THERMAL ENGINEERING

L	T	P
3	0	2

Curri. Ref. No.: ME401

Total Contact Hrs.:   **Total Marks: 100**

Theory: 45
Practical: 0

Theory Class duration:
45 classes of 1 Hr. or
60 classes of 45 minutes

Pre-requisite: G106. G107

Credit : 3

Theory:
End Exam : 70
P.A.: 30

Practical:
End Term Exam:0
P.A. : 0

RATIONALE:
Amount of useful energy produced and spent is the most important factor by which a country's technical advancement is measured. Useful mechanical and electrical energy is produced from heat energy. It is of paramount importance to an engineer to know the basic principles by which heat energy can be converted into mechanical energy, which in turn can be converted into electrical energy. Thermodynamics is the field of applied science which deals with the energy possessed by heated gases and vapours and the laws which govern the conversion of this energy into mechanical energy and vice versa. This is the fundamental subject for understanding the process of producing vast amount of mechanical energy from heat energy and therefore necessary to be learned by the engineering students. Understanding the working principles and features of the various machines and plants in which either such heated gas/vapours are produced or conversion of heat to mechanical energy takes place is of great importance.

AIM:
To have a clear understanding of the subject "Thermodynamics" and its importance for mechanical engineers. Students should know and understand the physical significance of first law and second law of thermodynamics. They should also learn about the thermodynamic properties of gases and steam which acts as the thermodynamic medium and how heat energy contained in the medium is converted to mechanical energy by passing through cyclic thermodynamic processes. Students will also learn the properties of steam, how steam is produced commercially in a boiler.

DETAIL COURSE CONTENT

THEORY: 45 Hours

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
1.0 INTRODUCTION: Importance of conversion of heat energy into mechanical energy and electrical energy, definition of Thermodynamics, concept of heat engines.	2
2.0 FUNDAMENTALS OF THERMODYNAMICS:	6
2.1 Definition and understanding of terms: Energy, work, power, law of conservation of energy, heat, units of heat, temperature, absolute temperature, pressure, absolute and gauge pressure, specific heat.	
2.2 Thermodynamic system; closed, open and isolated systems; system boundary; properties of a thermodynamic system; concept of work and heat energy transfer to and from a system. State relationship between: work and power, Centigrade and Fahrenheit scale of temperature, work and heat energy.	
3.0 PROPERTIES OF GASES Gas as the working substance in a thermodynamic system; definition of gas and perfect (or ideal) gas; laws of perfect gases—Boyle's law, Charle's law and Gay- Lussac law with corresponding gas equations; characteristic gas equation $pv = mRT$; problems	5
4.0 LAWS OF THERMODYNAMICS Thermal equilibrium; statement of Zeroth law; first law of thermodynamics; mechanical equivalent of heat; non flow energy equation (heat added = work done + rise in internal energy); second law of thermodynamics-statements; physical significance of second law, state clausius inequality.	5
5.0 THERMODYNAMIC PROCESSES OF PERFECT GASES Definition of thermodynamic (or non-flow) process; P - V diagram; constant volume, constant pressure, isothermal, adiabatic, polytropic and throttling processes.	6

6.0 ENTROPY OF GASES 5

Concept of entropy; relation between heat and entropy; T-S diagram; change of entropy during different thermodynamic process (final expressions only, deduction not required) and their representation on T-S diagram.

7.0 THERMODYNAMIC AIR CYCLES 5

Definition of thermodynamic cycle; representation of a cycle in P-V diagram; work done in the cycle; reversible and irreversible cycle; working of an ideal engine; efficiency of a cycle; Carnot cycle in P-V and T-S diagram; expressions for work done and efficiency; simple problems on air cycles.

8.0 PROPERTIES OF STEAM 5

8.1 Difference between gas and vapour; saturation temperature and pressure; sensible heat; latent heat; total heat; dryness fraction.

8.2 Wet steam; dry saturated steam; superheated steam; degree of superheat.

8.3 Use of steam table; Mollier's diagram; calculation of total heat; specific volume and internal energy of steam; solve problems.

9.0 STEAM BOILER 6

9.1 Function of steam boiler; fire tube & water tube boilers; working principle of Cochran, Lancashire, Locomotive, Babcock and Wilcox, Stirling boilers

9.2 Constructional features and uses of important boiler parts like shell, grate, drum, tubes, furnace, mountings, accessories.

9.3 Fuels; burning equipment; feed water treatment

9.4 Boiler performance; boiler efficiency

- Understand the difference between fire tube and water tube boilers.
- Explain working principles of various types of boilers with help of sketches.
- State use and importance of various parts and systems of a boiler.
-

10. HEAT TRANSFER 4

10.1 Modes of heat transfer: Conduction, convection and radiation.

10.2 Heat transfer by conduction: Fourier's law, thermal conductivity, conduction through cylinder, thermal resistance, composite walls, combined conduction and convection.

10.3 Heat transfer by radiation: Thermal radiation, absorptivity, transmissivity, reflectivity, emissivity, black and gray bodies, Stefan – Bolzman law.

10.4 Heat exchangers: Shell and tube, plate type, multiphase heat exchangers, materials used and applications.

Total Hours 45

Note: *Arrangement should be made to show the running of a boiler to the students during tenure of this course or during normal industrial visits.*

REFERENCE BOOKS:
1. V. P. Vasandani & D. S. Kumar: Heat Engineering - Metropolitan Book Co (P) Ltd.
2. R. S. Khurmi: A Textbook of Engineering Thermodynamics – S. Chand & Co. Ltd.
3. B. K. Sarker: Thermal Engineering – TMH
4. P. L. Ballaney: Thermal Engineering – Khanna Publishers
5. K.C.Pal: Heat Power-Orient Longman.
6. K. Soman: Thermal Engineering – PHI Learning Pvt. Ltd.
7. K. K. Ramalingam: Thermal Engineering – Scitech Publications (India) Pvt. Ltd.
8. P. K. Nag: Engineering Thermodynamics - Tata McGraw Hill, New Delhi, 2008
9. R. S. Khurmi & Gupta: Refrigeration and Air Conditioning
10. Domkundwar, Kothandarman and Domkundwar: A Course in Thermal Engineering - Dhanpat Rai Publishing Company New Delhi
11. Mahesh M. Rathore: Thermal Engineering - Tata McGraw Hill Education Private Ltd.
12. R. Rudramoorthy: Thermal Engineering - Tata McGraw Hill Published New Delhi, 2003
13. R. K. Rajput: Thermodynamics - Laxmi Publications, New Delhi, 2007
14. M. M. Rathore: Essential Engineering Thermodynamics - Dhanpat Rai Publishing Co, New Delhi, 2005
15. S. L. Somasundaram: Thermal Engineering - New Age International (P) Ltd.
16. J. S. Rajadurai: Thermodynamics and Thermal Engineering - New Age (I), New Delhi

FLUID MECHANICS

L	T	P	
3	0	2	Curri. Ref. No.: ME402

Total Contact Hrs.:   **Total Marks: 150**   **Theory:**

Theory: 45   End Term Exam: 70

Practical: 30   P.A.: 30

Pre-requisite: G106, G107   **Practical:**

Credit : 3   End Term exam:25

                                                 P.A.: 25

RATIONALE

Though in majority of cases we use solids as engineering materials, use or application of fluids (i.e. liquids and gases) in engineering field is also numerous and of great importance.

A number of materials (elements and compounds) are available in fluid forms only, viz. air, water petroleum products, steam, mercury etc. Many metals are extracted from ores by pyrometallurgical process in liquid form only. Water is a liquid and is involved in all spheres of human activity, ranging from daily needs to irrigation, generation of power, water transportation, cooling agent in chemical & metallurgical processes and innumerable other applications. Heat Engines utilise fluid medium for conversion of heat energy to useful mechanical energy or for generation of electrical energy in power plants.

It is, therefore, necessary to study the physical properties and characteristics of fluids as a distinct group of materials which have very important use and application in a wide range of fields of engineering and in mechanical engineering in particular.

AIM:

To understand the properties and characteristics of fluids (mainly liquid) particularly in relation to handling and using fluids in engineering fields, like : physical properties of a liquid, pressure exerted by a liquid, property of buoyancy, energy of flowing fluid, characteristics of fluid flow in a pipe or open channel and measurement of flow of liquid.

D E T A I L   C O U R S E   C O N T E N T

THEORY:

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.

1.0 FLUID AND PROPERTIES OF FLUID   **3**

Definition and classification of fluid; definition of fluid mechanics and hydraulics; specific weight; density; compressibility; viscosity; surface tension.

Demonstrate by simple experiments viscosity and surface tension of a liquid.

2.0 PRESSURE AND ITS MESUREMENT   **8**

2.1 Intensity of pressure; pressure head; Pascal's Law;

2.2 Total pressure on plane and curved surface one face of which is submerged in liquid; centre of pressure

3.0 EQUILIBRIUM OF FLOATING BODIES   **8**

Archimede's principle; buoyancy and principle of floatation; hydrometer for measurement of specific weight of liquids; centre of buoyancy and metacentre; conditions of equilibrium of floating bodies; determination of metacentric height (analytical method).

4.0 FLOW OF FLUID   **8**

Definition of hydro kinematics and hydrodynamics; types of fluid flow: steady and unsteady, uniform and non-uniform, laminar and turbulent; rate of flow and their units; continuity equation of flow; potential energy of a flowing liquid; total head; Bernoulli's theorem (statement and proof)

5.0 FLOW THROUGH PIPES   **10**

5.1 Definition of pipe flow, wetted perimeter, hydraulicmean depth, hydraulic gradient; loss of head due tofriction; Chezy's equation and Dancy's equation of head loss; Reynold's number and its effect on pipe friction; syphons;

5.2 Loss of head in pipes due to sudden enlargement, sudden contraction, obstruction on flow path, change of direction and pipe fittings.

6.0 OPEN CHANNEL FLOW   4

Definition of open channel; Chezy's formula; definition and classification of weirs; co-efficient of discharge; flow over rectangular weir and riangular weir (V-notch).

Identify a few cases of open channel flow in everyday life. Deduce formulae for flow over rectangular and triangular weir

Solve simple problems of open channel flow

7.0 FLOW MEASUREMENT   4

Working principle and use of venturimeter, orificemeter, pitot tube, rectangular weir and triangular weir (V-notch).

Draw and explain working principle of different flow measuring devices.

Total Hrs   45

8.0 FLUID MECHANICS LABORATORY

8.1   To determine specific gravity of different liquids (like kerosine, mobile oil, aqueous solution of HCL, water) by use of a hydrometer.   **3**

8.2   Measurement of Buoyancy   **3**

8.2.1 Prove Archimede's Principle by using a balance

8.2.2 Determine volume of an odd shaped object

8.3   Measurement of Pressure and Velocity   **6**

8.3.1 Calculate atmospheric pressure using a barometer

8.3.2 Show that pressure head of a liquid increases linearly with depth using (i) piezometric tube, (ii) double column manometer and (iii) differential manometer

8.3.3 Calibrate a pressure gauge by using different columns of water contained in a flexible PE tube

8.3.4 To determine the velocity distribution in a pipeline and calculate average velocity using a pilot tube.

8.4   Verify Bernouli's theorem   **3**

8.5   Determine Darcy's friction factor "f " in pipe flow from the formula h_f= f (L/D) V^2/2g   **3**

8.6   Find out the co-efficient of discharge for a   **6**
1. Rectangular notch
2. V-notch

8.7   Flow Measuring Devices   **6**

8.7.1 Find out the co-efficient of a venturimeter (i.e. calibrate a venturimeter)

8.7.2 Find out the value of the co-efficient of discharge for an orifice meter

Total Hrs   30

REFERENCE BOOKS:

1. Jagadish Lal : Fluid Mechanics and Hydraulics – Metropolitan Co. Pvt. Ltd.
2. A.K. Jain : Fluid Mechanics – Khanna Publishers
3. R. S. Khurmi : A Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines – S. Chand & Co. Ltd.
4. Gupta and Gupta: Fluid Mechanics and its Applications – New Age International (P) Ltd.
5. S. K. Likhi : Hydraulics Laboratory Manual   - New Age International (P) Ltd.
6. Modi & Seth   Hydraulics & Hydraulic Machines - Standard Book.
7. B. Majumdar   Fluid Mechanics with Laboratory Manual - PHI Learning Private Limited
8. Ramamartham   Fluid Mechanics & Hydraulic Machines – Dhanpat Rai.
9. R. K. Rajput: A Textbook of Hydraulics - S. Chand & Co. Ltd.

MANUFACTURING PROCESSES - I

L	T	P		Curri. Ref. No.: ME404
3	0	0		

Total Contact Hrs.:   **Total Marks: 150**

Theory: 45

Practical: 0

Theory Class Duration

45 Classes for 1hr.

60 Classes for 45 mins.

Pre-requisite: Nil

Credit : 3

Theory:

End Exam : 70

P.A.: 30

Practical:

End Exam.: 0

P.A. : 0

RATIONALE

Manufacturing is the backbone of any industrial nation. The level of manufacturing activity is directly related to the economic health of a country. Generally, the higher the level of manufacturing activity in a country, the higher is the standard of living of is people. Manufacturing is generally a complex activity, involving people who have a broad range of disciplines and skills and a wide variety of machinery, equipment, and tooling with various levels of automation, including computers, robots, and material handling equipment.

AIM:

To develop basic concepts of different manufacturing processes mechanical properties of metals and alloys, manufacturing iron and steel, carbon steels, alloy steels, non-ferrous alloys, and working principles of heat treatment of steels and castings.

DETAILED COURSE CONTENTS

THEORY:

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.
1.0 INTRODUCTION TO MANUFACTURING PROCESS Manufacturing processes, Functions of manufacturing process, Factors influencing in selection of manufacturing process, State the factors for selection of manufacturing processes.		1
2.0 MECHANICAL PROPERTIES OF METAL AND ALLOYS Importance of mechanical properties in manufacturing, Hardness, Toughness, Ductility, yield strength etc., define Hardness, Toughness, Ductility etc.		1
3.0 MANUFACTURING OF IRON AND STEEL Blast furnace operation, Production of Pig iron, Cast iron and wrought iron. Difference between Pig iron, Cast iron, Sequence of Blast furnace operation		1
4.0 CARBON STEELS Composition and their relative importance in manufacturing, composition of dead mild steel, low, medium high carbon steel and their respective properties, specific use of mold steel, medium carbon and high carbon steel, standard designation as per Indian Standard.		4
5.0 ALLOY STEELS Different kind of alloy steels and their elements and Impurities, Properties developed or influenced by alloying elements and effects of different alloying elements, specific use of alloy steels, methods of designating alloy steels.		3
6.0 ALLOY STEELS Common types of non-ferrous alloys: Muntz metal, Babbit metal, Phosphor Bronze, Gun metal, German Silver and Aluminum Bronze, Properties and uses of alloys. List some of the non-ferrous alloys, with their composite Identify the factor influences on the properties of alloys. Bearing metals: Composition and their desirable qualities, White metal, Copper bare alloys and aluminum alloys, Properties and their specific uses.		5

7.0 METALLURGY AND MANUFACTURING   **10**

  7.1 Introduction to Metallurgy. Definition, importance of Metallurgy in manufacturing. State the relevance of microstructure of metal in Manufacturing.

  7.2 Microstructure of Metals: Crystalline structure and grain formation, Pearlite, Ferrite, Cementite, Ledeburite and their specific properties. Micro structure of wrought Iron, Grey Cast Iron, Carbon Steels and White Cast Iron.

  7.3 Equilibrium diagram (E.D.) of alloys: Definition, Importance of E.D. in Manufacturing, The Iron carbon phase diagram, Phase diagrams for Eutectic journey Alloys, Phase diagram for Paratactic Transformation, Define phase diagram of an alloy, Explain the importance of phase diagram in manufacturing.

  7.4 Transformation of Austenite: Isothermal Cooling, Isothermal decomposition of Austenite, Define isothermal cooling, explains the importance of isothermal cooling in manufacturing.

8.0 HEAT TREATMENT OF STEEL   **10**

  8.1 Introduction
  Definition of heat treatment, Importance related to Manufacturing Examples of heat treated parts, Define Heat Treatment of Steel, Explain the important Heat Treatment Process In Manufacturing.

  8.2 Different heat treatment processes of carbon steel. Annealing: Types, Methods and specific use. Description of the process with the help of phase diagram.

  8.3 Different heat treatment processes of carbon steel: Normalizing: Methods and specific use. Description of the process with the help of phase diagram.
  Hardening: Methods and specific use. Description of the process with the help of phase diagram.
  Tempering: Methods and specific use. Description of the process with the help of phase diagram.

  8.4 Case hardening process: Carburising:- Principle, purpose and uses; Nitriding:-Principle, purpose and uses; Cyaniding:- Principle, purpose and uses

  8.5 Surface hardening processes
  Flame hardening- Principle, purpose and uses.
  Induction hardening - Principle, purpose and uses.
  State different types of surface hardening processes.
  Describe Flame Hardening, Induction Hardening with specific.

9.0 CASTING   **10**

  9.1 Specific use of casting.
  9.2 Melting of metal and types of furnaces
  9.3 Casting processes: Sand casting, Pressure Die Casting, Centrifugal casting etc.
  9.4 Fettling and Cleaning of Casting
  9.5 Defects in casting and their remedies
    9.5.1 Non Destructive Testing, Visual, Sound, Ultra Sound, X-ray, Magnetization, and Liquid penetration.
  9.6 Safety precautions required in casting

                                        Total Hrs   45

REFERENCE BOOKS:

1. R. K. Jain: Manufacturing Process.
2. L. Doyle: Manufacturing Process and Materials for Engineers.
3. H. V. Johnson: Manufacturing Process.
4. B. H. Amstead, Phillipe, F. Ostwald & Myron L. Begeman: Manufacturing Process – John Wiley & Sons.
5. J. S. Campbell: Principles of Manufacturing Materials and Processes - Tata McGraw – Hill Publishing Company.
6. George E. Dieter: Mechanical Metallurgy – McGraw - Hill International Book Company.
7. Donal S. Clark and Wilbur R. Varney: Physical Metallurgy for Engineers - Affiliated East – West Press Private Limited.
8. B. S. Raghuwanshi: A Course in Workshop Technology Vol. I and II- Dhanpat Rai & Sons.
9. John A. Schey: Introduction to Manufacturing Process - McGraw – Hill Book Company.
10. P. N. Rao: Manufacturing Technology: Foundry, Forming and Welding - Tata McGraw - Hill Publishing Company Limited.
11. Serope Kalpakjan: Manufacturing Engineering and Technology - Addison Wesley Publishing Company.

THEORY OF MACHINES

L	T	P
3	0	0

Curri. Ref. No.: ME406

Total Contact Hrs.:

Total Marks: 100

Theory:

Theory: 45
Practical: 0

End Exam : 70
P.A.: 30

Theory Class Duration

Practical:

45 Classes of 1Hr. or
60 Classes of 45 minutes

End Exam : 70
P.A.: 0

Pre-requisite:G206A

Credit : 3

RATIONALE:

Mechanical Engineering is primarily related with design, manufacture & use of various types of machines which receives input energy in some available form and convents it to do a particular kind of useful work at the output. Each machine consists of a large number of static parts and connected moving parts or subassemblies called mechanisms. There exist a large number of different kinds of mechanisms. Each of these mechanisms can generate a particular type of output motion with some other kind of input motion. Theory of Machines is basically study of such different types of mechanisms. Any machine utilizes one or many such mechanisms to obtain desired kind of motions in different parts of that machine. It is, therefore, necessary to study and understand functions of different types of mechanisms for design, manufacture and use of various machines.

AIM:

To study and understand different types of mechanisms with respect to their functions and applications, functional relationship between different components, relationship between the input and output motions and their design features.

DETAILED COURSE CONTENTS:

THEORY: 45 Hrs.

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.
1.0	**MECHANISM** Definition of machine, mechanism and kinematics; types of motions; link; kinematic pair; kinematic chain; inversion; four-bar linkage; slider crank mechanism; crank and slotted lever quick return mechanism.	**6**
2.0	**BELT, ROPE AND CHAIN DRIVE**	**9**
2.1	Flat belt & pulley drive; velocity ratio; effect of belt thickness and slip on velocity ratio; length of belt for open or crossed belt condition; power transmission by belt drive; belt material and safe strength; belt creep and tensioning; idler pulley; belts connecting non parallel shafts; applications.	
2.2	V-belts and pulleys–advantages and disadvantages; specification of a V- belt; applications.	
2.3	Use of wire-ropes; construction of wire ropes; sheaves; applications.	
2.4	Chain & sprocket drive; advantage and specific uses of chain drives; constructional features of roller chain and sprocket; simplex and duplex chain & sprocket; joining of chain links; applications.	
3.0	**GEAR DRIVE** Definition and function of gears; classifications of gears with respect to relative disposition of their axes (spur, helical, herringbone, rack & pinion, bevel, worm & wheel);leading terms and definitions pertaining to a gear tooth; velocity ratio and centre distance for simple or compound gear trains; epicyclic gear train; concept of gear box; selection of a gear box from manufacturers' catalogue; applications.	**12**

4.0 FLYWHEEL   **2**

Fluctuation of turning moment and energy of a prime-mover; function of a flywheel; calculation of size of a flywheel; simple problems; hoop stress in a rotating flywheel.

Fluctuation of turning moment and energy of a prime-mover; function of a flywheel; calculation of size of a flywheel; simple problems; hoop stress in a rotating flywheel.

5.0 BALANCING   **3**

Effect of imbalance in a rotary shaft; static balancing and dynamic balancing; balancing of one or several revolving masses in a shaft.

6.0 CAMS   **6**

Types of cams and cam followers; time displacement diagram for follower motion; drawing a rotating cam profile from a given displacement diagram for knife-edge, flat and roller type follower; applications.

7.0 BRAKES, CLUTCHES AND DYNAMOMETER   **7**

7.1 Functions of brakes; types–block or shoe, band; calculation of braking torque; simple problems; brake shoe materials; applications.

7.2 Function of clutches; types – friction (plate, conical), toothed; estimation of friction torque (formula only no derivation); applications.

7.3 Function of dynamometers; absorption dynamometers pony brake & rope brake type

Total Hrs.   45

REFERENCE BOOKS:

1. The Theory of Machines – Thomas Bevan: CBS Publishers & Distributors
2. Theory of Machines – A. Shariff and N. A. Shariff : Dhanpat Rai & Sons
3. Theory of Mechanisms & Machines –Dr. Jagdish Lal: Metropolitan Book Co. Pvt. Ltd.
4. Theory of Machines –P. L. Ballany: Khanna Publishers.
5. Design of Machinery - R.L.Norton: Tata McGraw Hill.
6. Theory of Machines and Mechanisms- John J. Vicker Jr, Gordon R. Pennock, Joseph E. Shigley: Oxford Press.
7. Theory of Machines –S.S.Rattan: Tata McGraw Hill
8. Mechanism and Machine Theory –J. S. Rao, R. V. Dukkipatti: New Age International Publishers.
9. A Textbook of Theory of Machines – Dr. R. K. Bansal: Laxmi Publishers (P) Ltd., New Delhi.
10. Theory of Machines – R. S. Khurmi and J. K. Gupta: Eurasia Publishing House Pvt. Ltd.
11. Theory of Machines and Mechanisms – John J. Uicker Jr, Gordon R. Pennock and Joseph E. Shigley: Oxford Press.

APPLIED MATHEMATICS

L   T   P   Curri. Ref. No.: G105
         3   0   0

Total Contact Hrs.:   **Total Marks: 125**   **Theory:**
Theory/Lecture: 45   End Exam : 70
  Tutorial: 0   P.A.: 30
  Practical: 0   **Practical:**
  Pre-requisite: P.A. : 0
                    Credit : 3

DETAIL COURSE CONTENT

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.

1.0   NUMERICAL ANALYSIS   **13**

   1.1   Interpolation.

    (i)   Introduction to interpolation.

    (ii)   Lagrange's interpolation formula.

    (iii)   The operators   ,   and   .Relation between them.

    (iv)   Difference Table.

    (v)   Newton's forward and backward interpolation formula.

        (vi)   Concept of extrapolation.

2.0   Differential Equations (ordinary   **12**

   (i)   Introduction.

   (ii)   Order and degree of a differential equation.

   (iii)   Formation of Differential Equations.

   (iv)   Solution of a Differential Equation.

   (v)   Differential equation of the first order and first degree.

   (vi)   Variables separable.

   (vii) Homogeneous Differential Equations.

   (viii) Linear Differential Equations.

   (ix)   Exact differential Equations.

3.0   Graph Theory   **15**

   1)   Introduction.

   2)   Basic Terminology.

   3)   Simple Graph, Multigraph and Pseudo graph.

   4)   Degree of a Vertex.

   5)   Types of Graphs.

   6)   Subgraphs and Isomorphic Graphs.

   7)   Operations of Graphs.

4.0   Discrete Mathematics   **5**

   4.1   The principle of Inclusion and Exclusion with examples.

   4.2   Generating Functions.

    (i)   Introductory examples.

    (ii)   Definition and examples of Calculation Techniques.

TOTAL: 45

SUGGESTED LEARNING RESOURCES:
Reference Books :

(1)   Integral Calculus by B.C.Das and B.N.Mukherjee.
(2)   Diploma Engineering Mathematics (Volume-II) by B.K.Pal.
(3)   Applied Mathematics-I by Dr.J.S.Bindra and K.S.Gill.
(4)   Applied Mathematics-II by Dr.J.S.Bindra and K.S.Gill.
(5)   Applied Mathematics-III by Dr.J.S.Bindra.
(6)   Engineering Mathematics (Volume-I, Volume-II & Volume-III) By S.Arumugam, A.Thangapandi Issac and A.Somsundaram.
(7)   Discrete and Combinatorial Mathematics by Ralph P.Grimaldi.
(8)   A TEXT BOOK OF DISCRETE MATHEMATICS by Swapan Kumar Sarkar.
(9)   Mathematics for Polytechnic by S.P.Deshpande.
(10)   Higher Engineering Mathematics by B.S.Grewal.
(11)   Introductory Method of Numerical Analysis by S.S.Sastry.
(12)   Calculus of Finite Difference and Numerical Analysis by Gupta-Malik.

ENGINEERING ECONOMICS & ACCOUNTANCY

L	T	P
3	0	0

Curri. Ref. No.: G303

Total Contact Hrs.: **Total Marks: 100**

Theory: 45

Theory Class Duration

45 classes of 1hr. or

60 classes of 45 mins.

Prerequisite: G103, G104

Credit: 3

Theory:

End Exam : 70

P.A.: 30

Practical:

End Exam.: 0

 P.A. : 0

RATIONALE/AIM:

The knowledge of Economics and Accountancy is needed by personal dealing with the cost of products of any kind related to quality and standards of production including its financial control. Engineers in general need to know the cost of the final products for marketing purposes. The knowledge of Economics as well as Accountancy is required by all people dealing in any business or enterprises.

This particular subject deals with the Basic Concepts of Economics, Factors of Production, Types of Industries, Market forms, Need of Economics Planning for overall development, Concept of Money, Unemployment causes and measures, Industrial Policy, Public Finance, Business Transactions and Accountancy, Maintenance of Cash and balances, Receipts and Expenditures Accounts, Final Accounts and Cost Concepts.

COURSE OUTCOME:

After completion of the course, the students will be able to:

1. Define basic terminologies of economics.
2. Identify factors of production.
3. Define different scales of industries.
4. Distinguish different Market Forms.
5. Distribute Expenditure (Capital & Revenue)
6. Do the cost analysis with appropriate classifications of cost accounts.
7. Apply the concept of Trial balance & final accounts.
8. Define basic features of economy of money.
9. Understand industrial policy with appropriate acts.
10. Apply different concept of business transactions and accountancy.

DETAIL COURSE CONTENTS: THEORY:

UNIT	TOPIC/SUB-TOPIC	Total hrs.
1	**INTRODUCTION:** Introduction to Economics and its Utility of Study Importance of the study of economics.	1
2	**BASIC CONCEPTS OF ECONOMICS:** Definition of Goods, Utility, Value, Price, Income, Capital Classification of Goods, Human Wants-Classification and Types-Relation between Wealth and Capital. Consumer Behaviour: Basic Law of Demands and Supply Concepts and measurement of elasticity of demand	3
3	**PRODUCTION:** Meaning and Factors of Production Land, Labour, Capital and Organisation – meaning and Characteristics Formation of Capital, Break Even Analysis, Break Even Chart its uses.	3
4	**SCALE OF INDUSTRIES:** Meaning of Small, Medium and Large Scale production Advantages and Disadvantages of Small Scale and Large Scale Production	2
5	**MARKET FORMS:** Meaning of Market-Forms of Market Features of Perfect, Imperfect and Monopoly Price Determination under Perfect Competition and Monopoly	3
6	**ECONOMIC PLANNING:** Basic features of underdeveloped Economy – Basic features of Indian Economy. Meaning, Objectives and Needs of Planning Current Five Year Plan	2
7	**MONEY:** Meaning and Function of Money Introduction to the concepts of the value of Money	2
8	**UNEMPLOYMENT:** Meaning, types and causes of Unemployment in India. Unemployment problems in India-Measures taken by the Government of India.	2 `

9	**INDUSTRIAL POLICY:**	**3**

9 INDUSTRIAL POLICY: **3**
Current Industrial Policy.
Monopoly Restricted Trade Practices Act (MRTP), Foreign Exchange
Management Act (FEMA), Competitions Act

10 PUBLIC FINANCE: **2**
Meaning of Public Finance-Distinction Between Public and Private
Finance. Sources of Public Revenue.

11 BUSINESS TRANSCTIONS AND ACCOUNTANCY: **5**
Transactions and classifications, need and objectives of proper records
including double entry system.
Classification of accounts and its description (in respect of real
accounts, personal accounts and nominal accounts)
Debit and credit concepts: Golden rules of Debit and Credit.
Objectives and Principals of Double Entry System of Book Keeping.

12 BOOKS OF ACCOUNTS: **2**
Journal and Ledger, their subdivisions; posting from journals to
ledger. Balancing of Accounts

13 CASH BOOK: **2**
Objectives of Cash Book (in respect of all kinds of Cash
Transactions). Single Column, Double Column and Triple Column
Impress System of Petty Cash Book.

14 TRIAL BALANCE: **2**
Objectives, Preparation – Errors and Rectification
(In respect of Balance of Accounts for the Total period)

15 FINAL ACCOUNTS: **5**
Steps of preparing accounts: Trading Accounts, Profit and Loss
Accounts. Revenue and Depreciation Adjustment.
Introduction to Balance Sheet

16 CAPITAL AND REVENUE EXPENDITURE DISTRIBUTION: **3**
Receipt and Payments
Income and Expenditure differences

17 MEANIING AND PURPOSE OF COSTING: **3**
Element of Cost Analysis and Classification of expenditure for Cost
Accounts.
Cost Control: Prime Cost, Overhead Cost and Indirect Material and
Tools.

                                                    TOTAL HRS: 45

TEXT / REFERENCE BOOKS:

1. Elements of Economics – K.K. Dewett & J.D. Verma
2. An Introduction to Economics Theory – H.L.Ahuja
3. Double Entry Book Keeping – Mohan, Juneja, Chawla & Saxena
4. Double Entry System of Book Keeping – J.R. Batliboy

<div align="center">**MECHANICAL DRAWING**</div>

L	T	P		Curri. Ref. No.: ME407
0	0	4		

Total Contact Hrs.:	**Total Marks: 50**	**Theory:**
Theory: 0		End Exam : 0
Practical: 60		P.A.: 0
Prerequisite: Nil		**Practical:**
		End Exam.: 25
Credit: 2		P.A. : 25

RATIONALE:
For learning and practicing mechanical engineering use of mechanical drawing is most essential. With the advent of computers, knowledge of Computer-Aided Drawing making has become a must in industries. Thus knowledge and practice of mechanical engineering in the CAD environment is a must for a mechanical engineer.

AIM:
Students will be able to understand and produce drawings of various mechanical components and devices and should be conversant with CAD operation.

DETAILED COURSE CONTENT:

UNIT	TOPIC/SUB-TOPIC	Contact Hrs.
1.0	**INTRODUCTION**	**3**
	1.1 **Specification of Standard Mechanical Components**	

    (a) Washers – plain washers (IS : 2016-1967)
    (b)Keys – Taper keys and key ways (IS : 2292-1974)
    (c)Splines (IS : 2327)
    (d) Miscellaneous pins – cylindrical pins (IS : 2393-1980)taper pins
(IS : 6688 – 1972)
    (e)Rivets (IS : 2155)

    (f)Oil Seals – rotary shaft oil seals (IS : 5129), O-rings

    (g)Ball bearings
Select a standard machine component from IS codes or design hand books to use in machine drawing

1.2 **Limits, Tolerances and Fits (IS : 919 Part I and II)**
    i) Limit system – Tolerance, limits, deviation, allowance, basic size, design
    ii) Tolerances– Fundamental tolerances, fundamental deviation, method of placing limit dimension.
    iii) Fits – Clearance fit, transition fit, interference fit, hole basis system, shaft basis system, tolerance grades
Calculate the values of clearance/interference, hole tolerance and shaft tolerance with given basic size for common assemblies like H7 / g6, H7/m6, H8 / u7.

1.3 **Surface Roughness**
    a) Introduction– actual profile, reference profile, datum profile, mean profile, peak-to-valley height, mean roughness index, surface roughness number
    b) Use of machining symbols in production drawings
    c) Indication of surface roughness
Indication of special surface roughness characteristics, indication of machining allowance, indication of surface roughness, Symbols on drawings, method of indicating surface roughness on a given component.

2.0 ISOMETRIC DRAWINGS OF MACHINE PARTS   **4**
    2.1 Nut, bolt, V-block, Corner block, Stop block, C-clamp, Hook's joint, Pulley, Bracket in a machine, shaft and any machine component.

3.0 ASSEMBLY DRAWING AND DETAILED DRAWING OF MACHINES   **10**
    (i) I.C. Engine piston, petrol engine connecting rod.
    (ii) Revolving centre, square tool post
    (iii)Hydraulic cylinder
    (iv) Crane hook
    (v) Spindle assembly
Prepare the assembly drawing and the part drawings providing necessary tolerances, fits, between mating parts and surface finishes.

4.0 KEYS AND COTTERS   **2**

    4.1 Keys and Splines

    4.2 Cotter joint, kunckle joint, Universal joint (with local section, if necessary) of the assembly of above joints.

5.0 SHAFT COUPLING   **6**

    5.1 Rigid coupling, Flange Coupling, and Muff Coupling

    5.2 Non-rigid or Flexible coupling: Pin-bush coupling, Universal Coupling or Hooke's joint

6.0 BEARINGS (ANY ONE)   **4**

    6.1 Foot step bearing, bracket

    6.2 Ball bearing mounted on a shaft

7.0 STRUCTURALDRAWING   **7**

    7.1 Drawings of riveted structure with the following types of riveted points: single riveted, double riveted (chain, Zig-gag), lap joint and butt joint.

    7.2 Drawing of welded structures with following types of welds and their symbols

    -fillet, square butt, single V butt, double V butt, single U- butt, double U-butt, single level butt, double level butt, single J-butt, double J-butt, stud, bead, sealing run, plug or slot, backing strip, spot, seam, meshed seam, stitch, meshed stitch, projection, flash, belt resistance.

8.0 COMPUTER AIDED DRAFTING   **24**

  Use of AutoCAD or any other drafting package to make simple engineering drawings. The use of commands will enable the student to do the following activities.

  (i) Making of simple drawing

  (ii) Editing of existing drawing

  (iii) Dimensioning, drawing section lines and hatched sections.

  (iv) Writing text on drawings

  (v) Display of drawings

  (vi) Making different settings of drawings related to co-ordinate system.

REFERENCE BOOKS AND STANDARDS

1. BOOKS:

1. Thomas E. French, Charles J. Vireck, Robert J. Foster : Engineering Drawing and Graphic Technology – Mc Graw Hill Inc.
2. Gerard G. S. Volland : Modern Engineering Graphic & Design - CBS Publishers & Distributors.
3. M. Bhattacharyya and S. Pal : Fundamentals of Engineering Drawing - CBS Publishers & Distributors, Delhi.
4. Subrata Pal and Madhusudan Bhattacharyya : Mechanical Engineering Drawing – Arnold Associates, Calcutta.
5. K. L. Narayana, P. Kannaiah, K. Venkata Reddy : Production Drawing - New Age International (P) Ltd., Publishers, New Delhi – 110 002.
6. R. B. Gupta : A Textbook of Engineering Drawing – Satya Prakashan, New Delhi – 110 005.
7. R. B. Gupta : A Textbook of Machine Drawing– Satya Prakashan, New Delhi – 110 005.
8. N. D. Bhatt and V. M. Panchal : Engineering Drawing – Charotar Publishing House, Anand, Gujrat.
9. V. Lakshminarayan, M. L. Mathur and R. S. Vaishwanar : Machine Drawing – Jain Brothers.
10. N. D. Bhatt : Machine Drawing – Charotar Book Stall
11. R. K. Dhawan : A Text Book of Machine Drawing – S. Chand & Company Ltd.
12. K.L.Narayana, P.Kannaiah and K.Venkata Reddy: Machine Drawing- New Age International Publishers.
13. K.L.Narayana and P. Kannaiah: Engineering Graphics – Scitech Publications (India) Pvt.Ltd. International Publishers.

2. STANDARDS:

1. IS : 4897 – 1986 Bureau of Indian Standards.
2. IS : 919 (Part I & II) : 1993 Bureau of Indian Standards.
3. IS : 1364 – 1967   Bureau of Indian Standards
4. IS : 3640 - 167   Bureau of Indian Standards
5. IS : 2585 – 1963   Bureau of Indian Standards
5. IS : 2269 – 1967   Bureau of Indian Standards
6. IS : 1365 – 1968   Bureau of Indian Standards
7. IS : 1366 – 1968   Bureau of Indian Standards
8. IS : 1862 – 1975   Bureau of Indian Standards
9. IS : 2232 – 1967   Bureau of Indian Standards
10. IS : 2016 – 1967   Bureau of Indian Standards
11. IS : 2292 – 1974   Bureau of Indian Standards
12. IS : 2327 - 1993   Bureau of Indian Standards
13. IS : 2393 – 1980   Bureau of Indian Standards
14. IS : 6688 – 1972   Bureau of Indian Standards
15. IS : 2155 - 1982   Bureau of Indian Standards
14. IS : 5129 - 1987   Bureau of Indian Standards
15. IS: 919 (Part I and II) Bureau of Indian Standards
16. IS: 813 – 1961   Bureau of Indian Standards.

WORKSHOP PRACTICE - III

L	T	P
0	0	3

Curri. Ref. No.: ME513

Total Contact Hrs.:   **Total Marks: 50**   **Theory:**
Theory: 0   End Exam : 0
Practical: 45   P.A.: 0
Prerequisite: Nil   **Practical:**
                                                      End Exam.: 0
Credit: 2   P.A. : 50

RATIONALE:

To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

AIM:

Student will be able to:
- Acquire information from different sources
- Prepare notes for given topic
- Present given topic in a seminar
- Interact with peers to share thoughts
- Prepare a report on industrial visit, expert lecture

Contents	Activities	Hrs.

1. INDUSTRIAL VISITS   12

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

i. Machine shop having CNC machines.
ii. ST workshop / Auto service station
iii. City water supply pumping station
iv. Manufacturing unit to observe finishing and super finishing processes.

2. **LECTURES BY PROFESSIONAL / INDUSTRIAL EXPERT LECTURES TO BE ORGANIZED FROM ANY TWO OF THE FOLLOWING AREAS:** 10
   1) Interview Techniques.
   2) Modern Boilers - Provisions in IBR
   3) Applications of Sensors and Transducers
   4) Alternate fuels - CNG / LPG, Biodiesel, Ethanol, hydrogen
   5) Piping technology

3. **INFORMATION SEARCH:** 10
   Information search can be done through manufacturer's catalogue, websites, magazines, books etc. and submit a report any one topic.
   Following topics are suggested:
   i. Engine lubricants & additives
   ii. Automotive gaskets and sealants
   iii. Engine coolants and additives
   iv. Two and Four wheeler carburetor.
   v. Power steering
   vi. Filters
   vii. Different drives/Transmission systems in two wheelers.
   viii. Types of bearings - applications and suppliers.
   ix. Heat Exchangers
   x. Maintenance procedure for solar equipment.
   xi. Tools holder on general purpose machines and drilling machines.

4. **SEMINAR:** 13
   Seminar topic shall be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time - 10 minutes)
   Mini Project / Activities: (any one)
   a) Prepare one model out of card board paper/ acrylic/ wood / thermocol/ metal such as: i) Elliptical Trammel ii) Pantograph iii) Coupling iv) Cams and Followers v) Geneva mechanism
   b) Dismantling of assembly (e.g. jig / fixtures, tool post, valves etc.) Take measurement and prepare drawings / sketches of different parts.
   c) Make a small decorative water fountain unit.
   d) Toy making with simple operating mechanisms.

DEVELOPMENT OF LIFE SKILL - II

L	T	P		Curri. Ref. No.: G302
1	0	3		

Total Contact Hrs.:	**Total Marks: 50**	**Theory:**
Theory: 15		End Exam : 0
Tutorial: 0		P.A. : 0
Practical: 30		**Practical:50**
Pre-requisite:		End Term Exam:0
Credit : 3		P.A.:50

Aim:-This subject is kept to
- Conduct different session to develop students interpersonal skills
- Conduct different session to improve problem solving skills
- Conduct different session to improve communication and presentation skills

Objective: - This course will enable the students to:
- Develop interpersonal skill
- Develop problem solving skill.
- Develop presentation skill
- Enhance creativity skills.
- Develop communication skills.
- Prepare for interviews

DETAIL COURSE CONTENT

THEORY:

UNIT TOPIC / SUB-TOPIC	Lecture Hrs.
1. INTER-PERSONAL RELATION Importance, Interpersonal conflicts, Resolution of conflicts, Developing effective interpersonal skills communication and conversational skills, Human Relation Skills (People Skills).	**1**

2 PROBLEM SOLVING
 I) Steps in Problem Solving (Who? What? Where? When? Why? How? How much?)
    1. Identify, understand and clarify the problem
    2. Information gathering related to problem
    3. Evaluate the evidence
    4. Consider feasible options and their implications
	2

5. Choose and implement the best alternative
6. Review

    II) Problem Solving Technique
      1. Trial and Error
      2. Brain Storming
      3. Thinking outside the Box

3. PRESENTATION SKILLS   4

Concept, Purpose of effective presentations.

Components of Effective Presentations:
Understanding the topic, selecting the right information, organizing the process interestingly, Good attractive beginning, Summarising and concluding, adding impact to the ending.

Use of audio visual aids OHP, LCD projector, White board.

Non verbal communication:
Posture, Gestures, Eye contact and facial expression, Voice and Language Volume, pitch, Inflection, Speed, Pause, Pronunciation, Articulation, Language, Handling questions Respond, Answer, Check, Encourage, Return to presentation.

Evaluating the presentation:
Before the presentation, During the presentation, After the presentation.

4. LOOKING FOR A JOB   2
Identifying different sources announcing Job vacancies, Skim, scan and read advertisements in detail, write efficacious CVs, write covering letters to a company CVs, write Job Application Letters in response to advertisements and self-applications

5. JOB INTERVIEWS   4

Prepare for Interviews:
Intelligently anticipating possible questions and framing appropriate answers, Do's and don'ts of an interview(both verbal and non verbal).

Group Discussion:
Use of Non verbal behavior in Group Discussion,
Appropriate use of language in group interaction,
Do's and don'ts for a successful Group Discussion.

6. NON VERBAL GRAPHIC COMMUNICATION   1

Nonverbal codes:
A. Kinesics.   B. Proxemics.   C. Haptics.   D. Vocalics.
E. Physical appearance,   F. Chronemics,.
  G. Artifacts Aspects of Body Language

7. FORMAL WRITTEN SKILLS   1

Memos, Emails, Netiquettes, Business correspondence Letter of enquiry, Letter of Placing Orders, Letter of Complaint.

                                  TOTAL: 15

PRACTICAL   **30 Hrs.**

Unit 1 Inter-personal Relationship   **2**
    Case Studies:
    1. From books.
    2. From real life situations.
    3. From students' experiences.
    Group discussions on the above and step by step write of any one or more of these in the sessional copies.

Unit 2 Problem Solving   **4**
    Case Studies:
    1. From books
    2. From real life situations
    3. From students' experiences
    Group discussions on the above and step by step write of any one or more of these in the sessional copies.

Unit 3 Presentation Skills   **8**
Prepare a Presentation (with the help of a Power point) on a Particular topic. The students may refer to the Sessional activity (sl.No.8) of the Computer Fundamental syllabus of Semester1. For engineering subject oriented technical topics the cooperation of a subject teacher may be sought. Attach hand out of PPT in the sessional copy.

Unit 4 Looking for a job   **4**
Write an effective CV and covering letter for it.
Write a Job Application letter in response to an advertisement and a Self-Application Letter for a job.

Unit 5 Job Interviews & Group Discussions   **8**
Write down the anticipated possible questions for personal interview (HR) along with their appropriate responses. Face mock interviews. The cooperation of HR personnels of industries may be sought if possible. Videos of Mock Group Discussions and Interviews may be shown.

Unit 7 Formal Written Skills   **4**
Write a memo, Write an effective official e-mail, write a letter of enquiry, letter of placing orders, and letter of complaint.

PROFFESIONAL PRACTICE - II

L   T   P   Curri. Ref. No.: ME512
0   0   2

Total Contact Hrs.: 30   Total Marks: 50   Practical:
Credit : 1   P.A. : 50

RATIONALE:
To develop general confidence, ability to communicate and attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.

AIM:
Student will be able to:
1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

DETAIL COURSE CONTENT

Contents	Activities	Hrs.

1: INDUSTRIAL VISITS   6
Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. **Two** Industrial visits may be arranged in the following areas / industries:

i. Manufacturing organizations for observing various manufacturing processes including heat treatment
ii. Material testing laboratories in industries or reputed organizations
iii. Auto workshop / Garage
iv. Plastic material processing unit
v. Sate Transport workshop / City transport workshop

2:   LECTURES BY PROFESSIONAL / INDUSTRIAL EXPERT   6
To be organized from ANY THREE of the following areas:
i. Use of plastics in automobiles.
ii. Nonferrous Metals and alloys for engineering applications

iii. Surface Treatment Processes like electroplating, powder coating etc.
iv. Selection of electric motors.
v. Computer aided drafting.
vi. Industrial hygiene.
vii. Composite Materials.
viii. Heat treatment processes.
ix. Ceramics
x. Safety Engineering and Waste elimination

3:   INDIVIDUAL ASSIGNMENTS: 6
Any two from the list suggested
a) Process sequence of any two machine components.
b) Write material specifications for any two composite jobs.
c) Collection of samples of different plastic material or cutting tools with properties, specifications and applications.
d) Preparing models using development of surfaces.
e) Assignments on bending moment, sheer forces, deflection of beams and torsion chapters of strength of material.
f) Select different materials with specifications for at least 10 different machine components and list the important material properties desirable.
g) Select 5 different carbon steels and alloy steels used in mechanical engineering applications and specify heat treatment processes employed for improving the properties. Also give brief description of the heat treatment processes.
h) List the various properties and applications of following materials - i. Ceramics ii. Fiber reinforcement plastics iii. Thermo plastic plastics iv. Thermo setting plastics v. Rubbers.

OR Conduct ANY ONE of the following activities through active participation of students and write report.
i. Rally for energy conservation / tree plantation.
ii. Survey for local social problems such as mal nutrition, unemployment, cleanliness, illiteracy etc.
iii. Conduct aptitude , general knowledge test , IQ test
iv. Arrange any one training in the following areas :
A) Yoga.   B) Use of firefighting equipment and First aid.
v. Maintenance of Domestic appliances.

4. **MODULAR COURSES (OPTIONAL):** 6

A course module should be designed in the following areas for max. 12hrs. Batch size - min. 15 students. Course may be organized internally or with the help of external organizations.
a) Forging Technology.
b) CAD-CAM related software.
c) Welding techniques.
d) Personality development.
e) Entrepreneurship development.

5. **3-D DESIGN USING SOFTWARE** 6

Computer screen, coordinate system and planes, definition of HP,VP, reference planes How to create them in 2nd/3rd environment. Selection of drawing site & scale. Commands of creation of Line, coordinate points, Axis, Poly lines, square, rectangle, polygon, sp line, circles, ellipse, text, move, copy, offset, Mirror, Rotate, Trison, Extend, Break, Chamfer, Fillet,Curves, Constraints fit tangency, perpendicularity, dimensioning Line convention, material conventions and lettering.

The Student should draw - different orthographic Views (including sections), Auxiliary views according to first/ Third angle method of projection. (Minimum two sheets, each containing two problems) after learning the contents as above.

Sample path for Term III in Mechanical Engineering.

Sl. No	Code	Course	Study Scheme				Evaluation Scheme								Total Marks	Credit
			Pre-requisite	Contact Hours / Week			Theory				Practical					
				L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment				
								Class Test	Assign ment	Atten dance		Sessi onal	Viva voce			
1	ME401	Thermal Engineering	NIL	3	0	0	70	15	10	5	0	0	0	100	3
2	ME403	Fluid Mechanics	G201 G201	3	0	2	70	15	10	5	25	25	0	150	4
3	ME404	Manufacturing Process-I	NIL	3	0	0	70	15	10	5	0	0	0	100	3
4	ME406	Theory of Machines	NIL	3	0	0	70	15	10	5	0	0	0	100	3
5	G105	Applied Mathematics	G103 G104	3	1	0	70	15	10	5	0	0	0	100	4
6	G303	Engineering Economics & Accountancy	NIL	3	0	0	70	15	10	5	0	0	0	100	3
7	ME407	Mechanical Drawing	NIL	0	0	4	0	0	0	0	25	25	0	50	2
8	G302	Development of Life Skill-Ii	NIL	1	0	2	0	0	0	0	0	25	25	50	2
9	CE513	Professional Practices – II		0	0	2	0	0	0	0	0	50	0	50	1
TOTAL				**19**	**1**	**14**	**420**	**90**	**60**	**30**	**50**	**150**	**50**	**850**	**27**