B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

3rd Semester (For all branches)
Industrial Economics
MGT - 231

L	T	P	Cr	
3	0	0	3	**On Semester Evaluation : 100**
				End Semester Evaluation : 100

Note: Examiner will be required to set NINE questions in all. Question Number 1 will consist of objective type/short-answer type questions covering the entire syllabus. In addition to this compulsory question there will be four units i.e. Unit-I to Unit-IV. Examiner will set two questions from each Unit of the syllabus. Each question will carry 20 marks.
Student will be required to attempt FIVE questions in all. Question Number 1 will be compulsory. In addition to compulsory question, student will have to attempt four more questions selecting one question from each Unit.

UNIT-I

Introduction : Meaning, Nature and Scope of Economics, Correlation between Economics, Science, Engineering, Technology and Management. Managerial Economics and its scope in engineering perspective. Present condition of Indian Economics in the background of World Economy.

UNIT-II

Basic Macro Economic Concepts: GDP, GNP, National Income(NI), Business Cycles Concept of NI and Measurement. Inflation: Types, causes & prevention methods, Phases of business cycle, Reserve Bank of India and Its role in economic control, Concept of Currency and its control mechanism.

UNIT-III

Basic Concept of Investment: Primary Market, Secondary Market, Investors, Investment options, Issues of Securities, Types of securities, Regulatory Laws-SEBI ACT

UNIT-IV

Basic Concept of Corporate : Company and its different types, Non Government Organization (NGO), Consultancy Firm, Partnership Firm, Incorporation of company and general concept, Fund of a company: Its generation and operation, Share, Equity, Debenture, Bond, ESOP, Books of account.

Text Books:

1. Indian Economics, Dutt & Sundaram
2. A test book of Economic Theory by Stonier & Hague, Pearson
3. Indian Security Markets A Premier, By National Institute of Securities Markets, FPCIL

Reference Books:

4. Double entry book keeping by T.S. Grewal- S. Chand.
5. Modern Micro Economics by Theory - H.L.Ahuja-S.Chand
6. Managerial Economics for Engineering : Prof. D.N. Kakkar
7. Advance Economic Theory by M.L.Jhingan, Konark Publication

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

MATHEMATICS-III

MATH-231

L	T	P	Cr
4	1	-	5

On Semester Evaluation	100
End Semester Evaluation	100
Maximum Time	3 hrs

Note: -

1. **There will be NINE questions in the question-paper. All questions carry equal marks.**
2. **First question covers the whole syllabus. It is objective/ short answer type (at least ten questions). Two questions will be taken from each of the four units.**
3. **Attempt five questions in all. FIRST question is compulsory. Attempt ONE question from each of the other four Units**

UNIT-I

Partial Differential Equations: Formation of partial differential equations, Lagrange's linear partial differential equation, First order non-linear partial differential equation, Charpit's method.

UNIT-II

Functions of a Complex Variables: Exponential function, Trigonometric, Hyperbolic and Logarithmic functions, limit and continuity of a function, Differentiability and analyticity. Cauchy-Riemann equations, Necessary and sufficient conditions for a function to be analytic, Polar form of the Cauchy-Riemann equations, Harmonic functions, Application to flow problems

UNIT-III

Integration of complex functions, Cauchy-Integral theorem and formula, Power series, radius and circle of convergence. Taylor's, Maclaurin's and Laurent's series. Zeros and singularities of complex function, Residues. Integration of real integrals using residues(around unit and semi circle only)

UNIT-IV

Power series methods for solutions of ordinary differential equations. Bessel Equation, Recurrence formula for $J_n(x)$, generating function for $J_n(x)$, Equation reducible to Bessel function, Orthogonality of Bessel function, Legendre equation and Legendre polynomials, Rodrigue's Formula, Generating function for $P_n(x)$, Recurrence formula for $P_n(x)$.

Text books:

1. Kresyzig, E., "Advanced Engineering Mathematics", John Wiley and Sons. (Latest edition).
2. Ramana, B.V., "Higher Engineering Mathematics" Tata McGraw-Hill.
3. Jain, R. K. and Iyengar, S. R. K. "Advanced Engineering Mathematics", Narcosis, 2003 (2nd Ed.)
4. Mathur A. B., Jaggi V. P., "Advanced Engineering Mathematics", Khanna Publishers.
5. Grewal, B.S., "Higher Engineering Mathematics", Khanna Publishers.

References Books:

1. Mitin, V. V., Polis, M. P. and Romanov, D. A., "Modern Advanced Mathematics for Engineers", John Wiley and Sons, 2001.
2. Wylie, R., "Advanced Engineering Mathematics", McGraw-Hill, 1995.
3. Sastry , S. S. , "Engineering Mathematics Part-II" , Prentice Hall of India.

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

THERMODYNAMICS

ME-231

L	T	P	Cr
3	1	-	4

On Semester Evaluation	100
End Semester Evaluation	100
Maximum Time	3 hrs

Note: -

1. **There will be NINE questions in the question-paper. All questions carry equal marks.**
2. **First question covers the whole syllabus. It is objective/ short answer type (at least ten questions). Two questions will be taken from each of the four units.**
3. **Attempt five questions in all. FIRST question is compulsory. Attempt ONE question from each of the other four Units**

UNIT I

Basic Concepts: Macroscopic and Microscopic Approach, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Property, Thermodynamic Equilibrium, State, Path, Process and Cycle, Quasistatic, Reversible and Irreversible Processes, Concept of Thermodynamic Work and Heat, Equality of Temperature, Zeroth Law of Thermodynamic and its utility.

Ideal and Real Gases: Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avogadro's law and Universal Gas Constant, P-V-T surface of an Ideal Gas.

Vander Waal's Equation of state, Reduced Co-ordinates, Compressibility factor and law of corresponding states, Mixture of Gases, Mass, Mole and Volume Fraction, Gibson Dalton's law, Gas Constant and Specific Heats.

UNIT II

First Law of Thermodynamics: Energy and its Forms, Energy and 1st law of Thermodynamics, Internal Energy and Enthalpy, 1st Law Applied to Non-Flow Process, Steady Flow Process and Transient Flow Process, Throttling Process and Free Expansion Process.

Second Law of Thermodynamics: Limitations of First Law, Thermal Reservoir, Heat Source and Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin- Planck and Clausius Statements and their Equivalence, Perpetual Motion Machine of Second Kind. Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot's Theorem and its Corollaries.

UNIT III

Entropy: Clausius Inequality and Entropy, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Entropy for a mixture of Gases, Introduction to Third Law of Thermodynamics.

Availability, Irreversibility and Equilibrium: High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Availability of a Non-Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility.

UNIT IV

Pure Substance: Pure Substance and its Properties, Phase and Phase Transformation, Vaporization, Evaporation and Boiling, Saturated and Superheat Steam, Solid – Liquid – Vapour Equilibrium, T-V, P-V and P-T Plots during Steam formation, Properties of Dry, Wet and Superheated Steam, Property Changes during Steam Processes, Temperature – Entropy (T-S) and Enthalpy – Entropy (H-S) Diagrams, Throttling and Measurement of Dryness Fraction of Steam.

Thermodynamic Relations: Maxwell Relations, T-ds Relations, Enthalpy and Internal Energy as a Function of Independent Variables, Specific Heat Capacity Relations, Clapeyron Equation.

Text Books:

1. Engineering Thermodynamics – C P Arora, Tata McGraw Hill
2. Engineering Thermodynamics – P K Nag, Tata McGraw Hill
3. Thermal Science and Engineering – D S Kumar, S K Kataria and Sons

Reference Books:

1. Engineering Thermodynamics: Work and Heat transfer – G F C Rogers and Maghew Y R Long man
2. Engineering Thermodynamics – Cengel & Boles, Tata McGraw Hill
3. Fundamental of Thermodynamics – Sonntang & Borgnakke, Wiley Sons.

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

STRENGTH OF MATERIALS-1

ME-232

L	T	P	Cr
3	1	-	4

On Semester Evaluation	100
End Semester Evaluation	100
Maximum Time	3 hrs

Note: -

1. **There will be NINE questions in the question-paper. All questions carry equal marks.**
2. **First question covers the whole syllabus. It is objective/ short answer type (at least ten questions). Two questions will be taken from each of the four units.**
3. **Attempt five questions in all. FIRST question is compulsory. Attempt ONE question from each of the other four Units**

Unit-I

Simple Stresses & Strains, Composition and resolution of Forces, Equilibrium of Forces, Poisson's ratio, Elastic Constants & their Relationship, Compound bars, Stress-Strain diagram, Temperature stresses.
Compound Stress & Strain, Volumetric Strain, Principal Stress and Strain, Mohr's Circle of stresses.

Unit- II

Bending moment & Shearing force diagram for determinate beams, Types of beams, types of loading, Moments and their applications, Parallel Forces and Couples, Support Reactions, Relation between Rate of loading the Shear force and Bending Moment.
Bending and Shearing stresses in beam - Center of Gravity, Moment of Inertia, Theory of simple bending, Flexure formula, Section Modulus, Composite beam in Circular, Rectangular, I, T, & Channel Section, Shear stress Distribution, Combined Stresses in beam,

Unit- III

Slope and Deflection in Beams and Cantilevers – Double Integration method, Moment area method, Conjugate beam method, Unit load method.
Torsion of hollow and solid Circular Shaft within elastic limit, Thin Shaft, Tapered Shaft, Composite Shaft, Torque and Horse power, angle of twist, Torsion equation, Assumptions.

Unit- IV

Euler's Theory of long Columns, derivations of buckling load for different end conditions, Slenderness ratio, Short column, Rankine- Gordons formula, Johnson's empirical formula,
Fixed Beam- Definition, Reaction, Fixing moments, SF, BM & Deflection.

Text Books:

1. Strength of Materials – Sadhu Singh, Khanna Publications
2. Strength of Materials – Dr. R. K. Bansal, Luxmi Publications
3. Strength of Materials – Dr. R. K. Rajput, Luxmi Publications

Reference Books:

1. Strength of Materials – G.H.Ryder, Third Edition in SI UNITs 1969 Macmillan India
2. Strength of Materials – Andrew Pytel and Fredinand L.Singer, Fourth Edition, Int. Student Ed. Addison – Wesley Longman
3. Strength of Materials – Popov, PHI, New Delhi.
4. Strength of Materials- A Rudimentary Apprach – M.A. Jayaram,

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

THEORY OF MACHINES - I

ME-233

L	T	P	Cr
3	1	-	4

On Semester Evaluation	100
End Semester Evaluation	100
Maximum Time	3 hrs

Note: -

1. **There will be NINE questions in the question-paper. All questions carry equal marks.**
2. **First question covers the whole syllabus. It is objective/ short answer type (at least ten questions). Two questions will be taken from each of the four units.**
3. **Attempt five questions in all. FIRST question is compulsory. Attempt ONE question from each of the other four Units**

UNIT I

Kinematics, Kinematic pairs, Kinematic chain, Mechanism, Machine, Structure, Types of links, Types of consrained Motions, Types of joints in a chain,

Inversions of four-bar chain, Single and double slider crank chain, Quick return mechanisms.

Velocity determination; Relative velocity methods, Instantaneous center method, Kennedy's Theorem, Space cent rode and body centrode

UNIT II

Centripetal and tangential accelerations, Acceleration determination by graphical method using velocity polygons, Coriolis component of acceleration, Klein's construction.

Introduction to analysis and synthesis of mechanisms, Introduction to function generation, Path generation and rigid bodied guidance.Analytical methods to find velocity and acceleration of four –link mechanism (Freudenstein's equation), slider crank mechanism, To Coordinate angular displacements of input and output links, least square technique.

UNIT III

Pantograph, straight-line motion mechanisms (Peculiar, Hart, Scott Russell, Grasshopper, Watt, Tchybishev) Indicator mechanisms (Simplex, Crosby, Thomson, etc) Automobile steering gears (Davis and Ackerman), Hooks joint (universal coupling), Double hooks joints.

Types of friction, Laws of dry friction, Motion along inclined plane, Friction of screws, Screw Jack, Pivots and collars, Plate and cone clutches, friction circle.

UNIT IV

Types of cams and followers, various motions of the follower, Construction of cam profiles, Analysis for velocities and accelerations of tangent and circular arc cams with roller and flat –faced followers.

Open and crossed belt drives, velocity ratio, slip, material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts, ratio 0f tensions, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drive, chain length, classification of chains

Text Books:

1. Theory of machines: S. S. Rattan, Tata McGraw Hill Publications.
2. Theory of Mechanism and Machines: Jagdish Lal, Metropolitan Book Co.
3. Theory of Machines: P.L.Ballaney, Khanna Publisher.

Reference Books:

1. Mechanism synthesis and analysis: A.H. Soni, McGraw Hill Publications.
2. Mechanism: J.S. Beggs.
3. Mechanics of Machines: P.Black, Pergamon Press.

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

PRODUCTION TECHNOLOGY-I
ME-234

L	T	P	Cr		
3	0	-	3	**On Semester Evaluation**	100
				End Semester Evaluation	100
				Maximum Time	3 hrs

Note: -

1. **There will be NINE questions in the question-paper. All questions carry equal marks.**
2. **First question covers the whole syllabus. It is objective/ short answer type (at least ten questions). Two questions will be taken from each of the four units.**
3. **Attempt five questions in all. FIRST question is compulsory. Attempt ONE question from each of the other four Units**

UNIT I

Metal Cutting & Tool Life

Basic tool geometry, single point tool nomenclature, chips-various types and their characteristics, mechanism of chip formation, theoretical and experimental determination of shear angle, orthogonal and oblique metal cutting, metal cutting theories, relationship of velocities, forces and power consumption. Effect of operating parameters life tool geometry, cutting speed, feed depth of out, coolant, materials etc on forces temp. tool life, surface finish etc., tool life relationship, tailor equation of tool life , tool material and mechanism.

UNIT II

Economics of metal machining & Multi edged tools

Element of machining cost, tooling economics, machines economics and optimization.

Broach tools-types materials and applications, geometry of twist drills, thrust torque and power calculation in drills, form tools-application.

UNIT III

Metal forming & Jigs and Fixtures

Metal blow condition, theories of plasticity conditions of plane strains, friction condition in metal working, wire drawing-extension of rods, theory of forging, rolling of metals and elementary rolling theory, no slip angle and forward slip.

Tool engineering, types of tools, usefulness, principles of location, locating and clamping devices, Jigs bushes, drilling Jigs, milling fixtures, turning fixtures, boring and broaching fixtures, different materials for Jigs and fixtures, economics of jigs and fixtures.

UNIT-IV

Metrology

Measurements, linear and angular simple measuring instruments various clampers, screw gauge, sine bar, auto-collimator, comparator-mechanical, electrical, optical, surface finish and its measurement, micro and macro deviation, factors influencing surface finish and evaluation of surface finish.

Suggested reading:

1. Manufacturing science: Ghosh and Malik, E.W. Press
2. Principles of metal cutting: Sen and Bhattacharya, New Central Book.
3. Metal cutting principles:Shaw, MIT Press Cambridge
4. Manufacturing analysis: Cook, Adisson-Wesley
5. Modern machining processes: Pandey and Shan, Tata McGraw Hill Publications

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

STRNGTH OF MATERIALS LAB

ME- 23P1

L	T	P	Cr
-	-	2	1

On Semester Evaluation	120
End Semester Evaluation	80
Maximum Time	2 hrs

LIST OF EXPERIMENTS

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness-testing machine & perform the Rockwell hardness test.
3. To study the Impact testing machine and perform the Izod test
4. To study the Impact testing machine and perform the Charpy test
5. To study the Universal testing machine and perform the tensile test.
6. To perform compression & bending tests on UTM.
7. To study the torsion testing machine and perform the torsion test.
8. To find Moment of Inertia of a Fly Wheel
9. To determine Mechanical Advantage and Efficiency of Worm and Worm Wheel.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

THEORY OF MACHINES LAB-I

ME – 23P2

L	T	P	Cr
-	-	2	1

On Semester Evaluation	120
End Semester Evaluation	80
Maximum Time	2 hrs

LIST OF EXPERIMENTS

1. To determine the modulus of rigidity of the material of a closed coil helical spring and the stiffness of a spring.
2. To determine the value of coefficient of friction for a given pair of surfaces using friction apparatus
3. To determine the modulus of rigidity of horizontal shaft
4. To draw experimentally a curve of the follower-displacement v/s cam-angle.

   Differentiate the above curve to get velocity and acceleration plot and compare the values with those obtained analytically.
5. To determine the coefficient of friction between belt and pulley and plot a graph between $\log_{10} T_1/T_2$ Vs θ.
6. To determine velocity & acceleration of slider in slider-crank mechanism and plot the following:
   a. θ v/s x (displacement of slider)
   b. θ v/s velocity and
   c. θ v/s acceleration.

   Compare the values of velocities & acceleration with those obtained theoretically. (Assume ω=I rad/sec.).
7. Study of the inversions of the single slider crank mechanism.
8. To verify the law of moment using Bell- crank lever.
9. To verify the law of moments using disc moment apparatus.
10. To verify the law of polygon of forces

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

THERMODYNAMICS LAB

ME-23P3

L	T	P	Cr
-	-	2	1

On Semester Evaluation	120
End Semester Evaluation	80
Maximum Time	2 hrs

LIST OF EXPERIMENTS

1. To study Babcock-Wilcox boiler (Model).
2. To study locomotive boiler (Model).
3. To study Lancashire boiler (Model).
4. To study Cornish boiler
5. To study working of two stroke petrol engine.
6. To study working of two stroke diesel engine.
7. To study working of four stroke petrol engine.
8. To study working of four stroke diesel engine.
9. To study working of Solex Carburetor.

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

PRODUCTION TECHNIOLOGY-1 LAB

ME-23P4

L	T	P	Cr		
0	0	2	1	**On Semester Evaluation**	**120**
				End Semester Evaluation	80
				Maximum Time	2 hrs

List of Experiments:-

1. To study the milling machines, its various types, functions applications.
2. To study various measuring instruments- Veriner, gear tooth caliper, sine bar, veriner bevel protector, telescopic gauge, wire gauge, Go or not Go gauge, thred pitch gauge.
3. To study the Drilling machine and practice of drilling and reaming operations.
4. To perform on slab milling and side face milling.
5. To study and perform on welding on MIG welding.
6. To cut external threads on a lathe machine.
7. To study single point cutting tool and practice of grinding single point cutting tool and drill tool.
8. To practice of slot cutting on shaper machine.
9. To practice to making wooden pattern, split pattern and solid pattern
10. To cut the metal pieces by Arc welding.
11. To perform on a job on lathe.
12. To perform taper turning by using tail stock.
13. To perform sand moisture testing, clay testing and sand mould hardness testing in foundry shop.

B.TECH 3RD SEMESTER (MECHANICAL ENGINEERING)

SOCIETY & SCHOOL CONNECT PROGRAMME

ME-23A

L	T	P	Cr
0	0	2	A

Students are required to establish contacts with school and/or society to perform socially useful activities. Some of the typical examples are listed below**.**

1. Raise money for good cause
2. Volunteer at health camp
3. Teach in school
4. Visit to Hospital
5. Start anti smoking complain
6. Inspect school play grounds for hazards
7. Serve meals to homeless/poor neighborhood
8. Adopt path holes and raise funds to repair it.
9. Plant trees in public areas.
10. Adopt a grand friend.
11. Teach computer/internet/mobile applications to grand friend.
12. Volunteer at animal shelter and do needful to make "nicer home" for animals.
13. Drug menace for village youth.
14. Learn and teach Yoga in your neighbourhood.