



**B.E - MECHANICAL ENGINEERING  
 (SEVAN SEMESTER)  
 CURRICULUM - 2008**

**SEMESTER I**

Code No	Course Title	L	T	P	C
<b>Theory</b>					
PME101	Mathematics-I	3	1	0	4
PME102	Strength of Materials	3	1	0	4
PME103	Fluid Mechanics and Machines	3	0	0	3
PME104	Engineering Materials and Metallurgy	3	0	0	3
<b>Practical</b>					
PME105	Strength of Materials and Fluid machinery lab	0	0	3	2

**Total Hours: 17**

**Total Credits: 16**

**SEMESTER II**

Code No	Course Title	L	T	P	C
<b>Theory</b>					
PME201	Probability and Statistics	3	1	0	4
PME202	Mechanics of machines-I	3	1	0	4
PME203	Thermal engineering	3	0	0	3
PME204	Metrology and measurements	3	0	0	3
<b>Practical</b>					
PME205	Thermal engineering lab-I	0	0	3	2

**Total Hours: 17**

**Total Credits: 16**

### SEMESTER - III

Code No	Course Title	L	T	P	C
<b>Theory</b>					
PME301	Numerical methods	3	1	0	4
PME302	Gas Dynamics and Jet Propulsion	3	1	0	4
PME303	Machine Element Design	3	1	0	4
PME304	CAD/CAM	3	0	0	3
<b>Practical</b>					
PME305	CAD/CAM lab	0	0	3	2

**Total Hours: 18**

**Total Credits: 17**

### SEMESTER IV

Code No	Course Title	L	T	P	C
<b>Theory</b>					
PME401	Design of Transmission systems	3	1	0	4
PME402	Manufacturing Technology-II	3	0	0	3
PME403	Heat and Mass Transfer	3	1	0	4
PME404	Mechanics of machines-II	3	0	0	3
<b>Practical</b>					
PME405	Heat and Mass Transfer lab	0	0	3	2

**Total Hours: 17**

**Total Credits: 16**

## SEMESTER V

Code No	Course Title	L	T	P	C
<b>Theory</b>					
PME501	Operations Research	3	1	0	4
PME502	Engineering Economics & Cost analysis	3	0	0	3
PME504	Power Plant Engineering	3	0	0	3
PME505	Mechatronics	3	0	0	3
<b>Practical</b>					
PME506	Special Machines Lab	0	0	3	2

**Total Hours: 16**

**Total Credits: 15**

## SEMESTER VI

Code No	Course Title	L	T	P	C
PME601	Industrial Engineering & Quality Control	3	0	0	3
PME602	Automobile Engineering	3	0	0	3
PME603*	Elective-I	3	0	0	3
PME604*	Elective-II	3	0	0	3
<b>Practical</b>					
PME605	Automobile Engineering Lab	0	0	3	2

**Total Hours: 15**

**Total Credits: 14**

## SEMESTER VII

Code No	Course Title	L	T	P	C
PME701	Industrial Engineering & Quality Control	3	0	0	3
PME703*	Elective-I	3	0	0	3
PME704*	Elective-II	3	0	0	3
<b>Practical</b>					
PME705	Project Work	0	0	20	12

**Total Hours: 29**

**Total Credits: 21**

**Total Credits: 116**

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### LIST OF ELECTIVES

#### ELECTIVE I

* Elective Code	Course Title	L	T	P	C
603A	Refrigeration & Air conditioning	3	0	0	3
603B	Fluid Power Engineering	3	0	0	3
603C	Energy Conversion Systems	3	0	0	3

### ELECTIVE II

* Elective Code	Course Title	L	T	P	C
604A	Power Plant Engineering	3	0	0	3
604B	Optimum Utilization of Heat and Power	3	0	0	3
604C	Advanced I.C Engines	3	0	0	3

### ELECTIVE III

* Elective Code	Course Title	L	T	P	C
703A	Mathematical Modeling and simulation-MATLAB	3	0	0	3
703B	Computational Fluid Dynamics	3	0	0	3
703C	Finite Element Methods	3	0	0	3
703D	Nano Technology	3	0	0	3

### ELECTIVE IV

* Elective Code	Course Title	L	T	P	C
704A	Automation and Control Engineering	3	0	0	3
704B	Modern Manufacturing Technology- JIT, AMT	3	0	0	3
704C	Reliability Engineering	3	0	0	3
704D	Tribology	3	0	0	3

**PME 101 MATHEMATICS – I**

**3 1 0 4**

**UNIT - I MATRICES**

**9**

Eigen values and Eigenvectors of a real matrix – Characteristic equation Properties of Eigen values and Eigen vectors - Cayley - Hamilton theorem (excluding proof) - Similarity transformation (Concept only) – Orthogonal matrix - Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to Canonical form by Orthogonal transformation.

**UNIT- II THREE DIMENSIONAL ANALYTICAL GEOMETRY**

**9**

Direction Cosine and Ratios – Angle between two lines – Equation of plane – Equation of Straight line – Coplanar lines – shortest distance between skew lines – Sphere – Tangent plane – Plane section of a sphere

**UNIT -III GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS**

**9**

Curvature – Cartesian and polar co – ordinates – Centre and radius of curvature – Circle of curvature – Involutives and evolutes – Envelops – Properties of envelopes and evolutes.

**UNIT -IV FUNCTION OF SEVERAL VARIABLES**

**9**

Functions of two variables – Partial derivatives – Total differential – Taylor’s expansion – Maxima and Minima – Constrained maxima and minima – Lagrange’s Multiplier method – Jacobians .

**UNIT V ORDINARY DIFFERENTIAL EQUATIONS (ODE) AND APPLICATIONS**

**9**

Linear equations of second order with constant and variable coefficients - Simultaneous first order linear equations with constant coefficients – Method of variation of parameters.

**L: 45; T: 15; Total: 60**

**TEXT BOOKS:**

1. Grewal .B.S., “Higher Engineering Mathematics”, 38<sup>th</sup> Edition- Khanna Publication –Delhi, 2004.
2. Kreyszi.E., “Advance Engineering Mathematics”, 8<sup>th</sup> Edition-John Wiley & Son (Asia) Ltd, Singapore,. 2001.

## REFERENCES:

1. Bali. N.P., Narayana Iyengar, and Chand.N., "Engineering Mathematics" Laxmi Publication Pvt. Ltd-New Delhi, 2003.
2. Veerarajan.T., "Engineering Mathematics (For First Year )", 4<sup>th</sup> Edition , John Wiley & Son -Hill Publishing company Ltd, New Delhi, 2005.
3. Kandasamy. P., Thilagavathy. K, and Gunavathy. K., "Engineering Mathematics"-Volume I &II, S. Chand & Co, New Delhi, 2005.
4. Venkataraman. M. K., "Engineering Mathematics"-Volume I &II, Revised enlarged 4<sup>th</sup> Edition, The National Publishing Company-Chennai, 2004.

**1. STRESS, STRAIN AND DEFORMATION OF SOLIDS 9**

Rigid and Deformable bodies – Strength, Stiffness and Stability – Stresses; Tensile, Compressive and Shear – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy – Strain energy in uniaxial loads.

**2. BEAMS - LOADS AND STRESSES 9**

Types of beams: Supports and Loads – Shear force and Bending Moment in beams – Cantilever, Simply supported and Overhanging beams – Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced – Shear stresses in beams – Shear flow.

**3. TORSION 9**

Analysis of torsion of circular bars – Shear stress distribution – Bars of Solid and hollow circular section – Stepped shaft – Twist and torsion stiffness – Compound shafts – Fixed and simply supported shafts – Application to close-coiled helical springs – Maximum shear stress in spring section including Wahl Factor – Deflection of helical coil springs under axial loads – Design of helical coil springs – stresses in helical coil springs under torsion loads

**4. BEAM DEFLECTION 9**

Elastic curve of Neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Double integration method, Macaulay Method, and Moment-area Method – Columns – End conditions – Equivalent length of a column – Euler equation – Slenderness ratio – Rankine formula for columns

**5. ANALYSIS OF STRESSES IN TWO DIMENSIONS 9**

Biaxial state of stresses – Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point – Stresses on inclined plane – Principal planes and stresses – Mohr's circle for biaxial stresses – Maximum shear stress - Strain energy in bending and torsion.

**L:45; T:15; Total: 60**

**TEXT BOOKS**

1. Popov E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi, 1997.
2. Beer F. P. and Johnston R, "Mechanics of Materials", McGraw-Hill Book Co, Third Edition, 2002.

## REFERENCES

1. Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995
2. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co, New Delhi, 1981
3. Ryder G.H, "Strength of Materials", Macmillan India Ltd., Third Edition, 2002
4. Ray Hulse, Keith Sherwin & Jack Cain, "Solid Mechanics", Palgrave ANE Books, 2004.
5. Singh D.K "Mechanics of Solids" Pearson Education 2002.
6. Timoshenko S.P, "Elements of Strength of Materials", Tata McGraw-Hill, New Delhi 1997.

**1. BASIC CONCEPTS AND PROPERTIES****6**

Fluid – definition, distinction between solid and fluid - Units and dimensions - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

**2. FLUID KINEMATICS AND FLUID DYNAMICS****12**

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- Equation of streamline - stream function - velocity potential function - circulation - flow net – fluid dynamics - equations of motion - Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube - dimensional analysis - Buckingham's  $\pi$  theorem- applications - similarity laws and models.

**3. INCOMPRESSIBLE FLUID FLOW****12**

Viscous flow – Navier - Stoke's equation (Statement only) - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - Hydraulic and energy gradient - flow through pipes - Darcy - weisback's equation - pipe roughness -friction factor- Moody's diagram-minor losses - flow through pipes in series and in parallel - power transmission - Boundary layer flows, boundary layer thickness, boundary layer separation - drag and lift coefficients.

**4. HYDRAULIC TURBINES****8**

Fluid machines: definition and classification - exchange of energy - Euler's equation for turbo machines - Construction of velocity vector diagrams - head and specific work - components of energy transfer - degree of reaction.

Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - propeller turbine - Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies -performance curve for turbines.

**5. HYDRAULIC PUMPS****7**

Pumps: definition and classifications - Centrifugal pump: classifications, working principle, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump: classification, working principle, indicator diagram, work saved by air vessels and performance curves - cavitations in pumps - rotary pumps: working principles of gear and vane pumps

**L:45; Total : 45**

## TEXT BOOKS

1. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 1983.
2. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd, New Delhi (7<sup>th</sup> edition), 1995.
3. Vasandani, V.P., "Hydraulic Machines - Theory and Design", Khanna Publishers.1992

## REFERENCES

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5<sup>th</sup> edition), Laxmi publications (P) Ltd, New Delhi, 1995
2. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5<sup>th</sup> Edition, New Delhi, 2003.
3. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 1998.
4. Som, S.K., and Biswas, G., "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw-Hill, 2<sup>nd</sup> Edition, 2004.



**LIST OF EXPERIMENTS**

1. Hardness test on metals - Brinnell and Rockwell Hardness Number
2. Deflection test on beams
3. Compression test on helical springs
4. Determination of the Coefficient of discharge of given Orifice meter and venturi meter.
5. Determination of friction factor and losses for a given set of pipes.
6. Conducting experiments and drawing the characteristic curves of centrifugal pump / submersible pump
7. Conducting experiments and drawing the characteristic curves of reciprocating pump.
8. Conducting experiments and drawing the characteristic curves of Gear pump.
9. Conducting experiments and drawing the characteristic curves of Pelton wheel.
10. Conducting experiments and drawing the characteristics curves of Francis turbine.
11. Conducting experiments and drawing the characteristic curves of Kaplan turbine.
12. Determination of static and Dynamic pressure on pitot tube

**Total: 45**

**1. PROBABILITY AND RANDOM VARIABLE 9**

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variable - Probability mass function - Probability density functions - Properties- Moments - Moment generating functions and their properties.

**2. STANDARD DISTRIBUTIONS 9**

Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties - Functions of a random variable.

**3. TWO DIMENSIONAL RANDOM VARIABLES 9**

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

**4. TESTING OF HYPOTHESIS 9**

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

**5. DESIGN OF EXPERIMENTS 9**

Analysis of variance – One way classification – CRD - Two – way classification – RBD - Latin square.

**L: 45;T: 15; Total: 60**

*Note: Use of approved statistical table permitted in the examination.*

**TEXT BOOKS**

1. Ross. S., “A first Course in Probability”, Fifth Edition, Pearson Education, Delhi 2002. (Chapters 2 to 8)
2. Johnson. R. A., “Miller & Freund’s Probability and Statistics for Engineers”, Sixth Edition, Pearson Education, Delhi, 2000. (Chapters 7, 8, 9, 12)

**REFERENCES**

1. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, “Probability and Statistics for Engineers and Scientists”, Seventh Edition, Pearsons Education, Delhi, 2002.
2. Lipschutz. S and Schiller. J, “Schaum’s outlines - Introduction to Probability and Statistics”, McGraw-Hill, New Delhi, 1998.
3. Gupta, S.C, and Kapur, J.N., “Fundamentals of Mathematical Statistics”, Sultan Chand, Ninth Edition , New Delhi ,1996.

**1. BASICS OF MECHANISMS****7**

Terminology and Definitions-Degree of Freedom Mobility-Kutzbach criterion-Grashoff's law-Kinematic Inversions of 4-bar chain and slider crank chains-Mechanical Advantage-Transmission angle-Description of common Mechanisms-Single, double and offset slider mechanisms - Quick return mechanisms - Ratchets and escapements - Indexing Mechanisms - Rocking Mechanisms - Straight line generators-Design of Crank-rocker Mechanisms.

**2. KINEMATICS****12**

Displacement, velocity and acceleration - analysis in simple mechanisms - Graphical Method velocity and acceleration polygons - Kinematic analysis by Complex Algebra methods-Vector Approach, Computer applications in the kinematic analysis of simple mechanisms-Coincident points- Coriolis Acceleration.

**3. KINEMATICS OF CAM****8**

Classifications - Displacement diagrams-parabolic, Simple harmonic and Cycloidal motions - Layout of plate cam profiles - Derivatives of Follower motion - High speed cams - circular arc and tangent cams - Standard cam motion - Pressure angle and undercutting.

**4. GEARS****10**

Spur gear Terminology and definitions-Fundamental Law of toothed gearing and involute gearing-Inter changeable gears-gear tooth action – Terminology - Interference and undercutting-Non standard gear teeth- Helical, Bevel, Worm, Rack and Pinion gears (Basics only)-Gear trains-Parallel axis gear trains-Epicyclic gear trains-Differentials

**5. FRICTION****8**

Surface contacts-Sliding and Rolling friction - Friction drives – Friction in screw threads - Friction clutches - Belt and rope drives, Friction aspects in Brakes – Friction in vehicle propulsion and braking

**L:45; T: 15; Total : 60**

## **TEXT BOOK**

1. Rattan S.S, "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1998.
2. Shigley J.E and Uicker J.J, "Theory of Machines and Mechanisms", McGraw-Hill, Inc. 1995.

## **REFERENCES**

1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
2. Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., New Delhi, 1988.
3. Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.
4. John Hannah and Stephens R.C, "Mechanics of Machines", Viva Low-Prices Student Edition, 1999

**1. GAS POWER CYCLES****9**

Otto, Diesel, Dual, Brayton cycles, Calculation of mean effective pressure and air standard efficiency, Actual and theoretical PV diagram of four stroke engines, Actual and theoretical PV diagram of two stroke engines.

**2. INTERNAL COMBUSTION ENGINES****9**

Classification of IC engine, IC engine components and functions. Valve timing diagram and port timing diagram. Comparison of two stroke and four stroke engines. Fuel supply systems, Ignition Systems, Performance calculation. Comparison of petrol & diesel engine. Fuels, Air-fuel ratio calculation, Knocking and Detonation. Lubrication system and cooling system. Exhaust gas analysis, pollution control norms.

**3. STEAM CYCLES, STEAM NOZZLES AND TURBINES****9**

Rankine cycle, Modified Rankine cycle, Combined cycle, Bottoming and Topping cycles, Performance testing - Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow. Impulse and reaction principles, compounding, velocity diagrams for simple and multistage turbines, speed regulations-governors and nozzle governors.

**4. AIR COMPRESSOR****9**

Classification and working principle, work of compression with and without clearance. Volumetric efficiency, Isothermal efficiency and isentropic efficiency of reciprocating air compressors. Multistage air compressor and inter cooling – work of multistage air compressor, Rotary & Roto Dynamic types (Descriptive treatment only).

**5. REFRIGERATION AND AIR-CONDITIONING****9**

Vapour compression Refrigeration cycle – super heat, sub cooling, performance calculations. Working principle of vapour absorption system. Psychrometry, psychrometric chart, Cooling load calculations. Concept of RSHF, GSHF, ESHF, performance analysis on simple systems.

**L: 15; Total :45**

*(Use of standard thermodynamic tables, Mollier diagram, Psychrometric chart and Refrigerant property tables are permitted in the examination)*

**TEXT BOOKS**

1. Rajput, "Thermal Engineering", S. Chand publishers, 2000.
2. Rudramoorthy R, "Thermal Engineering", Tata McGraw-Hill, New Delhi, 2003.

## REFERENCES

1. Kothandaraman.C.P., Domkundwar.S. and A.V.Domkundwar., “A course in Thermal Engineering”, Dhanpat Rai & Sons, Fifth edition, 2002
2. Holman. J.P., “Thermodynamics”, McGraw-Hill, 1985.
3. Rogers, Meyhew, “Engineering Thermodynamics”, ELBS, 1992.
4. Arora.C.P., “Refrigeration and Air conditioning”, TMH, 1994.
5. Sarkar B.K, “ Thermal Engineering”, Tata McGraw-Hill, 1998.

**1. CONCEPT OF MEASUREMENT****9**

General concept – Generalised measurement system-Units and standards-measuring instruments- sensitivity, readability, range of accuracy, precision-static and dynamic response-repeatability-systematic and random errors-correction, calibration, interchangeability.

**2. LINEAR AND ANGULAR MEASUREMENT****9**

Definition of metrology-Linear measuring instruments: Vernier, micrometer, interval measurement, Slip gauges and classification, interferometry, optical flats, limit gauges- Comparators: Mechanical, pneumatic and electrical types, applications. Angular measurements: -Sine bar, optical bevel protractor, angle Decker – Taper measurements.

**3. FORM MEASUREMENT****9**

Measurement of screw threads-Thread gauges, floating carriage micrometer-measurement of gears-tooth thickness-constant chord and base tangent method-Gleason gear testing machine – radius measurements-surface finish, straightness, flatness and roundness measurements.

**4. LASER AND ADVANCES IN METROLOGY****9**

Precision instruments based on laser-Principles- laser interferometer-application in linear, angular measurements and machine tool metrology Coordinate measuring machine (CMM)- Constructional features – types, applications – digital devices-computer aided inspection.

**5. MEASUREMENT OF POWER, FLOW AND TEMPERATURE RELATED PROPERTIES****9**

Force, torque, power: -mechanical, pneumatic, hydraulic and electrical type-Flow measurement: Venturi, orifice, rotameter, pitot tube –Temperature: bimetallic strip, pressure thermometers, thermocouples, electrical resistance thermister.

**L: 45; Total: 45****TEXT BOOKS**

1. Jain R.K., “Engineering Metrology”, Khanna Publishers, 1994
2. Alan S. Morris, “The Essence of Measurement”, Prentice Hall of India, 1997

**REFERENCES**

1. Gupta S.C, “Engineering Metrology”, Dhanpat rai Publications, 1984
2. Jayal A.K, “Instrumentation and Mechanical Measurements”, Galgotia Publications 2000
3. Beckwith T.G, and N. Lewis Buck, “Mechanical Measurements”, Addison Wesley, 1991
4. Donald D Eckman, “Industrial Instrumentation”, Wiley Eastern, 1985.

**LIST OF EXPERIMENTS**

**I.C ENGINE LAB AND FUELS LAB 30**

1. Valve Timing and Port Timing Diagrams.
2. Performance Test on 4-stroke Diesel Engine.
3. Heat Balance Test on 4-stroke Diesel Engine.
4. Morse Test on Multi cylinder Petrol Engine.
5. Retardation Test to find Frictional Power of a Diesel Engine.
6. Determination of Viscosity – Red Wood Viscometer.
7. Determination of Flash Point and Fire Point.

**STEAM LAB 15**

1. Study of Steam Generators and Turbines.
2. Performance and Energy Balance Test on a Steam Generator.
3. Performance and Energy Balance Test on Steam Turbine.

**Total: 45**