



Grams: "TECHNOLOGY"  
E Mail: [dapjntuh@gmail.com](mailto:dapjntuh@gmail.com)

Phone: Off: +91-40-23156115  
Fax: +91-40-23158665

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

(Established by Andhra Pradesh Act No.30 of 2008)

Kukatpally, Hyderabad – 500 085, Andhra Pradesh (India)

### B.TECH. MECHANICAL ENGINEERING

#### III YEAR I SEMESTER

Code	Subject	L	T/P/D	C
	Managerial Economics and Financial Analysis	4	-	4
	Engineering Metrology	4	-	4
	Dynamics of Machinery	4	-	4
	Machine Tools	4	-	4
	Design of Machine Members – I	4	-	4
	Thermal Engineering -II	4	-	4
	Machine Tools & Metrology Lab	-	3	2
	Thermal Engineering Lab	-	3	2
	<b>Total</b>	<b>24</b>	<b>6</b>	<b>28</b>

III Year B.Tech. ME-I Sem

L T/P/D C

4 -/- 4

**(A50010) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS****Objectives:**

To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations namely: demand and supply, production function, cost analysis, markets, forms of business organisations, capital budgeting and financial accounting and financial analysis.

**Unit I**

**Introduction & Demand Analysis:** Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. *Elasticity of Demand:* Definition, Types, Measurement and Significance of Elasticity of Demand. *Demand Forecasting,* Factors governing demand forecasting, methods of demand forecasting.

**Unit II**

**Production & 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. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

**Unit III**

**Markets & New Economic Environment:** Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing:* Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, *New Economic Environment:* Changing Business Environment in Post-liberalization scenario.

**Unit IV**

**Capital Budgeting:** Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital - Trading Forecast, Capital Budget, Cash Budget. 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).

**Introduction to Financial Accounting & Financial Analysis:** Accounting concepts and Conventions - Introduction IFRS - Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis: Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.*

**TEXT BOOKS:**

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.
2. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2013.
3. M. Kasi Reddy & Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2012.

**REFERENCES:**

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2012
4. Domnick Salvatore: Managerial Economics in a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, Pearson, 2012.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Shailaja & Usha : MEFA, University Press, 2012.
10. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
11. Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011.
12. J. V. Prabhakar Rao & P.V. Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011.

**Outcomes:**

At the end of the course, the student will

- understand the market dynamics namely, demand and supply, demand forecasting , elasticity of demand and supply, pricing methods and pricing in different market structures.

Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis

- Develop an understanding of
- Analyse how capital budgeting decisions are carried out
- Understand the framework for both manual and computerised accounting process
- Know how to analyse and interpret the financial statements through ratio analysis.



## (A50318) ENGINEERING METROLOGY

## 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 – International Standard system for plane and screwed work.

## UNIT - II

**Linear Measurement :** Length standard: line and end standard, slip gauges – calibration of slip gauges, Dial indicator, micrometers.

**Measurement Of Angles and Tapers :** Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate used to determine the tapers.

**Limit Gauges :** Taylor's principle – Design of GO and NO GO gauges, plug, ring, snap, 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.M.S Values,  $R_z$  values,  $R_{10}$  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.

**Screw Thread Measurement :** Element of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch, profile thread gauges.

**Machine Tool Alignment Tests:** Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling, drilling machine tools. Preparation of acceptance charts.

**Gear Measurement:** Gear measuring instruments, Gear tooth profile measurement, Measurement of diameter, pitch pressure angle and tooth thickness.

**Coordinate Measuring Machines:** Types of CMM, Role of CMM, and Applications of CMM.

## TEXT BOOKS :

1. Engineering Metrology / R.K. Jain / Khanna Publishers.
2. Engineering Metrology / I C Gupta./ Dhanpath Rai.

## REFERENCE BOOKS :

1. Dimensional Metrology/Connie Dotson/Cengage Learning.
2. BIS Standards on Limits & Fits, Surface Finish, Machine Tool Alignment etc.
3. Fundamentals of Dimensional Metrology/ / Connie Dotson / Thomson/ 4<sup>th</sup> Edition.
4. Engineering Metrology/Kenneth John Hume/McDonald.
5. Engineering Metrology/D.M. Anthony/Pergamon Press.
6. Principles of Engineering Metrology/Rega Rajendra/Jaico Publications.

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**(A50317) DYNAMICS OF MACHINERY****UNIT – I**

**Angular Motion:** Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aero planes and ships. Static and Dynamic Force Analysis of planar mechanisms.

**UNIT – II**

**Friction:** Inclined plane – Friction of screw and nuts - Pivots and collars – Uniform pressure, uniform wear – friction circle and friction axis: lubricated surfaces – boundary friction – film lubrication. Clutches. Single plate, multi plate, cone clutch, centrifugal clutches.

**Brakes And Dynamometers:** Simple block brake - Internal expanding brake-band brake of vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

**UNIT – III**

**Turning Moment Diagram and Flywheels:** Turning moment- Inertia torque-connecting rod angular velocity and acceleration-crank effort and torque diagrams-fluctuation of energy – flywheels and their

**Governors:** Watt, Porter and Proell governors- Spring loaded governors – Hartnell and Hartung with auxiliary springs- Sensitiveness, isochronisms and hunting- effort and power of the governors.

**UNIT – IV**

**Balancing:** Balancing of rotating masses- Primary, Secondary, and higher balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples. Examination of "V" and multi cylinder in-line and radial engines for primary and secondary balancing- locomotive balancing – Hammer blow – Swaying couple – variation of tractive effort.

**UNIT – V**

**Vibrations:** Free Vibration of mass attached to vertical spring – oscillation of pendulums. Transverse loads – vibrations of beams with concentrated and distributed loads. Dunkerly's method – Raleigh's method. Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems.

**TEXT BOOKS:**

1. Theory of Machines/ S.S.Rattan/McGraw Hill.

2. Theory of Mechanism and Machines /Jagdish Lal/Metropolitan Book Company.

**REFERENCE BOOKS:**

1. Theory of Machines/ Shigley/ Mc Graw Hill Publishers.
2. Theory of Machines/ Thomas Bevan/Pearson.
3. Theory of Machines/ R.K.Bansal/Lakshmi publications/5<sup>th</sup> Edition.
4. Mechanism and Machine Theory/ JS Rao and RV Duggipati/ New Age.
5. Theory of Machines/Sadhu Singh/Pearson/3<sup>rd</sup> Edition.
6. Mechanism and Machine Theory/Ashok G. Ambekar/PHI/Eastern Economy Edition.



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**(A50321) 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.

**UNIT - II :**

Engine lathe – Principle of working, specification of lathe – types of lathe – work and tool holding devices, Taper turning, Thread turning – Lathe attachments. Turret and capstan lathe – Principal features of automatic lathes – classification : Single spindle and multi-spindle automatic lathes – tool layouts.

**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.

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 - IV**

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

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

**UNIT -V**

**Finishing Processes:** Grinding – fundamentals – theory of grinding – classification of grinding machines – 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.

**TEXT BOOKS:**

1. Production Technology/HMT/Tata McGraw Hill.
2. Production Technology / R.K. Jain and S.C. Gupta/Khanna Publishers.

**REFERENCE BOOKS:**

1. Principles of Machine Tools/ Bhattacharya A and Sen.G.C/ New Central Book Agency.
2. Workshop Technology – Vol.-II/ B.S. Raghuvamsi.
3. Elements of Work Shop Technology – Vol. II/Hajra Choudry/ Media Promoters.
4. Fundamentals of Metal Machining and Machine Tools/ Geoffrey Boothroyd/ McGraw Hill.
5. Manufacturing Processes/JP Kaushish/Prentice Hall/2<sup>nd</sup> Edition.
6. Machine Tools/C Elanchezhian & M. Vijayan/Anuradha Publications.

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## (A50316) DESIGN OF MACHINE MEMBERS - I

**NOTE :** Design Data books are not permitted in the Examinations. The design must not only satisfy strength criteria but also rigidity criteria.

**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. Theories of failure – Factor of safety – Design for strength and rigidity – preferred numbers.

**Fatigue loading:** Stress concentration – Theoretical stress Concentration factor – Fatigue stress concentration factor- Notch Sensitivity – Design for fluctuating stresses – Endurance limit – Estimation of Endurance strength – Goodman's line – Soderberg's line. *184*

**UNIT - II**

**Design of Fasteners:** Riveted joints-methods of failure of riveted joints-strength equations-efficiency of riveted joints- eccentrically loaded riveted joints.

**Welded joints:** Design of fillet welds- axial loads-circular fillet welds-bending and torsion.

Design of bolts with pre-stresses- design of joints under eccentric loading-bolts of uniform strength.

**UNIT - III**

**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. *108*

**UNIT - IV**

**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 shafts for gear and belt drives.

**Shaft couplings :** Rigid couplings – Muff, Split muff and Flange couplings. Flexible couplings – PIN-Bush coupling.

**UNIT - V**

**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. Machine design/Pandya & Shah/ Charotar Publishing House Pvt. Ltd.
2. Machine Design/ PV Soundararajan Murthy and N. Shanmugam/ Anuradha Publishers.

**REFERENCE BOOKS:**

1. Design of Machine Elements/V.M. Faires.
2. Machine design/ Schaum Series.
3. Mechanical Engineering Design/JE Shigley.
4. Machine Design/S Md. Jalaludine/Anuradha Publishers.
5. Machine Design/UC Jindal/Pearson.
6. Design of Machine Elements (Vol.1)/T. Krishna Rao/IK International Publishing House/2<sup>nd</sup> Edition.



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**(A50326) THERMAL ENGINEERING – 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- concept 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 principle.

**Steam Nozzles:** Function of nozzle – Applications and Types- Flow through nozzles- Thermodynamic analysis.

**UNIT – III**

**Steam Turbines:** Classification – Impulse turbine; Mechanical details – Velocity diagram – Effect of friction – Power developed, Axial thrust, Blade or diagram efficiency – Condition for maximum efficiency.

**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.

**Steam Condensers:** Requirements of steam condensing plant – Classification of condensers – Working principle of different types.

**UNIT IV**

**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 – V**

**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 / Rajput / Lakshmi Publications.
2. Gas Turbines/V.Ganesan /TMH.

**REFERENCE BOOKS:**

1. Gas Turbines and Propulsive Systems/ P.Khajuria & S.P.Dubey / Dhanpatrai Pub.
2. Thermal Engineering/ Ballaney / Khanna Pub.
3. Gas Turbines / Cohen, Rogers and Saravana Muttou / Addison Wesley – Longman.
4. Thermal Engineering/R.S. Khurmi & J.S.Gupta / S.Chand Pub.
5. Thermodynamics and Heat Engines / R. Yadav / Central Book Depot.
6. Thermal Engineering / Ajoy Kumar/ Narosa.



**(A50384) MACHINE TOOLS & METROLOGY LAB****Section-A:**

1. Use of gear teeth vernier calipers for checking the chordal addendum and chordal height of the spur gear.
2. Machine tool alignment of test on the lathe.
3. Tool makers microscope and its application
4. Angle and taper measurements by bevel protractor and sine bars.
5. Use of spirit level and optical flats in finding the flatness of surface plate.
6. Thread measurement by 2-wire and 3-wire methods.

**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 Planning
7. Slotting
8. Milling
9. Cylindrical Surface Grinding
10. Grinding of Tool angles.

**(A50383) 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 for 4 Stroke SI engines
3. I.C. Engines Performance Test for 2 Stroke SI engines
4. I.C. Engines Morse, Retardation, Motoring Tests
5. I.C. Engine Heat Balance – CI/SI Engines
6. I.C. Engines Economical speed Test on a SI engine
7. I.C. Engines effect of A/F Ratio in a SI engine
8. Performance Test on Variable Compression Ratio Engine
9. IC engine Performance Test on a 4S CI Engine at constant speed
10. Volumetric efficiency of Air – Compressor Unit
11. Dis-assembly / Assembly of Engines
12. Study of Boilers