledge to students by combination Electronics and Instrumentation Engineering for applied engineering.
- Enhancing the knowledge of students dealing with the measurement, control, and automation of processes.
- Covering core subjects such as industrial instrumentation and process control, bio-medical instrumentation and robotics, students deal with software and hardware topics such as microprocessor and microcontroller-based instrumentation, VLSI and embedded system designs, computer architecture and organization and computer control of processes.
- Computer languages such as C and C++ are also part of the curriculum.

**Unit I:**

**Multistage Amplifiers:** Introduction, Multistage Amplifiers, n Stage Cascaded Amplifiers, Frequency Response of Coupled Amplifiers, Step Response of An Amplifier, RC coupled Transistor Amplifier, Transformer Coupled Transistor Amplifiers, Impedance Coupled Transistor Amplifiers, Direct Coupled Transistor Amplifiers, Cascaded FET Amplifiers, Cascode or CE- CB Configuration, CE-CC Configuration, Differential Amplifiers, Bandpass of Cascaded Stage.

**Unit II:**

**Large Signal or Power Amplifiers:** Introduction, Difference Between Voltage and Power Amplifiers, Terms used in Power Amplifiers, Classification Of Power Amplifiers, Practical Power Amplifier Stages, Class A Power Amplifiers, Class B Power Amplifiers, Harmonic Distortion in Power Amplifiers, Class AB Power Amplifiers, Class C Power Amplifiers, Class D Power Amplifiers, Push Pull Amplifiers.

**Feedback Amplifiers:** Introduction, Classification of Amplifiers, Feedback Concepts, Transfer Gain with feedback, Advantages of Negative Feedback, Analysis of Feedback Amplifiers, voltage series feedback, voltage shunt feedback, current Series feedback, current shunt feedback, Emitter follower, Darlington Amplifier, Comparison Between Darlington Amplifier and Emitter Follower.

**Unit III:**

**Tuned Amplifiers:** Classification of Tuned Amplifiers, Single Tuned Amplifiers, Effect of cascading Single tuned Amplifiers on bandwidth, FET Tuned Amplifiers, Double tuned Amplifiers, Effect of Cascading Double tuned Amplifiers on Bandwidth, Large Signal Tuned Amplifiers, Oscillation In tuned Amplifiers.

**Unit IV:**

**Sinusoidal Oscillators:** Operation of Oscillators, Essentials Of an Oscillator Circuits, Frequency Stability of Oscillators, Types of Transistor Oscillators, LC Oscillators, Frank inn Oscillators, Colpitt's Oscillators, clap Oscillators, Hartley Oscillators, Crystal Oscillators, Audio Oscillators, Phase Shift Oscillators, Wein Bridge Oscillators, Beat Frequency Oscillators, Negative Resistance Oscillators, Selection Of Oscillators.

**Suggested Reading:**

1. *Electronic Devices and circuits J.B Gupta*
2. *A Textbook Of Applied Electronics by R. S. Sedha*
3. *Applied Electronics by Kevin Karplus*

**Program:** Diploma

**Semester:** Fourth

**Course:** Professional Skills

**Course Code:** 40D.251

L	T	P	C
2	0	0	2

**Course Objective:**

It is student-centric, value based, activity oriented professional education, where the Faculty is not only the disseminator of common wealth of knowledge and experience but the organizer of learning situations, facilitator of the learning process and co-coordinator of learning following the age old adage of **“I hear, I forget, I see, I remember, I do, I understand**

- In this unit the students get opportunities to apply their classroom learning to practical situation. This course aims to develop the professional traits in them, so that they can meet the neo- challenges of job opportunities.
- Students become the architect of their career goals.
- Acquire leadership traits,
- Interpersonal skills,
- Adaptability, discussion skills, interview skills etc..

**Unit I:**

**DISCUSSION SKILLS**

- Introduction
- Importance of Group Discussion Skills
- Process, Scope & Limits of Group Discussion
- Group Discussion, Interaction Strategies, Individual Contribution
- Leadership Skills, Team Management, Creating Friendly Co-operative Atmosphere
- Selection Group Discussion, Interactive Oral Process, Purposeful & Goal Oriented Characteristics, Agreement on Group Goals, Agreement on Procedure, Effective Communication, Equitable Distribution of Time; Speaking & Listening Skills; Adaptability; Assertiveness; Command Over the Subject

**Unit II:**

**NEGOTIATION SKILLS**

- Speaking & Listening Skills
- Rapport Building
- Decision Making Ability
- Problem Solving Skill
- Attitudes
- Adaptability
- Conflict Handling Ability

**Unit III:**

**JOB SEARCH & CORRESPONDENCE SKILLS**

- Introduction; Job Search Strategies
- Developing Job Communication Skills
- Skill Analysis
- Job Communication Process
- Creating Network,
- Prelude; Biodata, Curricula Vitae ( CV )  
Resume
- Determining the Need of the Employer
- Relevant Information Analysis
- Preparing Final Draft
- Developing Confidence, Apprehension, Set Realistic Goals, Negative Thoughts
- Stress Reduction Techniques
- Follow up Correspondence

**Unit IV:**

**INTERVIEW SKILLS**

➤ Interview; Introduction  
➤ The Interview Process  
➤ Types of Interview; Face to Face, Group Interview, Through Video Conferencing, Telephonic,

➤ Skype, Panel Interview  
➤ Planning/Purpose  
➤ Pre-Interview Techniques  
➤ Answering Strategies  
➤ Follow up

***Suggested Reading:***

1. Monippally, Matthukutty. M. 2001. *Business Communication Strategies*. 11<sup>th</sup> Reprint. Tata McGraw-Hill. New Delhi
2. Swets, Paul. W. 1983. *The Art of Talking So That People Will Listen: Getting Through to Family, Friends and Business Associates*. Prentice Hall Press. New York
3. Lewis, Norman. 1991. *Word Power Made Easy*. Pocket Books
4. Sen, Leena. *Communication Skills ; Eastern Economy Edition*
5. Ghanekar, Dr. Anjali. *Essentials of Business Communication Skills ; Everest Publishing House*
6. David Green. *Contemporary English Grammar, Structure & Composition ; MacMillan*
7. Dictionary; Oxford
8. Dictionary ; Longman