

DEVI AHILYA VISHWAVIDYALAYA, INDORE



FACULTY OF ENGINEERING

**SCHEME OF EXAMINATION
&
COURSE OF CONTENTS**

**BE II Year Program
(Mechanical Engineering)**

INSTITUTE OF ENGINEERING & TECHNOLOGY
(www.iet.dauniv.ac.in)

Scheme for B.E. II (**Mechanical Engineering**) effective from July 2007

B. E. II YEAR MECHANICAL ENGINEERING
Th- Theory, CW – Class Work, SW – Sessional Work, Pr – Practical

Semester III

Maximum Marks

SNo	Sub Code	Subject	L	T	P	Th	CW	SW	Pr	TOTAL
1.	2AM101	Applied Mathematics-III	4	-	-	100	50	-	-	150
2.	2ME102	Strength of Materials	4	-	2	100	50	50	50	250
3.	2ME103	Material Science	4	-	2	100	50	50	50	250
4.	2ME104	Manufacturing Processes	4	-	2	100	50	50	50	250
5.	2ME105	Applied Thermodynamics	4	-	2	100	50	50	50	250
6.	2SS007	Effective Communication Skills	2	-	-	-	50	-	-	50
	TOTAL		22	-	8	500	300	200	200	1200

Semester IV

SNo	Sub Code	Subject	L	T	P	Th	CW	SW	Pr	TOTAL
1.	2ME151	Industrial Engg. & Mgmt	4	-	-	100	50	-	-	150
2.	2ME152	Theory of Machines	4	-	2	100	50	50	50	250
3.	2ME153	Machine Design and Drawing	4	-	4	100	50	50	50	250
4.	2ME154	Mechatronics	4	-	2	100	50	50	50	250
5.	2ME155	Fluid Mechanics	4	-	2	100	50	50	50	250
6.	2SS057	Engineering Economics	2	-	-	-	-	50	-	50
	TOTAL		22	-	10	500	250	250	200	1200

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2AM101 APPLIED MATHEMATICS-III	L	T	P		TH	CW	SW	PR	Total
	4	-	-	Max	100	50	-	-	150
Duration of Theory Paper: 3 Hours				Min	35	25	-	-	60

Objective of the subject: The course aims at developing the Laplace Transform methods, useful in problems where mechanical/electrical driving force has discontinuities, is impulsive or is a complicated periodic function, fundamentals of Complex Analysis, applicable to potential theory useful in steady state conduction, electrostatic and gravitational fields, and the most basic Numerical Methods and concepts like error estimation, order of convergence, stability etc. Software like Matlab, MathCAD, Mathematica etc. can be used to simulate the results of various numerical methods.

Prerequisite(s): Basic knowledge of determinants, matrices, differentiation and integration of functions and complex numbers.

COURSE OF CONTENTS

UNIT I

Laplace transform: Definition and properties of Laplace transform, Inverse Laplace Transforms. Convolution theorem.

Application of Laplace transform in solution of ordinary differential equations:

Solution of ordinary differential equations with constant and variable coefficients. Simultaneous differential equations with constant coefficients.

UNIT-II

Function of Complex variables: Analytic functions, Cauchy-Riemann conditions, Harmonic functions, Conjugate functions and their applications.

Complex integral: Integration of complex functions, simply and multiply connected regions, Cauchy's integral theorem, Cauchy's integral formula, Singularities, Zeroes, Residues and Residue theorem.

UNIT-III

Numerical solutions of algebraic and transcendental equations: Bisection method, Regula-Falsi method, Newton-Raphson method, Direct iterative method, Graffe's root squaring method.

Solution of system of linear algebraic equation: Matrix inversion method, Gauss- elimination Method, Jordan's method, Crout's method. Gauss-Seidel iterative method

UNIT-IV

Interpolation: Finite difference operator, Interpolation formula with equal and unequal intervals. Divided differences and central differences.

Numerical differentiation and integration: Differentiation using forward, backward and divided difference General quadrature formula, Trapezoidal rule, Simpson's $1/3^{\text{rd}}$ rule, Simpson's $3/8^{\text{th}}$ rule, Weddle's rule.

UNIT-V

Numerical solution of ordinary differential equation: - solution by Euler's method, Euler' Modified method, Taylor's series. Picard's successive approximation method. Runge-kutta method. Milne's Predictors and Correctors method. Numerov's methods

Numerical solution of partial differential equation: Classification of second order Partial differential equation. Integration of elliptic, parabolic and hyperbolic equations by Iteration method. Method of Crank-Nicholson for space time problems.

RECOMMENDED BOOKS:

- [1] Francis J. Scheid, *Schaum's Outline of Numerical Analysis*, McGraw-Hill, New York, 1989.
- [2] Gupta P.P. & Malik G.S., *Calculus of Finite Differences and Numerical Analysis*, Krishna Prakashan Mandir, Meerut, 21/e, 2006.
- [3] B.S. Grewal, *Engineering Mathematics*, Khanna Publishers, 12/e, 2006.
- [4] S. S. Sastry, *Engineering Mathematics*, Vol I,II Prentice Hall Publication, 3/e, 2004.
- [5] Murray R. Spiegel, *Schaum's Outline of Complex Variables*, McGraw-Hill, NewYork, 1968.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2ME102 STRENGTH OF MATERIALS	L	T	P		TH	CW	SW	PR	Total
	4	-	2	Max	100	50	50	50	250
Duration of Theory Paper: 3 Hours				Min	35	25	25	25	110

Objective of the subject: With this subject the beginning of a Mechanical engineering starts for the II year Mechanical Engineering students. The subject introduce the students about the mechanics of a material by introducing the terms stress and strain. It gives an idea of behavior of a material comes under the different loading like tensile, compression, shear and torsion. The subject also covers the theory used in designing of column and struts.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Stress and strain: Tensile, compressive and shear stresses, complimentary shear stresses with varying cross section, Temperature stresses, Modulus of Elasticity. Modulus of rigidity, Bulk modulus, Poisson's ratio, Relations between the three moduli, Stress on oblique Section of a bar subjected to axial stress, Compound stresses, Principle stresses & strain, Mohr's circle of stresses and strain. Elastic strain energy, Different type of loading, Resilience, Proof resilience, Strain energy in Tensile, Static, Sudden falling, Gradually applied and Impact loading. Strain energy due to shear stresses.

UNIT-II

Shear force and Bending moment of Beams:

Beams, Classification of beams, Types of loading, span, Shear force and Bending moment, Relation between load, shear force and bending moment, shear force and bending moment diagram for cantilever and simply supported beam with concentrated load, Point load, uniformly distributed load, gradually varying load, Eccentric point load.

UNIT-III

Bending stresses & Deflection of Beams:

Introduction, Pure Bending, Simple Bending theory, Expression for Bending Stress, Moment of inertia of section, Bending Stresses in Symmetrical Section, Shearing stresses in Beams, Distribution of shearing stress in different sections..

Slope & Deflection of Beam subjected to Uniform Bending Moment, Relation between Slope, Deflection and Radius of Curvature, Deflection of simply supported beam carrying a point load and uniform distributed load, Macaulay's Method and Moment Area Method for finding out deflection of beam. ,

UNIT-IV

Torsion of Circular shaft:

Introduction, Pure Torsion, Torsional stress & strain in circular shafts, Polar moment of Inertia, Torsional moment of resistance, Torsion equation of circular shaft, Power transmitted by shaft, composite shaft, Strength of shaft, Torsional shear stress in shaft, Shaft of varying section.

UNIT-V

Columns & Struts:

Introduction, Classification of column, Failure of column Euler's theory for column, End conditions of column and struts, Equivalent length of column, Calculation of equivalent length for different end conditions of column, Slenderness ratio, limitations of Euler's formula, Rankin's formula for long column and eccentric loading. Formula for Indian standard code of practice.

BOOKS RECOMMENDED

- [1] Warnock Ramamurtham, *Strength of Materials*, Dhanpat Rai Publications, 1998
- [2] Bansal R K, *Strength of Materials, 4/e*, Laxmi Publications(P) Ltd, 2007
- [3] Popov *Mechanics of Solids, 2/e*, Pearson Education (India),
- [4] Timoshenko, *Elements of Strength of Materials, 5/e*, Wadsworth Publishing; 1968

LABORATORY EXPERIMENTS:

1. Performance of Tensile test to obtained Tensile properties of the material
2. Performance of Tensile test to obtained Stress-Strain curve
3. Performance of Compressive test to obtained Compressive properties of the material.
4. Performance of Shear test to obtained Shear properties of the material
5. Performance of Bending test to obtained Bending properties of the material.
6. Performance of Brinell Hardness Test.
7. Performance of Vickers Hardness Test.
8. Performance of Torsion test to obtained torsional properties of the material.
9. Performance of Torsion test to obtained T- θ Curve
10. Performance of Impact test to obtained Impact Strength of the materials.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2ME103 MATERIAL SCIENCE	L	T	P		TH	CW	SW	PR	Total
	4	-	2	Max	100	50	50	50	250
Duration of Theory Paper: 3 Hours				Min	35	25	25	25	110

COURSE OF CONTENTS

Objective of the subject: The objective of the subject to introduce the students about the different materials used in the engineering applications and study of different mechanical properties and performance of the materials.

Prerequisite(s): Engineering Chemistry.

UNIT-I

Ferrous and Non-Ferrous Metals and Alloys:

Properties and application of various steels and cast iron. Effect of impurities, in ferrous metals. Effect of common alloying elements on the steels, High speed steels, Stainless steel, Other steel. Corrosion and its prevention. Composition, microstructure, properties and applications of Aluminium and its principle alloys, Copper and its principle alloys, Nickel and its principle alloys.

UNIT-II

Mechanical Properties & Equilibrium Diagram:

Various mechanical properties like strength, stiffness, elasticity, plasticity, ductility, hardness, impact strength, malleability, brittleness, toughness, resilience, etc Allotropy structure of alloys, lever rule, phase rule, Various types of phase diagrams. Cooling curves, Iron carbon equilibrium diagram . TTT diagrams.

UNIT-III

Heat Treatment of Metals and Alloys and Powder metallurgy:

Heat treatment procedure for steel hardening, harden ability, Surface hardening of steel, Defects in heat treated parts. Strengthening mechanisms. Manufacturing of metal powders. Sintering and secondary operations. Projects of finished parts. Design considerations and applications. Composite materials.

UNIT-IV

Destructive and Non-Destructive Testings:

Tensile, compression, shear, torsion fatigue, impact, hardness tests. Ultrasonic, magnetic, eddy current, radiography tests etc. Metallography. Introduction to instrumental methods of analysis.

UNIT-V

Discription of Crystal Structure and Dislocation:

Seven Crystal System. Bravais lattice. Symmetry and properties of simple crystal structure Millers indices. Direction and planes indices. Edge Dislocation, Screw dislocations slip planes. Stress fields of dislocation. Grain Boundaries. Dislocation Densities. Strength of alloys. Dislocations and crystal growth.

BOOKS RECOMMENDED

- [1] Khanna, O.,P., *Material Science and Metallurgy*, Dhanpat Rai Publications,2005
- [2] Nayak, S.,P., *Engineering Metallurgy & Material Science*, Charotara Publications,2000
- [3]Narang., *Material Science*, Khanna Publisher-2000
- [4] Singh,I. P., *Material Science and Engineering* , Jain Brothers-2003

LABORATORY EXPERIMENTS

1. Performance of hardness test of ferrous materials using Rock Well hardness testing machine
2. Performance of magnetic particle crack detection to detect the cracks
3. Performance of impact test on a plastic test sample to detect impact strength of materials.
4. Study of construction and function of metallurgical microscope
5. Study of steps involved in sample preparation for observing the microstructure under metallurgical microscope
6. Study of microstructures of ferrous metal alloys
7. Study of iron carbon diagram
8. Study the working of ultrasonic crack detector
9. Study of T.T.T. diagram and various heat treatment process

Devi Ahilya University, Indore, India Institute of Engineering & Technology				II BE (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2ME104 Manufacturing Processes	L	T	P		TH	CW	SW	PR	Total
	4	-	2	Max	100	50	50	50	250
Duration of Theory Paper: 3 Hours				Min	35	25	25	25	110

Objective of the subject: To provide understanding about different manufacturing operations along with practical exposure of manufacturing processes.

Prerequisite(s): nil

COURSE OF CONTENTS

Unit-I

Production of A symmetric Parts:

Introduction to Turning and related processes, turning parameters, constructional features and operation of turning and related machine tools: Lathes, Capstan-Turret lathes, Automats, CNC lathes, Machining centers and Turning centers. Single point cutting tools: types and geometry.

Unit-II

Production of Prismatic Parts:

Fundamentals of Shaping, Planning and Milling processes, constructional features and operation of Shaper, Planner, Slotter and Milling machines, tool holding, work holding and indexing methods. Types of milling cutters.

Unit-III

Drilling, Broaching, Screw Thread and Gear cutting:

Introduction to operations like Drilling, Boring, Reaming, Counter Boring and Counter Sinking. Cutting tools, tool holding and work holding devices. Machine Tools for drilling and related hole making processes, accuracy and finish of drilled holes, Broaching process and Broaching machines, power calculations. Geometry of multipoint cutting tools like drill, reamer, broach and taps.

Types of Threads, External and Internal thread cutting processes. Gear: Types and Methods of Gear manufacturing.

Unit-IV

Abrasive Machining:

Introduction, types of abrasives and bonds, marking system for grinding wheels and their selection criteria, mechanics of grinding, truing and dressing of grinding wheels, grinding machines for cylindrical and surface grinding, tool & cutter grinders. Safety in grinding, other abrasive processes: Honing, Lapping, Super finishing, Polishing and Buffing.

Unit-V

Metrology:

Limits, tolerances and fits: Need for limit systems, interchangeability, statistical assembly, selective assembly, limit system. Taylor's principles of gauge design, gauge tolerance and wear allowances, types of limit gauges, thread or screw gauges, advantages & limitation of limit gauges. Measurement and inspection of external screw threads and gears.

BOOKS RECOMMENDED

[1] DeGarmo E.Paul, *Materials and Processes in Manufacturing*, Pearson Education.

[2] Sharma P. C., *Production Technology, Production Engineering*, S.Chand and Co.

[3] HMT *Production Technology*, Tata McGraw-Hill Publishing Company Ltd.

[4] Chapman W.A.J., *Workshop Technology Part1,2 and,3, 4ed*, Viva Books Private Ltd.

LABORATORY EXPERIMENTS

- 01 Study of geometry of single point cutting tools.
- 02 Study of geometry of milling cutters.
- 03 Study of geometry of double fluted twist drill.
- 04 Study of geometry of Taps and Reamer.
- 05 Study of constructional features of the Lathe and to machine a job as per given dimensions on it.
- 06 Study of constructional features of the Shaper and to machine a job as per given dimensions on it.
- 07 Study of constructional features of the Milling m/c and to machine a job as per given dimensions on it.
- 08 Study of constructional features of the CNC lathe.
- 09 Study of comparators.
- 10 Measurement and inspection of screw threads and cutting tools using a Tool Makers Microscope and Profile Projector.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2ME105 APPLIED THERMODYNAMICS	L	T	P		TH	CW	SW	PR	Total
	4	-	2	Max	100	50	50	50	250
Duration of Theory Paper: 3 Hours				Min	35	25	25	25	110

Objective of the subject: To make a fundamentally strong base to design Thermal System.

Pre requisites: Elements of Mechanical Engineering

COURSE OF CONTENTS

UNIT-I:

Second Law of Thermodynamics: Qualitative difference between Heat and Work, Cyclic Heat Engine, Kelvin-Planck statement, Clausius' statement, Refrigerator and Heat pump, Equivalence of Kelvin-Planck and Clausius' statement, Reversibility and Irreversibility, Carnot's Theorem, Corollary of Carnot's theorem, Absolute thermodynamic temperature scale.

UNIT-II

Entropy: Introduction, Clausius' theorem, Property of Entropy, Entropy principle and applications, Entropy generation in Closed system, Entropy transfer with heat flow, Entropy and disorder, Absolute entropy, Postulatory thermodynamics.

UNIT-III

Energy: Introduction, Available energy, Quality of energy, Maximum work in a reversible process, Reversible work by an open system exchanging heat with the surroundings, useful work, Dead state, Availability.

UNIT-IV:

Thermodynamic Relations: Mathematical theorems, Maxwell's equations, TdS Equations, Difference in heat capacities, Ratio of heat capacities, Energy equation, Joule-Kelvin effect, Evaluation of thermodynamic properties, General thermodynamic considerations.

UNIT-V:

Compressors: Introduction, Types of compressors, Compression Processes, Work done in compression, Single stage Reciprocating air compressor, Volumetric efficiency, Multi-stage compression, Advantages of Multi-staging, Air motors, Introduction to Rotary compressors.

RECOMMENDED BOOKS

- [1] P.K. Nag, *Engineering Thermodynamics*, Tata McGraw-Hill Co, 2005
- [2] Y.A. Centgel, *Thermodynamics- An Engineering Approach*, Tata McGraw-Hill Co, 2003.
- [3] R. Yadav, *Thermodynamics and Heat Engines*, Central Publishing House, 2002.
- [4] G. E. Myers, *Engineering Thermodynamics*, Prentice Hall Englewood Cliffs, 1989.

LABORATORY EXPERIMENTS:

1. Finding out the Coefficient of Performance of a refrigerator.
2. Finding out Energy Performance Ratio of a refrigerating plant used as a heat pump.
3. Establishing the relation between EPR and COP.
4. Carrying out the Exergy analysis of any component of thermal power plant.
5. Verifying the entropy principles in generalized fluid flow.
6. Finding out the Isothermal, Volumetric Efficiency of the Reciprocating Air Compressor.
7. Finding out the effectiveness of the intercooler in two stage compressor.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Common to All Branches)						
Subject Code & Name		Instructions Hours per Week			Marks					
2SS007 EFFECTIVE COMMUNICATION SKILLS	L	T	P		TH	CW	SW	PR	Total	
	2	-	-	Max	-	50	-	-	50	
	Duration of Theory Paper: Only Internal Tests			Min	-	25	-	-	25	

Course Objectives: To develop effective communication skills in engineers for expressing the technical ideas and for discussing the technical issues with confidence.

Prerequisite(s): Technical English

COURSE OF CONTENTS

Unit-I

Fundamentals of Communication: The Importance of Communication; the Basic forms of Communication; The Process of Communication; Why Communication is necessary?; Art of Communication.

Unit-II

Inter-personal skills: Building Positive Relationships; Giving Praise; Dealing with Criticism; Managing Conflicts; Telephone speaking skills and Cross-cultural communication skills

Unit-III

Listening- The importance of listening; Barriers to Effective Listening; Approaches to Listening; How to be a Better Listener; What speakers can do to ensure better listening.

Unit-IV

Interviews: Points to be remembered as an interviewer or an interviewee; Commonly asked questions; Types of interviews; Do's and Don'ts.

Unit-V

Making Presentations: Speech Purpose- General and Specific; Methods of Speaking; Analyzing the Audience; Non-verbal Dimensions of Presentation, Group Discussions: Importance; Process; Points to be kept in mind while participating; Do's and don'ts.

Note: *There shall be seminars and practice sessions by students.*

BOOKS RECOMMENDED

- [1] P D Chaturvedi, P.D. & M Chaturvedi, *Business Communication: Concepts, Cases and Applications*, Pearson Education, Singapore Pvt. Ltd, 2004.
- [2] ICMR, *Business Communication*, Feb 2001.
- [3] J Davies, *Communication Skills: A Guide for Engineering and Applied Science Students*, 2/e Pearson Education, 2006.
- [4] Lecture material given by the course teacher.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2ME151 INDUSTRIAL ENGG & MANAGEMENT	L	T	P		TH	CW	SW	PR	Total
	4	-	-	Max	100	50	-	-	150
Duration of Theory Paper: 3 Hours				Min	35	25	-	-	60

Objective of the subject: To provide understanding about industrial management practices along with their linkages to organizational efficiency and effectiveness.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Methods Engineering:

Introduction to Methods Engineering and Productivity, Methods study, Recording techniques, Work Measurement tool and techniques. Work place Design - Fundamental of Work place Design. Introduction to job Evaluation and Wage Incentive Schemes

UNIT-II

Operations Management:

Introduction to Operations management, manufacturing v/s service, Tools and Techniques. Types of Production system. Facilities planning, Introduction to plant Layout .

UNIT-III

Organization and Management:

Principles of Management and Management functions. Organization, Principles, Structures, Span of Control, Delegation, Centralization and Decentralization, Formal and Informal Organizations. Personal Management, Introduction, Communication, Motivation and Leadership.

UNIT-IV

Quantitative Techniques for Decision Making:

Introduction to operation Research, Basic Transportation and Assignment Models and Their Applications, Network Techniques and its Application

UNITV-V

Quality Control:

Quality planning and quality control Programme. Economics of Quality control. and control chart for variables and attributes. Introduction to TQM

RECOMMENDED BOOKS :

1. I.L.O., *Work study*.
2. Monks, J.E. *Operations Management*, Mc. Graw Hills
3. Hira and Gupta, *Operation Research*, S. Chand and Co, New Delhi
4. Mahajan, *Statistical Quality Control*, Dhanpat Rai, New Delhi

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2ME152 THEORY OF MACHINES	L	T	P		TH	CW	SW	PR	Total
	4	-	2	Max	100	50	50	50	250
Duration of Theory Paper: 3 Hours				Min	35	25	25	25	110

Objective of the subject: To provide knowledge about the different kinematic pairs and the relationship between the different mechanical linkages. The subject provide enough knowledge about the analysis of mechanical forces, velocity and acceleration analysis on different mechanical pairs and link.

Prerequisite(s): nil

COURSE OF CONTENTS

UNIT-I

Basics of theory of machines:

Degree of Freedom (Grubler's criterion), Inversions of Quadric cycle chain, single and double slider crank mechanism. Grashof's criterion, Types of kinematic synthesis, Chebychev spacing method for 3- positions, Synthesis of four bar function generator, Study Pantograph, Straight line mechanisms, Steering Mechanisms (Ackerman's mechanism, Delay's Steering Gear mechanism). Hooke's joint and engine indicators. Determination of velocity and acceleration by analytical and/or graphical methods.

UNIT-II

Velocity and acceleration diagrams:

Determination of velocity and acceleration by analytical and/or graphical methods of various mechanisms. Coriolis components, Klien's construction.

UNIT-III

Cams:

Types of Cams and followers, Cam profiles with specified follower motion e.g. simple harmonic, constant velocity and acceleration types, Cams with specified contours. Tangent Cams, Displacement, Velocity and Acceleration of followers.

UNIT-IV

Toothed Gearing :

Types of gears, Terminologies of various gears (Spur. Bevel gear, Helical gear, Worm and Worm wheel), Condition for correct gearing. Tooth profiles (cycloidal and involute). Gear trains, Epicyclic gear trains and their applications.

UNIT-V

Gyroscopes :

Product of inertia, Principle axis, Gyroscopic motion, Gyroscopic torque, Gyrostabilizer, Gyrocompass. Application to ships and aeroplanes. Stability of two & four wheelers.

RECOMMENDED BOOKS :

- [1] T. Bevan, *Theory of Machines*, CBS Publications & Distributions, 2000
- [2] J. Shigley, *Theory of Machines and mechanisms*, Oxford University, 2006.
- [3] Ambekar, A.G., *Mechanism and Machine Theory*, Jain Brothers-2005
- [4] Singh Sadhu, *Theory of Machines*, Pearson's Education -2006.

LABORATORY EXPERIMENTS

1. Study of cam and follower and finding velocity and acceleration of follower
2. Study of slider crank mechanism
3. Study of different kinematic pairs
4. Generation of involute teeth profile for different gears
5. Performance of interference and undercutting of tooth (by plotting)
6. Study of gyroscopic effect using gyroscope
7. Reducing and enlarging drawings using pantograph
8. Study of Double Hooks joint
9. Study of Oldham's coupling
10. Verification of Grashof's law
11. Study of automobile steering gears

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year(Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2ME153 MACHINE DESIGN & DRAWING	L	T	P		TH	CW	SW	PR	Total
	4	-	4	Max	100	50	50	50	250
Duration of Theory Paper: 3 Hours				Min	35	25	25	25	110

Objective of the subject: Objective of the subject is to familiar the students with the design concepts and to provide the application of drawing in the design of different mechanical parts.

Prerequisites : Engineering Drawing.

COURSE OF CONTENTS

UNIT-I

Engineering Materials: General selection of materials. Manufacturing Considerations in Design: Tolerances, Fits and Surface Roughness. Design and Drawing of Machine parts subjected to Tensile, Compressive and Shear Stresses such as Levers, Pins, Keys and Cotter.

UNIT-II

Riveted Joints: Design and Drawing of Boilers, Structures and Eccentrically Loaded joints. Welded Joints: Design and Drawings, Strength calculation for direct and eccentric loading.

UNIT-III

Screwed Fastenings: Design of bolts, Eccentric loading and Turnbuckle. Power Transmission Elements: Design of shafts and Couplings.

UNIT-IV

Machine Parts Drawings: Free Hand Sketches and fully dimensioned drawings of IC Engine Parts-Piston, Piston Rod, Connecting Rod, Crank Shaft and Flywheel using conventions and standard practices.

UNIT-V

Boiler Mountings: Free Hand Sketches and fully dimensioned drawings of Stop Valve, Feed Check Valve, Safety Valve and Blow off Cock using conventions and standard practices.

RECOMMENDED BOOKS:

- [1]. Abdulla Sharif, *Design of Machine Elements*, Dhanpat Rai Publications (P) Ltd, New Delhi, 1995
- [2]. P. C. Sharma, D. K. Agrawal, *Machine Design*, S. K. Kataria & Sons, New Delhi, 2007
- [3]. K. Mahadevan, K. Balaveera Reddy, *Design Data Hand Book*, CBS Publishers & Distributors, New Delhi, 2007
- [4]. P. S. Gill, *Machine Drawing*, S. K. Kataria & Sons, New Delhi 2007

LABORATORY EXPERIMENTS:

1. Application Program for Selection of Materials, Tolerances, Fits, and Surface Roughness using Computer Programming Languages such as C++ etc
2. Manual Design and Design Program for Keys, Pins and Cotters using Computer Programming Languages such as C++ etc
3. Manual Design and Design Program for Riveted Joints using Computer Programming Languages such as C++ etc
4. Manual Design and Design Program for Welded Joints using Computer Programming Languages such as C++ etc
5. Manual Design and Design Program for Bolts using Computer Programming Languages such as C++ etc
6. Manual Design and Design Program for Shaft and Couplings using Computer Programming Languages such as C++ etc
7. Manual Drawing of Piston and Piston Rod on Drawing Sheet
8. Manual Drawing of Connecting Rod on Drawing Sheet
9. Manual Drawing of Crank Shaft and Flywheel on Drawing Sheet
10. Manual Drawing of Stop Valve on Drawing Sheet.
11. Manual Drawing of Feed Check Valve on Drawing Sheet.
12. Manual Drawing of Safety Valves on Drawing Sheet.
13. Manual Drawing of Blow of Cock on Drawing Sheet.
14. Computer Aided Drawing of Any one of the Machine Parts using CAD Packages such as AutoCAD Inventor and IDEAS.
15. Computer Aided Drawing of Any one of the Boiler Mountings using CAD Packages such as AutoCAD Inventor and IDEAS.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year(Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2ME154 MECHATRONICS	L	T	P		TH	CW	SW	PR	Total
	4	-	4	Max	100	50	50	50	250
Duration of Theory Paper: 3 Hours				Min	35	25	25	25	110

Objective of the subject: The present course is intended for the undergraduate students of mechanical engineering to give an introduction to the development of mechatronic systems by considering the modeling of the dynamics of the components, their interactions and overall behaviour and by describing the components of information processing from sensors through microcomputers/microcontrollers to actuators.

Prerequisites : Basic understanding of the electrical and electronic devices along with the concepts of digital electronics and a basic course in computer science and engineering.

COURSE OF CONTENTS

Unit-I

Introduction to mechatronics:

Elements of a mechatronic system, Mechatronic design process, Application in mechatronics. Introduction to signals & system: Block diagram approach to system modeling, Modeling of electrical, mechanical, translational and rotational, fluid and thermal systems, Measurement of system response, Linearization of non linear systems, Fourier series representation of signals, O/P response of first order systems.

Unit-II

Sensors & Transducers:

Introduction of sensors and transducers, Performance characteristics of sensors and measurement systems, Sensors for motion & position measurement, Force torque & tactile sensors, Flow sensors, Temperature measuring devices, Ultra sonic sensors, Range sensors, Active vibration control using magnetostrictive transducers, Semiconductor, Fiber optic & microelectromechanical system(MEMS) devices in mechatronics.

Unit-III

Signal conditioning & recording of data:

Basic steps of signal conditioning, Devices for signal conditioning & data conversion : Voltage divider & rectifiers , bridge circuits, Operational and instrumentation amplifiers ,comparators & oscillators multiplexers, timers, amplitude modulation & demodulation ,voltage to frequency & frequency to voltage converters, pulse width modulation., Analog to digital conversion & digital to analog conversion ,Data recording & display devices.

Unit-IV

Actuators:

Introduction , Mechanical actuation systems , Electrical actuation systems: solenoids & relays, electric motors: DC motors , AC motors , Stepper motors, Servo motor drive circuits , selecting a motor , Fluid power actuators, Piezoelectric actuators, Power amplifiers & actuators drives.

Unit-V

Interfacing & control of mechatronic systems:

Elements of a data acquisition & control system, Overview of input / output systems: Interfacing, I/O addressing , Interface requirements , Peripheral interface adapters , serial common interface , Input /Output card & software, open systems, Communication interfaces. Introduction of various control systems, Control modes and control system performance, velocity control & adaptive control.

BOOKS RECOMMENDED

- [1] W.Bolton, *Mechatronics, 3rd Ed*, Pearson Education.
- [2] Nitai Gour & P.Mahalik, *Mechatronics: Principles, concepts and applications*, Tata McGraw-Hill Publishing Company Ltd.
- [3] Michael B.Histand & David Alciatore, *Introduction to mechatronics and measurement systems*, McGraw-Hill Publication.
- [4].Peckwith & Buck, *Mechanical Measurement* Addison Wesley Publishing company,Inc.Reading
- [5].D.S.Kumar, *Measurment & Control* Metropolitan Book Co. Delhi.
- [6].Narka and Choudhary, *Instrumentation, Measurement and analysis* Tata Mc Graw Hill,2e,2003

LABORATORY EXPERIMENTS

- 01 Study of electrical resistance strain gauges.
- 02 Study of linear variable differential transformer(LVDT).
- 03 Study of capacitive transducer.
- 04 Study of piezoelectric transducer.
- 05 A mechatronic approach to the study of the following:
 - Printers, Photocopier machine, Ignition system in automobiles, TV remote control, Washing Machine etc.
- 06 Calibration of pressure gauge using dead weight pressure gauge tester.
- 07 Calibration of orifice plate using anemometer.
- 08 Study and Calibration of Thermocouple.
- 09 Study on Hydraulic system power pack.
- 10 Study on Pneumatic system power pack.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Mechanical Engg.)					
Subject Code & Name	Instructions Hours per Week			Marks					
2ME155 FLUID MECHANICS	L	T	P		TH	CW	SW	PR	Total
	4	-	2	Max	100	50	50	50	250
	Duration of Theory Paper: 3 Hours			Min	35	25	25	25	110

Objective of the subject:

To make a fundamentally strong base to design fluid systems and understand the different fluid properties.

Prerequisites : Engineering Thermodynamics.

COURSE OF CONTENTS

UNIT I

Review of Fluid Mechanics:

Introduction, Fluid Properties, Pressure and its measurement, Hydrostatic forces on submerged surfaces, Buoyancy and Stability. Relative Equilibrium.

Fluid Kinematics: Lagrangian and Eulerian Approaches, Fundamentals of Flow visualization, Potential flow, Stream function and Velocity Potential function, Vorticity, Rotationality and Circulation, Flow Nets, Reynold's Transport Theorem.

UNIT II

Fluid Dynamics:

Introduction, Conservation of mass, Mechanical energy and efficiency, Bernoulli's equation, Applications of Bernoulli's equation, Correction factors, Newton's Law and Conservation of momentum, Linear Momentum equation, Angular Momentum equation. Introduction to boundary layer, Laminar and Turbulent boundary layers, Boundary Layer Thickness, Reynold's Number, Boundary Layer Separation.

UNIT III

Flow Over Bodies:

Introduction, Navier-Stokes Equations, Drag and Lift, Friction and Pressure Drag, Drag Coefficients of common geometries, Parallel Flow over Flat Plates, Flow over Cylinders and Spheres, Aerofoils, Lift, Von-Karmon Vortex Street, Kutta-Joukowski Equation.

UNIT IV

Flow Trough Conduits:

Flow through Pipes: Introduction to Laminar and Turbulent Flows, Entrance region, Fully Developed flow, Laminar Flow in pipes, Turbulent flow in pipes, Losses in Pipe flow, Hagen-Poiseuille's Equation, Dracy's Weisbach Equation, Moody's Chart, Piping Networks.

Open Channel flow: Classification, Froude Number and Wave Speed, Specific energy, Continuity and Energy equations, Uniform flow and Gradually Varied flow.

UNIT V

Compressible Flow:

Stagnation Properties, Speed of Sound and Mach Number, One- Dimensional Isentropic Flow, Isentropic Flow Through Nozzles, Shock Waves and Expansion Waves, Rayleigh and Fanno Flows. Introduction to Computational Fluid Dynamics(CFD)System.

RECOMMENDED BOOKS-

- [1] D. S Kumar, *Fluid Mechanics and Fluid Power Engineering*, S.K. Kataria & Sons, 2007
- [2] John F. Douglas, *Fluid Mechanics*, Pearson Education, 2005.
- [3] Y.A. Centgel, *Fluid Mechanics: Fundamentals and Applications*, McGraw-Hill Co, 2003.
- [4] V. L. Streeter and E. B. Wylie, *Fluid Mechanics*, McGraw-Hill Co, 2003.
- [5] C. White, *Fundamentals of Fluid mechanics*, McGraw-Hill Co, 2003.

LABORATORY EXPERIMENTS:

1. To verify Bernoulli's Theorem
2. Calibration of Venturi-meter and Orifice-meter.
3. To find the Friction Coefficient of different pipes.
4. To Determine Coefficient of impact for the vanes.
5. Determination of different coefficients of the orifice
6. Calibration of external cylindrical mouth pieces of different diameters/ Different L/D ratios
7. Calibration of internal cylindrical or Borda's mouth piece.
8. To Visualize the Forced/ Free Vortex Phenomenon.
9. To determine loss of head in the fittings at various water flow rates.

Devi Ahilya University, Indore, India Institute of Engineering & Technology				BE II Year (Common to All Branches)					
Subject Code & Name	Instructions Hours per Week			Marks					
2SS057 Engineering Economics	L	T	P		TH	CW	SW	PR	Total
		2	-	-	Max	-	50	-	-
Duration of Theory Paper: Only Internal Tests				Min	-	25	-	-	25

Objective of the subject: To make fundamentally strong base for decision making skills by applying the concepts of economics and accounting to cope up with the current dynamic business environment

Prerequisites : nil

COURSE OF CONTENTS

Unit-I

Engineering Economics: Economic Decision: Role of Engineering in Business; Concept, Nature and Scope of Economics & Business Economics; Types of Business Organizations.

Cost, Revenue and Profit Analysis: Cost Classifications for Predicting Cost Behavior; Concept of Profit, Gross Profit and Net Profit; Break Even Point (BEP).

Unit-II

National Income: Meaning and Concept of National Income: GNP/GNI, NNP/NNI, Personal Income and Disposable Income; Methods of Computing National Income -Production Method, Income Method, Expenditure Method.

Unit-III

Consumer Demand : Consumer Demand Analysis: Meaning, Features and Determinants of demand; Law of Demand and its Exceptions; Reasons for Law of Demand; Importance of Law of Demand; Elasticity of Demand.

Unit-IV

Production Supply : Production Supply Analysis: Meaning, Supply Function, Law of Supply, Determinants of Supply, Fluctuation of supply; Elasticity of supply and its measurement.

Unit-V

Liberalization : Liberalization, Globalization & Privatization: Concept & Characteristics; Evaluation of New Liberal Economic, Policy of India; Economy through Globalization.

BOOKS RECOMMENDED

[1]C S Park, *Contemporary Engineering Economics*, Pearson Education, 2002

[2]J S Chandan, *Statistics for Business and Economics*,

[3]C Dislis, JH Dick, I D Dear & AP Ambler, *Test Economics and Design for Testability*,

[4]S Damodaran, *Managerial Economics*,