

## III YEAR I SEMESTER

## COURSE STRUCTURE

Code	Subject	L	T/P/D	C
55015	Managerial Economics and Financial Analysis	4	0	4
55016	Metrology & Surface Engineering	3	1	3
55017	Dynamics of Machinery	4	1	4
55018	Machine Tools	3	1	3
55019	Design of Machine Members – I	4	1	4
55020	Applied Thermodynamics -II	3	1	3
55604	Machine Tools & Metrology Lab	0	3	2
55605	Thermal Engineering Lab	0	3	2
	Total	21	11	25

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. ME - I Sem	L	T/P/D	C
	4	-/-	4

**(55015) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS****Unit I**

**Introduction to Managerial Economics:** Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

**Unit II Elasticity of Demand:** Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

**Unit III**

**Theory of Production and Cost Analysis:** Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

**Cost Analysis:** Cost concepts, Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs, Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)- Managerial Significance and limitations of BEA.

**Unit IV****Introduction to Markets & Pricing Policies:**

**Market structures:** Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.

**Objectives and Policies of Pricing- Methods of Pricing:** Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

**Unit V**

**Business & New Economic Environment:** Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

**Unit VI**

**Capital and Capital Budgeting:** Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.

Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

**Unit VII**

**Introduction to Financial Accounting:** Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

**Unit VIII**

**Financial Analysis through ratios:** Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Profit Ratio, P/E Ratio and EPS).

**TEXT BOOKS:**

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.

**REFERENCES:**

1. Raghunatha Reddy & Narasimhachary: Managerial Economics & Financial Analysis, Scitech, 2009.
2. V.Rajasekarn & R.Lalitha, Financial Accounting, Pearson Education, New Delhi, 2010.
3. Suma Damodaran, Managerial Economics, Oxford University Press, 2009.
4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Cengage, 2009.
5. Subhash Sharma & M P Vittal, Financial Accounting for Management, Text & Cases, Machmillan, 2008.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2008.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2009.
8. Dwivedi: Managerial Economics, Vikas, 2009.

9. M.Kasi Reddy, S.Saraswathi: Managerial Economics and Financial Accounting, PHI, 2007.
10. Erich A. Helfert: Techniques of Financial Analysis, Jaico, 2007.

**Prerequisites:** Nil

**Objective:** To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making.

**Codes/Tables:** Present Value Tables need to be permitted into the examinations Hall.

**Question Paper Pattern:** 5 Questions to be answered out of 8 questions. Out of eight questions 4 questions will be theory questions and 4 questions should be problems.

Each question should not have more than 3 bits.

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**(55016) METROLOGY AND SURFACE ENGINEERING**

**UNIT – I**

**SYSTEMS OF LIMITS AND FITS:** Introduction, normal size, tolerance limits, deviations, allowance, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly. Indian standard Institution system – British standard system, International Standard system for plain and screwed work.

**UNIT – II**

**LINEAR MEASUREMENT:** Length standard, line and end standard, slip gauges – calibration of the slip gauges, Dial indicator, micrometers.

**MEASUREMENT OF ANGLES AND TAPERS:** Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate, rollers and spheres used to determine the tapers.

**LIMIT GAUGES :** Taylors principle – Design of go and No go gauges, plug ring, snap, gap, taper, profile and position gauges.

**UNIT – III**

**OPTICAL MEASURING INSTRUMENTS:** Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses, Interferometer.

**FLAT SURFACE MEASUREMENT :** Measurement of flat surfaces – Instruments used – straight edges – surface plates – optical flat and auto collimator.

**UNIT – IV**

**SURFACE ROUGHNESS MEASUREMENT:** Differences between surface roughness and surface waviness-Numerical assessment of surface finish – CLA,R, R.M.S Values – Rz values, Rz value, Methods of measurement of surface finish-profilograph. Talysurf, ISI symbols for Indication of surface finish.

**UNIT-V**

**MEASUREMENT THROUGH COMPARATORS:** Comparators – Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

**UNIT-VI**

**SCREW THREAD MEASUREMENT :** Element of measurement – errors in

screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

#### UNIT-VII

**SURFACE ENGINEERING:** Surface texture and properties, Surface cleaning techniques, Surface integrity, Wear and its measurements, Lubricants and its selection for reducing wear, Principles of corrosion and remedial measures, Laser applications for surface modifications.

#### UNIT-VIII

**SURFACE TREATMENTS :** Mechanical surface treatment and coating, casehardening and surface coating, thermal spraying, Vapour deposition, Ion implantation, Diffusion coating, Electro plating, Electroless plating and Electro forming, Ceramic, Organic and Diamond coating

#### TEXT BOOKS :

1. Manufacturing Engineering and Technology, Serope Kalpakjian and Steven R. Schmid, Ed. 4, Pearson Publications, 2001
2. Metrology and Measurement, Anand Bewoor, Vinay A. Kulkarni, TMH, 2009
3. Principles of Engineering Metrology, R. Rahendra, JAICO Publications, 2008

#### REFERENCES :

1. Fundamentals of Dimensional Metrology, 4e , Connie Dotson, Thomson, 2003
2. Surface Engineering with Lasers/ Dehosson J.T.
3. Surface Engineering for corrosion and wear resistance / JR Davis/ Woodhead Publishers.
4. Precision Engineering and Manufacturing/ R.L Murty/ Newage Publications, 2009

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#### (55017) DYNAMICS OF MACHINERY

#### UNIT – I

**PRECESSION :** Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aero planes and ships.

#### UNIT – II

**STATIC AND DYNAMIC FORCE ANALYSIS OF PLANAR MECHANISMS:** Introduction – Free Body Diagrams – Conditions for equilibrium – Two, three and four force Members – Inertia forces and D' Alembert's Principle – planar rotation about a fixed center.

#### UNIT – III

**SYNTHESIS OF LINKAGES:** Three position synthesis – Four Position Synthesis – Precision positions – structural error – Chebychev's spacing, Freudentein's Equation, Problems.

#### UNIT – IV

**CLUTCHES:** Friction clutches- Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.

**BRAKES AND DYNAMOMETERS :** Simple block brakes, internal expanding brake, band brake of vehicle. Dynamometers – absorption and transmission types. General description and methods of operations.

#### UNIT – V

**TURNING MOMENT DIAGRAM AND FLY WHEELS :** Turning moment – Inertia Torque connecting rod angular velocity and acceleration, crank effort and torque diagrams – Fluctuation of energy – Fly wheels and their design.

#### UNIT-VI

**GOVERNERS :** Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung with auxiliary springs. Sensitiveness, isochronism and hunting.

#### UNIT – VII

**BALANCING :** Balancing of rotating masses Single and multiple – single and different planes. Balancing of Reciprocating Masses: Primary and Secondary balancing of reciprocating masses. Analytical and graphical methods -. Unbalanced forces and couples – Balancing of "V", multi

cylinder in line and radial engines for primary and secondary balancing, locomotive balancing.

#### UNIT – VIII

**VIBRATION :** Free Vibration of mass attached to vertical spring – Simple problems on forced damped vibration Vibration Isolation & Transmissibility- Whirling of shafts, critical speeds, torsional vibrations, two and three rotor systems.

#### TEXT BOOKS :

1. Theory of Machines by T.Beven, Pearson Education
2. Theory of Machines by SS Ratan, Mc Graw Hill

#### REFERENCES :

1. Theory of Machines and Mechanisms by P.L.Ballaney, Khanna Publishers
2. Kinematics and Dynamics of Machinery by R.L.Norton, Mc Graw - Hill
3. Mechanism and Machine Theory / JS Rao and RV Dukkupati / New Age
4. Theory of Machines and Mechanisms by Uicker, Pennock and Shigley, Oxford

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#### (55018) MACHINE TOOLS

##### UNIT – I

Elementary treatment of metal cutting theory – Element of cutting process – Geometry of single point tool and angles chip formation and types of chips – built up edge and its effects chip breakers. Mechanics of orthogonal cutting –Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, tool life, coolants, machinability – Tool materials.

Kinematic schemes of machine tools – Constructional features of speed gear box and feed gear box.

##### UNIT – II

Engine lathe – Principle of working, specification of lathe – types of lathe – work holders tool holders – Box tools Taper turning thread turning – for Lathes and attachments.

Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout.

Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes – tool layout and cam design.

##### UNIT – III

Shaping slotting and planing machines – Principles of working – Principal parts – specification classification, operations performed. Kinematic scheme of the shaping slotting and planing machines, machining time calculations.

##### UNIT – IV

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring machines – Fine boring machines – Jig Boring machine. Deep hole drilling machine. Kinematics scheme of the drilling and boring machines

##### UNIT – V

Milling machine – Principles of working – specifications, – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Types geometry of milling cutters – milling cutters – methods of indexing – Accessories to milling machines, kinematic scheme of milling cutters – milling cutters – methods of indexing.

**UNIT - VI**

Grinding machine – Fundamentals – Theory of grinding – classification of grinding machine – cylindrical and surface grinding machine – Tool and cutter grinding machine – special types of grinding machines – Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel Kinematic scheme of grinding machines.

**UNIT - VII**

Lapping, honing and broaching machines – comparison to grinding – lapping and honing. Kinematics scheme of Lapping, Honing and Broaching machines. Constructional features of speed and feed Units, machining time calculations

**UNIT - VIII**

Principles of design of Jigs and fixtures and uses. Classification of Jigs & Fixtures – Principles of location and clamping – Types of clamping & work holding devices. Typical examples of jigs and fixtures.

**TEXT BOOKS :**

1. Production Technology by R.K. Jain and S.C. Gupta.
2. Production Technology by H.M.T. (Hindustan Machine Tools).

**REFERENCES:**

1. Machine Tools – C.Elanchezian and M. Vijayan / Anuradha Agencies Publishers.
2. Workshop Technology – B.S.Raghu Vamshi – Vol II

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**(55019) DESIGN OF MACHINE MEMBERS - I****UNIT - I**

**INTRODUCTION :** General considerations in the design of Engineering Materials and their properties – selection – Manufacturing consideration in design. Tolerances and fits – BIS codes of steels.

**STRESSES IN MACHINE MEMBERS :** Simple stresses – Complex stresses – impact stresses – stress strain relations – static theories of failure – factor of safety – Design for strength and rigidity – preferred numbers. The concept of stiffness in tension, bending, torsion and combined situations.

**UNIT - II**

**FATIGUE LOADING :** Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor notch sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Fatigue theories of failure – Goodman and Soderberg.

**UNIT - III**

**RIVETED AND WELDED JOINTS: Riveted joints:** Modes of failure of riveted joints – Strength Equations – efficiency of riveted joints - Design of boiler joints – eccentrically loaded riveted joints.

**Welded joints:** Design of Fillet welds - axial loads - Circular fillet welds - bending and torsion – eccentrically loaded joints.

**UNIT - IV**

**BOLTED JOINTS:** Design of bolts with pre-stresses – Design of joints under eccentric loading – bolt of uniform strength, Cylinder cover joints.

**UNIT - V**

**AXIALLY LOADED JOINTS: Keys, Cotters And Knuckle Joints :** Design of Keys-stresses in keys-cottered joints-spigot and socket, sleeve and cotter, jib and cotter joints- Knuckle joints.

**UNIT - VI**

**DESIGN OF SHAFTS :** Design of solid and hollow shafts for strength and rigidity – Design of shafts for complex loads – Shaft sizes – BIS code – Design of shaft for a gear and belt drives.

**UNIT – VII**

**SHAFT COUPLING** : Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – Pin – Bush coupling.

**UNIT – VIII**

**MECHANICAL SPRINGS** : Stresses and deflections of helical springs – Extension -compression springs – Springs for static and fatigue loading – natural frequency of helical springs – Energy storage capacity – helical torsion springs – Co-axial springs.

**TEXT BOOKS :**

1. Mechanical Engineering Design by Bahl and Goel, Standard Publications
2. Machine Design by R.L.Norton, Mc Graw Hill

**REFERENCES :**

1. Machine Design by Timothy H. Wenzell PE, Cengage
2. Machine Design by V.Bandari, Tmh Publishers
3. Machine design / Schaum Series.
4. Machine design – Pandya & shah.
5. Machine Design, S MD Jalaludin, Anuradha Publishers

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**(55020) APPLIED THERMODYNAMICS - II****UNIT – I**

**Basic Concepts:** Rankine cycle - Schematic layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat addition, Methods to improve cycle performance – Regeneration & reheating. Combustion: fuels and combustion, concepts of heat of reaction, adiabatic flame temperature, stoichiometry, flue gas analysis

**UNIT II**

**Boilers** : Classification – Working principles – with sketches including H.P.Boilers – Mountings and Accessories – Working principles, Boiler horse power, equivalent evaporation, efficiency and heat balance – Draught, classification – Height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught, induced and forced.

**UNIT – III**

**Steam Nozzles:** Function of nozzle – applications - types, Flow through nozzles, thermodynamic analysis – assumptions -velocity of nozzle at exit-Ideal and actual expansion in nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, criteria to decide nozzle shape: Super saturated flow, its effects, degree of super saturation and degree of under cooling - Wilson line.

**UNIT – IV**

**Steam Turbines:** Classification – Impulse turbine; Mechanical details – Velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency.

De-Laval Turbine - its features. Methods to reduce rotor speed-Velocity compounding and pressure compounding, Velocity and Pressure variation along the flow – combined velocity diagram for a velocity compounded impulse turbine.

**UNIT V**

**Reaction Turbine:** Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency.

**UNIT VI**

**Steam Condensers:** Requirements of steam condensing plant  
Classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its effects, air pump- cooling water requirement.

**UNIT – VII**

**Gas Turbines:** Simple gas turbine plant – Ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating – Closed and Semi-closed cycles – merits and demerits, Brief concepts about compressors, combustion chambers and turbines of Gas Turbine Plant.

**UNIT – VIII**

**Jet Propulsion:** Principle of Operation – Classification of jet propulsive engines – Working Principles with schematic diagrams and representation on T-S diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo jet engines – Needs and Demands met by Turbo jet - Schematic Diagram, Thermodynamic Cycle, Performance Evaluation Thrust Augmentation – Methods.

**Rockets :** Application – Working Principle – Classification – Propellant Type – Thrust, Propulsive Efficiency – Specific Impulse – Solid and Liquid propellant Rocket Engines.

**TEXT BOOKS :**

1. Thermal Engineering / R.K. Rajput / Lakshmi Publications
2. Gas Turbines – V.Ganesan / TMH

**REFERENCES:**

1. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot
2. Gas Turbines and Propulsive Systems – P.Khajuria & S.P.Dubey / Dhanpatrai
3. Gas Turbines / Cohen, Rogers and Saravana Muttou / Addison Wesley – Longman
4. Thermal Engineering-R.S Khurmi/JS Gupta/S.Chand.
5. Thermal Engineering-P.L.Bellaney/ Khanna Publishers.
6. Thermal Engineering-M.L.Mathur & Mehta/Jain Bros.

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**(55604) METROLOGY AND MACHINE TOOLS LAB****Section A :**

1. Measurement of lengths, heights, diameters by vernier calipers micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth, vernier calipers and checking the chordal addendum and chordal height of spur gear.
4. Machine tool "alignment test on the lathe.
5. Machine tool alignment test on milling machine.
6. Tool makers microscope and its application
7. Angle and taper measurements by Bevel protractor, Sine bars, etc.
8. Use of spirit level in finding the flatness of surface plate.
9. Thread measurement by Two wire/ Three wire method or Tool makers microscope.
10. Surface roughness measurement by Taly Surf.
11. Surface Wear Resistances Test using Electro Spark Coating Device.

**Section B :**

1. Introduction of general purpose machines -Lathe, Drilling machine, Milling machine, Shaper,
2. Planing machine, slotting machine, Cylindrical Grinder, surface grinder and tool and cutter grinder.
3. Step turning and taper turning on lathe machine
4. Thread cutting and knurling on -lathe machine.
5. Drilling and Tapping
6. Shaping and Planing
7. Slotting
8. Milling
9. Cylindrical Surface Grinding
10. Grinding of Tool angles.



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**(55605) THERMAL ENGINEERING LAB**

Perform any 10 out of the 12 exercises

1. I.C. Engines Valve / Port Timing Diagrams
2. I.C. Engines Performance Test( 4 -Stroke Diesel Engines )
3. I.C. Engines Performance Test on 2-Stroke Petrol
4. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Petrol Engine
5. Evaluate of engine friction by conducting motoring /retardation test on 4 stroke diesel Engine.
6. Heat balance on IC Engines.
7. Determination of A/F Ratio and Volumetric Efficiency on IC Engines.
8. Determine of Economical speed test for fixed load on 4-stroke Engine.
9. Determine optimum cooling water temperature on IC Engine
10. Dis-assembly / Assembly of Engines.
11. Performance test on Reciprocating Air-compressor unit.
12. Study of Boilers.