05/09/18

Most urgent
Date bound

Chaudhary Devi Lal University
Sirsa, Haryana, Pin- 125055, (India)

Paper Assessment Scheme

For

Under Graduate Course,
For 4 Year(s) Bachelor Degree Program in

Faculty of Physical Science

Bachelor of Technology(B.Tech.)
(Credits System)

(w.e.f. 2017-18-Regular)
Mechanical Engineering
Course Code:

May be forwarded to Dean, faculty of Engg for notification, ll

Supdt. EDP Branch
I/C EDP

Dean (Faculty Engg.) / AR (Acad)

III Sem

Paper Name: Instrumentation
Paper Code: ECE-211-L Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Lectures	3	2.50	Theory	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

Paper Name: Fundamentals of Management
Paper Code: HUM-201-L Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Lectures	3	3.00	Theory	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

Paper Name: Mathematics-III
Paper Code: MAT-201-L Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Lectures	3	3.50	Theory	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

Paper Name: Mechanics of Solids-I
Paper Code: ME-201-L Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Lectures	3	3.50	Theory	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

Paper Name: Mechanics of Solids Lab
Paper Code: ME-201-P Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Practical	2	1.00	Practical	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

Paper Name: Production Technology
Paper Code: ME-203-L Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Lectures	3	3.50	Theory	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

Paper Name: Production Technology Lab
Paper Code: ME-203-P Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Practical	3	1.50	Practical	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

Paper Name: Thermodynamics
Paper Code: ME-205-L Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Lectures	3	3.50	Theory	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

Paper Name: Machine Drawing
Paper Code: ME-207-L Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Lectures	1	3.00	Theory	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

Paper Name: Personality Development
Paper Code: PSY-201-L Min: -- Max: 100

TLM	Hrs	Credits	AM	Min	Max	AT	Min	Max	Evaluation System
Lectures	3	0.00	Theory	40 -	100	EA	28	70	Marks System
						IA	12	30	Marks System

20/4/18

Course Part: S.Y.B.Tech.

Term: Sem-III

The papers for S.Y.B.Tech. - Sem-III are classified into following groups:

1.Core Group (Min Papers: 10, Max Papers: 10,
Separate Passing Head: No, Max. Marks: 0)
Select minimum 10 paper(s)
Select maximum 10 paper(s)
Papers:

HUM-201-L	Fundamentals of Management
MAT-201-L	Mathematics-III
ECE-211-L	Instrumentation
ME-201-L	Mechanics of Solids-I
ME-203-L	Production Technology
ME-205-L	Thermodynamics
ME-207-L	Machine Drawing
ME-201-P	Mechanics of Solids Lab
ME-203-P	Production Technology Lab
PSY-201-L	Personality Development

Term: Sem-IV

The papers for S.Y.B.Tech. - Sem-IV are classified into following groups:

-035

(2)

3rd - 4th

Scheme and Syllabus

2nd year B. Tech. (Mechanical Engineering)
(w.e.f. 2016-2017 batch)

DEPARTMENT OF MECHANICAL ENGINEERING

GURU JAMBHESHWAR UNIVERSITY OF SCIENCE AND TECHNOLOGY, HISAR

Scheme

2nd year B. Tech. (Mechanical Engineering)

(w.e.f. 2016-2017 batch)

III- Semester

Subject Area	Subject Code	Subject Name	Contact Hours			Credits
			Lecture	Tutorial	Practical	
HS-4	HUM-201-L	Fundamentals of Management	3	-	-	3.0
BS-6	MAT-201-L	Mathematics-III	3	1		3.5
ES-6	ECE-211-L	Instrumentation	2	1	-	2.5
PC-1	ME-201-L	Mechanics of Solids-I	3	1	-	3.5
PC-2	ME-203-L	Production Technology	3	1	-	3.5
PC-3	ME-205-L	Thermodynamics	3	1	-	3.5
PC-4	ME-207-L	Machine Drawing	1	4	-	3.0
PC-1	ME-201-P	Mechanics of Solids Lab	-	-	2	1.0
PC-2	ME-203-P	Production Technology Lab	-	-	3	1.5
			18	9	5	25.0
				32		25.0
MC-3	PSY-201-L	Personality Development	2	1	-	2 units
		Total		**35**		**25.0**

IV- Semester

Subject Area	Subject Code	Subject Name	Contact Hours			Credits
			Lecture	Tutorial	Practical	
ES-7	EVS-201-L	Environmental Studies	3	-	-	3.0
BS-7	MAT-202-L	Numerical Methods	3	-	-	3.0
PC-5	ME-202-L	Material Science	3	1	-	3.5
PC-6	ME-204-L	Fluid Mechanics	3	2	-	4.0
PC-7	ME-206-L	Steam and Power Generation	3	1	-	3.5
PC-8	ME-208-L	Mechanics of Solids-II	3	2	-	4.0
PC-5	ME-202-P	Material Science Lab	-	-	2	1.0
PC-6	ME-204-P	Fluid Mechanics Lab	-	-	2	1.0
PC-7	ME-206-P	Steam and Power Generation Lab	-	-	2	1.0
BS-7	MAT-202-P	Numerical Methods Lab	-	-	2	1.0
			18	6	8	25.0
				32		25.0
MC-4	ME-210-P	Skills and Innovation Lab	-	-	3	2 units
		Total		**35**		**25.0**

Note: At the end of IV-semester each student would undergo 4-6 weeks practical Training in an Industry/Research laboratory.

Subject Area	Abbreviation
Humanities and Social Sciences	HS
Basic Sciences	BS
Engineering Sciences	ES
Professional subjects-Core	PC
Professional subjects-Electives	PE
Open subjects-Electives	OE
Project Work, Seminar and/or Internship in industry or elsewhere	PW
Mandatory Courses (Qualifying) – Non Credit	MC

25/7/16

Dean (F&T)

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FUNDAMENTALS OF MANAGEMENT

General Course Information:

Course Code: HUM-201-L Course Credits: 3.0 Contact Hours: 3 hours/week. Mode: Lectures Examination Duration: 3 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus; it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite:

The students should have basic understanding of the concept of management and business organizations.

Course Objectives and Outcomes:

The objectives of this course are:

1. To enhance knowledge skills and attitude to Management.
2. To understand management and its relationship with organisation.

By the end of the course a student is expected:

1. To develop the basic understanding of the concept of management and functions of management.
2. The students will come to know about Human Resource management and Marketing management functions of management.
3. Students will come to know about the production activities of any manufacturing organisations.
4. To know that how finances are arranged and disbursed for all the activities of business organisations.

Course Contents

UNIT-I

Concept of Management: Definitions, Characteristics, Significance, Practical Implications; Management Vs. Administration; Management- Art, Science and Profession; Development of Management Thoughts; Managerial Functions.

UNIT-II

Concept of Human Resource Management: Human resource planning, Recruitment, Selection, Training and Development, Compensation; Concept of Marketing Management: Objectives and functions of Marketing, Marketing Research, Advertising, ConsumerBehaviour.

UNIT-III

Concept of Production Management, Production Planning and Control, Material management, Inventory Control, Factory location and Production Layout.

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UNIT-IV

Concept of Financial Management, Capital Structure and various Sources of Finance, Working Capital, Short term and long term finances, Capital Budgeting.

Text Books:

1. Principles and Practices of Management: R. S. Gupta, B. D. Sharma, N. S. Bhalla; Kalyani Publishers.
2. Organisation and Management: R. D. Aggarwal; Tata McGraw Hill.

Reference Books:

1. Marketing Management: S. A. Sherlikar; Himalaya Publishing House.
2. Financial Management: I.M. Pandey, Vikas Publishing House.
3. Production Management: B. S. Goel; Himalaya Publishing House.

MATHEMATICS-III

General Course Information:

Course Code: MAT-201-L Course Credits: 3.5 Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus; it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite:

Basic knowledge of calculus, complex analysis and statistics.

Course Outcomes:

By the end of the course a student is expected:

1. Problems of Fourier series and Fourier transforms used in engineering applications
2. Calculation of improper/ singular integrals with the help of complex analysis
3. Statistical tests for system goodness.
4. Problems of LPP and their interpretation.

Course Contents

UNIT-I

Fourier Series and Fourier Transforms: Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series. Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes), Fourier transforms of derivatives, Fourier transforms of integrals, convolution theorem, Fourier transform of Dirac delta function.

UNIT-II

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, 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. Integration of complex functions. Cauchy Theorem, Cauchy- Integral formula.

UNIT-III

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series.Zeroes and singularities of complex functions. Residues.Evaluation of real integrals using residues (around unit and semi circle only).

UNIT-IV

Probability Distributions and Hypothesis Testing: Expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions. Testing of a hypothesis, tests of significance for large samples,

Student's t-distribution (applications only), Chi-square test of goodness of fit. Linear Programming: Linear programming problems formulation, Solving linear programming problems using (i) Simplex method.

Text Books:

1. Advanced Engg. Mathematics : F Kreyszig.
2. Higher Engg. Mathematics : B.S. Grewal.

Reference books:

1. Advance Engg. Mathematics : R.K. Jain, S.R.K. Iyenger
2. Advanced Engg. Mathematics : Michael D. Greenberg.
3. Operation Research : H.A. Taha.
4. Probability and statistics for Engineers : Johnson. PHI.

INSTRUMENTATION

General Course Information:

Course Code: ECE-211-L Course Credits: 2.5 Contact Hours: 3.0 hours/week Mode: Lectures and Tutorials Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives and Outcomes:

The objectives of this course are:

1. To learn basic measurement concepts.
2. To learn importance of signal generators and signal analyzers in electronics.
3. To learn relevance of digital instruments in measurements and need for data acquisition systems.

By the end of the course a student is expected:

1. Students will be exposed to general electronic measurement principles and instrumentation techniques ranging from the physical foundations of measurement theory to error theory.
2. Students will learn quantum effect standards and high-sensitivity instrumentations.
3. Students will be able to understand various digital techniques for controlling instruments and acquiring and processing data, from the logic and electrical simulation of integrated circuits and also their automated testing.

Course Contents

UNIT I

Instruments and Their Representation: Introduction, Typical Applications of Instrument Systems, Functional Elements of a Measurement System, Classification of Instruments, Standards and Calibration.

Static and Dynamic characteristics of Instruments: Introduction, Accuracy, Precision, Resolution, Threshold, Sensitivity, Linearity, Hysteresis, Dead Band, Backlash, Drift, Formulation of Differential Equations for Dynamic Performance- Zero Order, First Order and Second order systems, Response of First and Second Order Systems to Step, Ramp, Impulse and Harmonic Functions.

UNIT II

Oscilloscope:
Block diagram, study of various stages in brief, high frequency CRO considerations, Sampling and storage oscilloscope, Measurements of Phase and Frequency (Lissajous Patterns)

Electronic Instruments:
DC and AC voltage measurements, DC and AC current measurements, Multimeter, Ohmmeter, Bolometer, Calorimeter, Power meter, Introduction to digital meters

UNIT III

Generation and Analysis of waveforms:
Block Diagram of pulse generators, signal generators, function generators, wave analyzers, distortion analyzers, spectrum analyzer, Harmonicanalyzer, introduction to power analyzer.

Frequency and Time Measurements:
Study of Decade Counting Assembly(DCA), frequency measurements, period measurements, universal counters, introduction to digital meters

UNIT IV

Transducers:
Classification, Transducers of types: RLC Photocell, thermocouple, etc., Basic schemes of measurements of displacement, velocity, acceleration, strain, pressure, liquid level & temperature.

Introduction to signal conditioning:
DC signal conditioning systems, AC signal conditioning systems, Data acquisition and conversion system, characteristics of modern digital data acquisition system, Filter, Settling time, Amplifier Characteristics.

Text Books:

1. A course in Electrical and Electronics Measurements and Instrumentation by A.K.Sawhney, Dhanpat Rai & sons

Reference Books:

1. Electronics Measurements and Instrumentation Techniques By H. Cooper, PHI
2. Electronics Instrumentation by Kalsi, TMH.
3. Electrical measurements: E.W. Golding
4. Electrical And Electronic measurement and instrumentation : J.B. Gupta, Kataria and Sons.
5. Electronic instrumentation and measurement technique : W.D. Cooper & A.D. Helfrick Measuring systems E.O. Doeblin: TMH

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MECHANICS OF SOLIDS-I

General Course Information:

Course Code: ME-201-L Course Credits: 3.5 Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Evaluate various kinds of stresses and strains (axial, bending, torsional and shearing) in various structural elements due to different type of external loads.
2. Determine and illustrate principal stresses and maximum shearing stress in complex stress system.
3. Draw shear force and bending moment diagrams in various kinds of beams subjected to different kinds of loads.
4. Determine stresses in various kinds of beams and columns.
5. Understand the theory of simple bending, unsymmetrical bending and torsion.

By the end of the course a student is expected to:

1. Understand the concepts of stress and strain at a point as well as the stress-strain relationships for homogenous, isotropic materials.
2. Determine and illustrate principal stresses, maximum shearing stress, and the stresses acting on a structural member.
3. Calculate the stresses and strains in axially-loaded members, circular torsion members, and members subject to flexural loadings.
4. Design of simple bars, beams, columns and shafts.

Course Contents

UNIT-I

Simple stresses and strains: General equations of equilibrium, free body diagram, Types of stresses and strains, Hooke's law, elastic constants & their relationships, concept of stress at a point, stress-strain diagrams, stresses and strains in compound bars under axial loading, stresses in composite systems, thermal stresses.

Complex stresses: Two and three dimensional stress systems, rectangular stress components, principal stresses and planes, Mohr's stress circle.

UNIT-II

Shear force and bending moment diagrams: Relation between the rate of loading, the shear force and the bending moment, SF & BM calculations & diagrams for (i) cantilevers (ii) simply supported beams with or without over-hang (iii) fixed beams under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it,

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(iii) combination of concentrated loads and uniformly distributed loads, (iv) varying loads (v) application of moments.

UNIT-III

Centroid and Moment of Inertia: Centroid and MOI for different shaped beam cross sections, Parallel axes theorem, perpendicular axis theorem, principal axes, principal moments of inertia, product of inertia, ellipse of inertia, Properties of beam cross section.

Bending stresses in beams: Theory of simple bending, position of neutral axis, flitched beams. Unsymmetrical Bending, Slope of the neutral axis, stresses & deflections, shear center and the flexural axis.

Shearing stresses: Introduction, shearing stress variation, variation of shear stress in beam cross section, shear stress distribution for typical sections.

UNIT-IV

Torsion: Torsion of circular shafts, comparison of Solid and hollow circular shafts, stepped shaft & composite circular shafts, statically indeterminate shafts, stresses in shafts under combined torsion, bending and axial loads.

Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Eulers, Rankine, Gordon's formula, Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections.

Text and Reference Books:

1. Mechanics of Solid by Muubeen Abdul, Pearson Publications, India.
2. Engineering Mechanics of Solids by Popov E.P, Prentice Hall of India Mechanics of Materials by Ferdinand P. Beer and E. Russel Johnston, Jr. Second Edition, McGraw Hill.
3. Solid Mechanics by Kazmi, Tata Mc Graw Hill.
4. Strength of Materials by G.H.Ryder, Macmillan, India.
5. Strength of Materials by D.S. Bedi, S. Chand & Co. Ltd.
6. Advanced Mechanics of Solids and Structures by N. Krishan Raju and D.R.Gururaje, Narosa Publishing House
7. Strength of Materials by Andrew Pytel and Fredinand L. Singer, Int. Student Ed. Addison, Wesley Longman.
8. Strength of Materials by Sadhu Singh, Khanna Publishers, India.
9. Strength of Materials by Timoshenko S, East-West Press Pvt. Ltd., New Delhi.

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PRODUCTION TECHNOLOGY

General Course Information:

Course Code: ME-203-L Course Credits: 3.5 Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Facilitate the student with theory of metal cutting, jigs and fixtures, work holding devices, manufacturing methods, metrology and non-conventional machining techniques being used in industry for production purposes.

By the end of the course a student is expected to:

1. Understand the principles of metal cutting, tool wear and tool life.
2. Differentiate jigs and fixtures and find their applications.
3. Understand different types of gear manufacturing methods.
4. Understand non-conventional machining method and statistical quality control tools

Course Contents

UNIT-I

Theory of Metal Cutting: Introduction, Metal Cutting Machines and Tools, Elements of Metal Cutting, Geometry of Cutting Tools, Orthogonal and Oblique Cutting, Chip Formation, Chip Control, Forces Acting on a Single Point Tool, Measurement of Cutting Forces, Mechanics of Metal Cutting, Shear Plane, Chip Thickness Ratio, Shear Angle, Velocity Relationship in Orthogonal Cutting, Forces on the Chips, Stress and Strain in the chip, Work done during Metal Cutting, Heat Generation and Temperatures in Metal Cutting

Tool Wear and Machinability: Introduction, Tool Failure, Tool Wear, Tool Life, Cutting Speed, Feed and Depth of Cut, Tool Materials, Cutting Fluids, Power required for cutting, Machinability, Single Pass, Multi Pass and Multistage Machining

UNIT-II

Jigs and Fixtures: Introduction, Definitions and Concepts of Jig and Fixture, Advantages of Using Jigs and Fixtures, Elements of Jigs and Fixtures, Degree of Freedom, Types of Jigs, Types of Fixtures

Work Holding Devices: Basic Requirements of Work Holding Devices, Location: Principles, Methods and Devices, Clamping: Principles, Methods and Devices

UNIT-III

Manufacturing Methods: Turret Lathes and Their Characteristics, Classification of Gear Production Methods, Gear Generation, Indexing of Gears, Gear Hobbing, Gear Shaping, Gear Finishing Methods:Shaving, Burnishing, Grinding, Honing

Economics of Machining: Introduction, Choice of Feed, Economic Cutting Speed, Economics of Metal Removal, Minimum Cost/Component, Determination of Cutting Speed for Minimum Cost, Tool Life for Minimum Cost, Cutting Speed for Maximum Production, Tool Life for Maximum Production, Maximum Production Rate, Maximum Profit Rate

UNIT-IV

Non-Conventional Machining: Introduction, Classification of Non-Conventional Machining Processes, Process Selection, Ultrasonic Machining, Abrasive Jet Machining, Electro Chemical Machining, Electric Discharge Machining, Wire Electric Discharge Machining(WEDM), Electron Beam Machining, Laser Beam Machining

Metrology: Measurements, Linear and Angular Simple Measuring Instruments, Screw Gauge, Sine Bar, Auto-Collimator, Comparator-Mechanical, Electrical, Optical, Surface Finish and its Measurement

Text and Reference Books:

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
6. Production Technology: P.C. Sharma, S. Chand Publication
7. Production Technology: O.P. Khanna, Dhanpat Rai Publication

THERMODYNAMICS

General Course Information:

Course Code: ME-205-L Course Credits: 3.5 Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Expose the basic concepts of engineering thermodynamics and the practical application of thermodynamic laws.
2. Provide an understanding of 1st law of thermodynamics and its implementation in steady and non-steady flow processes.
3. Impart knowledge to the limitations of 1st law of thermodynamics and the importance of 2nd law of thermodynamics.
4. Study the concept of availability and irreversibility of a system during non- flow and steady flow state.
5. Expose the students to the basic laws and mathematical equations used to understand the behaviour of ideal and real gases.
6. Impart in depth knowledge of pure substance and its properties during different phase transformations.
7. Understand basic air standard cycles used in thermodynamics to transfer heat into work.
8. Impart knowledge to the students about different mathematical relations used in thermodynamics.

By the end of the course a student is expected to:

1. Identify basic thermodynamic approaches and types of systems used in thermodynamics.
2. Understand the implementation of 1st law of thermodynamics for non-flow, steady flow and transient flow processes.
3. Understand the basic concepts of heat engine, heat pump and refrigerator used in engineering field.
4. Understand different availability and unavailability of energy during the closed and study flow processes of a system.
5. Understand the properties and behaviour of ideal and real gases.
6. Understand the properties and behaviour of pure substance during its phase transformations.
7. Understand the ideal thermodynamic air standard cycles.
8. Understand mathematical relationships between different thermodynamic properties.

Course Contents

UNIT-I

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

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

UNIT-II

Second Law of Thermodynamics: Limitations of First Law, Thermal Reservoir, Heat Source and Heat Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin- Planck and Clausius Statements and their Equivalence, PMM-2, Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot Theorem and its Corollaries, Thermodynamic Temperature Scale, Entropy, Clausius Inequality, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Introduction to Third Law of Thermodynamics. Problems.

Availability and Irreversibility: High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Dead state of a system, Availability of a Non- Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility, Second law efficiencies of processes & cycles. Problems.

UNIT-III

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, Entropy for a mixture of non-reactive gases. Problems.

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. Problems.

UNIT-IV

Thermodynamic Air Cycles: Introduction, Assumptions in Thermodynamic Cycles, Classifications of Thermodynamic Cycles, Reversible Cycle, Irreversible Cycle, Working of an Ideal Engine, Stirling Cycle, Ericsson Cycle, Joule Brayton Cycle, Otto Cycle, Diesel Cycle, Dual Combustion Cycle. Problems.

Thermodynamic Relations: Maxwell Relations, Clapeyron Equation, Relations for changes in Enthalpy and Internal Energy & Entropy, Specific Heat Capacity Relations, Joule Thomson coefficient & inversion curve.

Text Books:

1. Advanced engineering thermodynamics – Adrian Bejan, Wiley, 4th edition.
2. Engineering thermodynamics- P. Chattopadhay, OXFORD, Revised 1st edition.

Reference Books:

1. Thermodynamics: An Engineering Approach- Yunus Cengel and Michael Boles, Tata McGraw Hill, 8th edition.
2. Engineering Thermodynamics - P K Nag, Tata McGraw Hill, 5th edition.
3. Fundamentals of Engineering Thermodynamics - Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner and Margaret B. Bailey, Wiley, 7th edition.

MACHINE DRAWING

General Course Information:

Course Code: ME-207-L Course Credits: 3.0 Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 4 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain **five short answers type questions**. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. ***1st question will carry 10 marks. Questions numbers 2-7 set from Units I-III will also carry 10 marks each. Questions numbers 8 and 9 set from Unit IV will carry 30 marks each.***

Course Objectives and Outcomes:

The objectives of this course are to:

1. Familiarize the students with Indian Standards on drawing practices.
2. Impart knowledge of thread forms, fasteners, keys, joints and couplings.
3. Make the students understand and interpret drawings of machine components so as to prepare assembly drawings either manually and using CAD packages.

By the end of the course a student is expected to:

1. Understand the shape and structure of different types of screws, riveted joints, welded joints and pipe joints.
2. Understand shaft bearing, keys and couplings.
3. Produce assembly drawing using part drawings.

Course Contents

UNIT-I

Limits, Fits and Tolerances: General aspects, Nominal size and basic dimensions, Definitions, Basis of fit or limit system, Systems of specifying tolerances, Designation of holes, Shafts and fits, Commonly used holes and shafts.

Screw Threads: Drawings of various views of Screw threads, metric and BSW threads, Square thread and multi start threads, Nut bolts, Washers, Setscrew, Locknuts and foundation bolts.

Riveted and Welded Joints: Forms and Proportions of River Heads, Different Views of Different Types of Riveted Lap and Butt Joints. Welding, Types of Welded Joints, Elementary Welding Symbols, Position of the Symbols on Drawings, Dimensioning of Welds, Weld Contours, Surface Contour and Finish of Welds, Weld all Round, Site Weld, Method of Welding, Compound Weld, Projection Weld.

UNIT-II

Shaft Bearing: Solid and Bush Bearing, Plummer Block, Footstep Bearing.

Pipe Joint: Flanged Joint, Socket and Spigot Joint, Hydraulic Joint, Union Joint, Gland and Stuffing Box, Expansion Joint.

Pulley: Belt Pulley, V Belt Pulley, Fast and Loose Pulley, Speed Cone Pulley, Built Up Pulley.

UNIT-III

Keys, Cotters and Joints: Introduction, Key, Key Way, Depth of Immersion, Proportion of Key, Taper of Key, Classification of Keys, Cotter, Gib, Spline Shaft, Joint Used for Connecting Rods, Sleeve and cotter joint, Spigot and Socket Joint, Gib and Cotter Joint, Adjustable Joint, Knuckle Joint.

Shaft Couplings: Introduction, Shaft Coupling, Rigid Coupling, Flange Coupling, Types of Couplings, Protected Type Flange Coupling, Muff Coupling, Half Lag Muff Coupling, Split Muff Coupling, Flexible Coupling, Oldham's Coupling, Universal Coupling, Compression Coupling.

UNIT-IV

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies: Lathe tail stock, Tool Post, Tool Holder, Machine Vice, Pedestal Bearing (Plummer Block), Steam Stop Valve, I.C. Engine Connecting Rod, Rams Bottom Safety Valve, Drill Jigs and Milling Fixture etc.

Note:

- ***A significant part of the drawing work should also be practiced using any one of solid modeling CAD packages (e.g. AutoCAD, Solidworks, Pro-E, CATIA etc.)***
- ***Both Answer booklet and Drawing Sheet will be provided to attempt questions for the end semester examination.***

Text Books:

1. Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.
2. A Text Book of Machine Drawing - P S Gill, S K Kataria and Sons Publishing House.
3. Engineering Graphics with Auto CAD 2002 -James D Bethune, Pearson Education.
4. A Text Book of Machine Drawing - Laxmi Narayana and Mathur, Jain Brothers Publishing House.
5. Machine drawing - N Sidheshwar, Kanetohe, V S Sastry, TMH, Publishing House.

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MECHANICS OF SOLIDS LAB

General Course Information:

Course Code: ME-201-P Course Credits: 01 Mode: Practical Contact Hours: 02 hours per week Examination Duration: 03 hours	**Course Assessment Methods (internal: 30; external: 70):** Internal practical evaluation is to be done by the course coordinator. The end semester practical examination will be conducted jointly by external and internal examiners.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Find out the strength of the given specimen subjected to one type of load (tensile, compressive, shear, bending and torsion).
2. Find the hardness value (Rockwell, Vickers, Brinell) of the given specimen.

By the end of the course a student is expected to:

1. Predict the behavior of the solid bodies under various types of loading (tensile, compressive, shear, bending and torsion).
2. Interpret the experimental results for material selection in engineering applications.

Lab Contents

1. To study the Universal Testing Machine (UTM) and perform the tensile test on the given specimen (Mild steel and Cast Iron).
2. To perform compression test on UTM on the given specimen (Mild steel and Cast Iron).
3. To perform bending tests on UTM on the given specimen.
4. To perform the shear test on UTM on the given specimen.
5. To perform the torsion test on the given specimen (Mild steel and Cast Iron).
6. To perform the Rockwell hardness test.
7. To perform the Brinell hardness test.
8. To perform the Vickers hardness test.
9. To perform the Impact tests (Izod & Charpy).
10. To perform the Erichsen cupping sheet metal test.

NOTE: The list is indicative. The teacher can alter/add more number of experiments as per the requirement.

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PRODUCTION TECHNOLOGY LAB

General Course Information:

Course Code: ME-203-P Course Credits: 1.5 Mode: Practical Contact Hours: 03 hours per week Examination Duration: 03 hours	**Course Assessment Methods (internal: 30; external: 70):** Internal practical evaluation is to be done by the course coordinator. The end semester practical examination will be conducted jointly by external and internal examiners.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Design and manufacture of simple patterns
2. Fabricate the jobs using arc welding, gas welding, TIG and MIG welding equipments
3. Operate wire electric discharge machine and prepare job on it
4. Provide the knowledge of drilling, boring and external threads cutting on a lathe

By the end of the course a student is expected to:

1. Design and manufacture the simple patterns
2. Work with arc welding, gas welding, TIG and MIG welding equipments
3. Work on wire electric discharge machine
4. Perform drilling, boring and external threads cutting operations on a lathe

Lab Contents

1. To make a pattern for a given casting with all the necessary allowances, parting line, running system details. Prepare the mold and make the casting. Investigate the casting defects and suggest the remedial measures.
2. To make a component involving horizontal and vertical welding and study the welding defects and suggests their remedies.
3. To prepare a job on surface grinder/cylindrical grinder and measure the various parameters of the finished piece.
4. To cut external threads on a lathe.
5. Leveling of machine tools and testing their accuracy.
6. Disassembly and assembly of small assemblies such as tail stock, bench vice, screw jack etc.
7. Development and manufacture of complex sheet-metal components such as funnel etc
8. Multi slot cutting on milling machine by indexing.
9. Drilling and boring of a bush.
10. To study and prepare a job on wire electric discharge machine.

NOTE: The list is indicative. The teacher can alter/add more number of experiments as per the requirement.

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PERSONALITY DEVELOPMENT

General Course Information:

Course Code: PSY-201-L Course Credit: 0.0 Contact Hours: 3hrs/week Mode: Lectures Examination Duration: 3 Hours	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20 marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus; it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Course Objectives and Outcomes:

The objectives of this course are:

1. Holistic development of the students.
2. Make the students to understand self and personality through the interactive task based sessions.
3. To develop the life skills required to lead an effective personal and professional life.

By the end of the course a student is expected to:

1. Understand the concept of self and personality.
2. Develop the life skills required to lead an effective personal and professional life.

Course Contents

UNIT-I

Understanding the concept of self, Self-Esteem, Characteristics of individuals with high and low self-esteem. Self-Confidence, Strategies of building self-confidence. Case Study.

UNIT-II

Understanding Personality. Factors affecting Personality: Biological, Psychological Social, Theories of Personality: Freud, Allport. Personality Assessment- Neo-Big Five Personality Test; T.A.T

UNIT-III

Stress: Causes of Stress and its impact, Strategies of stress management. Case study.

UNIT-IV

Emotional Intelligence: Concept, emotional quotient why Emotional Intelligence matters, Measuring EQ. Developing healthy emotions. Management of anger and interpersonal relations. Case study.

Text books:

1. Burger, J.M. (1990), Personality, Wardsworth: California.
2. Hall C.S.,Lindzey, G (1978), Theories of Personality, New York: Wiley Eastern Limited.

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3. Morgan, C.T.King R.A. Weisz, J.R., and Schopler, J. (1987), Introduction to Psychology. Singapore: McGraw Hill.
4. Byronb. D., and Kalley, N. (1961). Introduction to Personality: Prentice Hall.
5. Taylor,S.E., (2009). Health Psychology (9th Ed). New Delhi: Tata McGraw-Hill Publishing Company Ltd.

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ENVIRONMENTAL STUDIES

General Course Information:

Course Code: EVS-201-L Course Credits: 3.0 Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus, it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks

Prerequisite:

Student should have prior knowledge of basic environment science.

Course Objectives and Outcomes:

The objectives of this course are:

1. To enhance knowledge skills and attitude to environment.
2. To understand natural environment and its relationship with human activities.

By the end of the course a student is expected:

1. Students will be able to enhance and analyze human impacts on the environment.
2. Integrate concepts & methods from multiple discipline and apply to environmental problems.
3. Design and evaluate strategic terminologies and methods for subs table management of environmental systems.
4. Field studies would provide students first-hand knowledge on various local environment aspects which forms an irreplaceable tool in the entire learning process.

Course Contents

UNIT-I

Multidisciplinary nature of Environmental studies: Definition, scope and importance, need for public awareness. Concept, Structure and function of an ecosystem. Producers, consumers and decomposers, Energy flow in the ecosystem ,Ecological succession ,Food chains, Food webs and ecological pyramids; Introduction, types, characteristics features, structure and function of Forest ecosystem, Grassland ecosystem ,Desert ecosystem, Aquatic ecosystem (Ponds, Stream, lakes, rivers, oceans, estuaries); Biodiversity: Introduction, Definition: genetic, species and ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and option values; Biodiversity at global, national and local level, India as a mega-diversity nation, Hot-spot of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-II

Renewable and non-renewable resources, Natural resources and associated problems ,Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal

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people; Water resources: Use and over utilization of surface and ground water, floods, droughts conflicts over water, dams benefits and problems; Mineral resources: Use and exploitation, environmental effects of extracting and mineral resources; Food resources: World food problem, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity; Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies; Land resources: Land as a resource, land degradation, main induced landslides, soil erosion and desertification, Role of an individual in conservation of natural resources, Equitable use of resources for suitable lifestyle.

UNIT-III

Definition of Environment Pollution; Causes, effects and control measures of: Air Pollution, Water Pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes effects and control measures of urban and industrial wastes; Role of and individual in prevention of pollution, Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies; different laws related to environment: Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act., Issues involved in enforcement of environmental legislation, Public awareness

UNIT-IV

Social issues and the Environment: From unsustainable to Sustainable development, Urban problems related to energy; Water conservation, rain water harvesting, watershed management; Resettlement and rehabilitation of people; its problem and concern, case studies; Environment ethics: Issues and possible solutions; Wasteland reclamation; Consumerism and waste products, Human Population growth, variation among nation, Population explosion- Family Welfare Programme, Environment and human health , Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

Field Work: Visit to a local area to document environmental assets- river/forest/grassland/hill/mountain; Study of simple ecosystems – ponds, river, hill slopes etc; Study of common plants, insects, birds; Visit to a local polluted site- Urban/Rural/Industrial/Agricultural.

Text Books:

1. Erach Bharucha "Environmental Studies for Undergraduate Courses", University Grants Commission and Bharati Vidyapeeth Institute of Environment Education and Research, Pune, University press pvt. Ltd. (India)
2. Fundamental concepts in Environmental studies by Dr. D.D. Mishra. S. Chand publications

Reference Books:

1. Essentials of Ecology and Environmental Science by Dr. S .V .S. Rana, PHI Learning Pvt. Ltd, Delhi
2. Environmental Chemistry by Anil Kumar De, Wiley Eastern Limited.
3. Environmental Science by T.G. Miller, Wadsworth Publishing Co, 13th edition.
4. Ecology and Environment by P. D. Sharma, Rastogi publications

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NUMERICAL METHODS

General Course Information:

Course Code: MAT-202-L Course Credits: 3.0 Mode: Lectures Contact Hours: 3 hours/week. Examination Duration: 3 hours.	**Course Assessment Methods (Internal: 30; External: 70)** Two minor test each of 20marks, class performance measured through percentage of lecture attended (4 marks), assignments, quiz etc. (6 marks) and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus; it will contain seven short answer type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the four units. All questions carry equal marks.

Prerequisite:

Basic knowledge of algebraic equations, ODE and PDE.

Course Outcomes:

By the end of the course a student is expected:

1. Problem of interpolation/extrapolation
2. Numerical solutions of differential equations
3. Numerical solutions of algebraic system of equations
4. Numerical solutions of PDE encountered in engineering

UNIT-I

Finite differences operators and their relationship, Newton-Gregory forward & Backward Formulas, Newton's, Gregory, Gauss difference interpolation formula, Lagrange interpolation, Inverse interpolation, Newton Divided difference, Least square approximation. Straight line and parabolic approximation.

UNIT-II

Non-Linear Equations: Bisection method, Linear Interpolation methods, Newton's method, fixed-point method. Simultaneous Linear Equations: Elimination method, Gauss and Gauss-Jordan method, Jacobi's method, Gauss-Seidal method, Relaxation method. LU-Decomposition.

UNIT-III

Numerical Differentiation and Integration: Derivatives from differences tables, Higher order derivatives, Newton - cotes integration formula, Trapezoidal rule, Simpson's rule, Boole's rule and Weddle's rule, Romberg's integration. Numerical Solution of Ordinary Differential Equations: Taylor series method, Euler and modified Euler method, Runge -Kutta methods.

UNIT-IV

Milne's method, Adams-Moulton method, Power method for Eigen values by iteration. Numerical Solution of Partial Differential Equations: Finite difference approximations of partial derivatives, solution of Laplace equation (Standard 5-point formula only), One-dimensional heat equation (Schmidt method, Crank-Nicolson method, Dufort and Frankel method) and wave equation.

Text books:

1. Applied Numerical Analysis: Curtis F. Gerald and Patrick G. Wheatley, Person, Education Ltd.
2. Numerical Method: E. Balagurusamy, T.M.H.
3. Numerical methods for Scientific and Engg. Computations: M.K. Jain, S.R. L. Lyenfer and R.K. Jain, Wiley Eastern Ltd.
4. Introductory methods of Numerical Analysis: S.S. Sastry, P.H.D.
5. Numerical Methods in Engg. & Science: B.S. Grewal.

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MATERIAL SCIENCE

General Course Information:

Course Code: ME-202-L Course Credits: 3.5 Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Understand structure-properties properties relationship
2. Understand the mechanical behavior of materials, phase & phase diagram, heat treatment, failure of materials & their protection, applications of recent materials.
3. Develop intuitive understanding of the subject to present a wealth of real world engineering examples to give students a feel of how material science is useful in engineering practices.

By the end of the course a student is expected to:

1. Analyze the Structure of materials at different levels, basic concepts of crystalline materials.
2. Explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions.
3. Understand and suggest the heat treatment process & types.
4. Explain features, classification, applications of newer class materials like smart materials, piezoelectric materials, biomaterials, composite materials etc.

Course Contents

UNIT-I

Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numericals related to crystallography.

Imperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations, surface defects, volume defects & effects of imperfections on metal properties.

UNIT-II

Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams. Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram.

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Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening, Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.

UNIT-III

Deformation of Metal: Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking, Recovery, re-crystallization and grain growth.

Failures of metals: Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.

UNIT-IV

Creep & Corrosion: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: Mechanism and effect of corrosion, prevention of corrosion.

Plastic, Composite and Ceramics: Polymers, formation of polymers, polymer structure and crystallinity, polymers to plastics types, reinforced particles-strengthened and dispersion strengthened composites. Ceramic materials: Types of ceramics, properties of ceramic, ceramic forming techniques, mechanical behavior of ceramic.

Text Books:

1. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp.
2. Material Science - Narula, Narula and Gupta. New Age Publishers

Reference Books:

1. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
2. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons
3. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons., Delhi.
4. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi

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FLUID MECHANICS

General Course Information:

Course Code: ME-204-L
Course Credits: 4.0
Contact Hours: 3 hours/week
Mode: Lectures
Examination Duration: 3 hours

Course Assessment Methods (internal: 30; external: 70) Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course **Objectives and Outcomes:**

The objectives of this course are to:

1. Familiar with all the basic concepts of fluids, their properties and fluid flow phenomenon.
2. Understand conservation equations and their applications
3. Understand various fluid flow problems
4. Knowledge of laminar and turbulent flow
5. Understand the concept of development of boundary layers

By the end of the course a student is expected to:

1. Understand the properties of the fluid.
2. Understand and solve the fluid flow problems.
3. Understand the mathematical techniques of practical flow problems.
4. Formulate and solve equations of momentum and energy
5. Solve problems in flow through pipes
6. Explain the various methods available for the boundary layer separation

Course Contents

UNIT-I

Fluid Properties and Fluid Statics: Concept of fluid and flow, ideal and real fluids, continuum concept, properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, manometers, hydrostatic equation, hydrostatic forces on plane and curved surfaces, Buoyancy and Flotation, stability of floating and submerged bodies. Problems.

Fluid Kinematics: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net. Problems.

UNIT-II

Fluid Dynamics: Concept of system and control volume, Euler's equation, Bernoulli's equation, venturimeter, orifices, orifice meter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications. Problems.

Potential Flow: Uniform and vortex flow, flow past a Rankin half body, source, sink, source-sink pair and doublet, flow past a cylinder with and without circulation. Problems.

UNIT-III

Viscous Flow: Flow regimes and Reynold's number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, Hagen-Poiseuilli law. Problems.

Flow Through Pipes: Major and minor losses in pipes, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes. Problems.

UNIT-IV

Boundary Layer Flow: Boundary layer concept, displacement, momentum and energy thickness, von-karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Problems.

Turbulent Flow: Shear stress in turbulent flow, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficients for smooth and rough pipes. Problems.

Text Books:

1. Fluid Mechanics Streeter V L and Wylie E B, Mc Graw Hill
2. Mechanics of Fluids – I H Shames, Mc Graw Hill
3. A text book of Fluid Mechanics and Hydraulic Machines", R.K Rajput., S. Chand & Company Ltd., New Delhi
4. Fluid Mechanics and Hydraulics Machines, .R.K. Bansal, Laxmi publications (P) Ltd., New Delhi
5. Hydraulics and Fluid Mechanics, Modi P.N, & Seth S.M Standard Book House, New Delhi

Reference Books:

1. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
2. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
3. Fluid Mechanics and Machinery – S.K. Agarwal, TMH, New Delhi
4. Fluid Mechanics, Yunus A Cengel & John M. Cimbala, Tata McGraw Hill Edition, New Delhi, 2006
5. Fluid Mechanics White F.M, Tata McGraw-Hill, 5th Edition, New Delhi, 2003
6. Fluid Mechanics & Fluid Machines. Basic Concepts & Principles, Shiv Kumar, Ane Books Pvt. Ltd., New Delhi, 2010

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STEAM AND POWER GENERATION

General Course Information:

Course Code: ME-206-L Course Credits: 3 5 Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Understand the combustion of fuels and formation of flue gases in the exhaust.
2. Understand the energy conversion in steam power plant through various vapor power cycles.
3. Recognize the parts and operations of high and low pressure steam boilers.
4. Analyze flow of steam through nozzles, turbines, engines and condensers.

By the end of the course a student is expected to:

1. Calculate air-fuel ratio for combustion of different fuels and estimate the amount of flue gases in exhaust.
2. Explain the steam power plant components with the help of basic and advanced cycles.
3. Explain the construction and working of different steam boilers and estimate their performance.
4. Calculate the performance of steam nozzle, steam turbine, steam engine, and steam condenser.

Course Contents

UNIT I

Fuels and Combustion: Characteristics of solid, liquid and gaseous fuels, Laws of combustion and reactions, Gravimetric and volumetric analysis, Air-fuel ratio, Exhaust gas analysis, Orsat apparatus. Calorific values of fuel, Bomb calorimeter, Numericals

Steam: Formation of steam at constant pressure, Variation in steam properties during phase change, Steam tables and their uses, Enthalpy – entropy (Mollier) diagram, Carnot and Rankine vapour cycles, Rankine cycle with reheat and regeneration, Numericals.

UNIT II

Steam Generators: Classification of steam boilers, Essentials of a good boiler, Construction and operational details of Cochran, Babcock Wilcox, Locomotive, Lancashire, Benson, Lamont, Loeffler and Velox boilers, Boiler mountings and accessories.

Boiler Draught (Draft) and Performance: Natural (Chimney) draught, Maximum discharge through a chimney, Artificial draught, Evaporative capacity and efficiency of boilers, Energy balance in a boiler, Numericals.

UNIT III

Steam Nozzles: Steam flow through a nozzle, Critical pressure ratio (maximum discharge condition) and its physical significance, Flow through actual nozzles, Supersaturated expansion of steam, Numericals.

Steam Turbines: Working principle of impulse and reaction steam turbines. Vector diagrams of velocities, Optimum operating conditions of turbines, Compounding of impulse turbines, Losses in steam turbines, Performance analysis of steam turbines, Governing of steam turbines, Numericals.

UNIT IV

Steam Engines: Construction and working of steam engines, Indicator diagrams, Performance of steam engines, Governing of steam engines. Numericals.

Steam Condensers: Elements of a condensing plant, Types of condensers, Comparison of jet and surface condensers, Condenser and vacuum efficiency, Cooling towers, Numericals.

Books recommended:

1. P. L. Ballaney, "Thermal Engineering", Khanna Publishers, 1994
2. Mahesh M. Rathore, "Thermal Engineering", Tata McGraw-Hill Education, 2010
3. R. K. Rajput, "Thermal Engineering", Laxmi Publication, 2017.
4. V. P. Vasandani, D. S. Kumar, "Treatise on Heat Engineering", Metropolitan Book Company, 2012

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MECHANICS OF SOLIDS-II

General Course Information:

Course Code: ME-208-L Course Credits: 4.0 Contact Hours: 3 hours/week Mode: Lectures Examination Duration: 3 hours	**Course Assessment Methods (internal: 30; external: 70)** Two minor tests each of 20 marks, Class Performance measured through percentage of lectures attended (4 marks) Assignment and quiz (6 marks), and end semester examination of 70 marks. For the end semester examination, nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Rest of the eight questions is to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt any other four questions selecting one from each of the remaining four units. All questions carry equal marks.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Understand the concepts of energy theorems.
2. Calculate the stresses and strains in pressure vessels, rotating bodies and springs.
3. Calculate the slope and deflection in beams subjected to different types of loading.
4. Design of machine elements using theories of deformable bodies.
5. Determine stresses in beam columns.

By the end of the course a student is expected to:

1. Understand the concepts energy theorems.
2. Calculate the stresses and strains in pressure vessels, rotating bodies and springs.
3. Determine the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading.
4. Calculate stresses in beam columns.

Course Contents

UNIT-I

Thin Pressure Vessels: Hoop and Longitudinal stresses & strains in cylindrical and spherical vessels under internal pressure, wire wound thin cylinders.

Thick Cylinders & Spheres: Derivation of Lame's equations, radial & hoop stresses and strains in thick and compound cylinders and spherical shells subjected to internal fluid pressure only, wire wound cylinders, hub shrunk on solid shaft.

UNIT-II

Rotating Rims & Discs: Stresses in uniform rotating rings & discs, rotating discs of uniform strength, stresses in (I) rotating rims, neglecting the effect of spokes, (ii) rotating cylinders, hollow cylinders & solids cylinders.

Beam columns: Beam columns subjected to single concentrated load, number of concentrated loads, continuous lateral Load, end couple, couples at both ends triangular loads.

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UNIT-III

Strain Energy & Impact Loading: Definitions, expressions for strain energy stored in a body when load is applied (i) gradually, (ii) suddenly and (iii) with impact, strain energy of beams in bending, beam deflections, strain energy of shafts in twisting, energy methods in determining spring deflection, Castigliano's & Maxwell's theorems.

Springs: Stresses in open coiled helical spring subjected to axial loads and twisting couples, leaf springs, flat spiral springs, concentric springs.

UNIT-IV

Slope & deflection: Relationship between bending moment, slope & deflection, calculations for slope and deflection using Integration, Macaulay's and area moment methods of (i) cantilevers and (ii) simply supported beams with or without overhang (iii) fixed beams under (i) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load (iv) varying load (v) application of moments, propped beams, sinking of prop, continuous beams.

Theories of Elastic Failure: Various theories of elastic failures with derivations and graphical representations, applications to problems of 2- dimensional stress system with (i) Combined direct loading and bending, and (ii) combined torsional and direct loading.

Text and Reference Books:

1. Mechanics of Solid by Muubeen Abdul, Pearson Publications, India.
2. Engineering Mechanics of Solids by Popov E.P. Prentice Hall of India Mechanics of Materials by Ferdinand P. Beer and E. Russel Johnston, Jr. Second Edition, McGraw Hill
3. Solid Mechanics by Kazmi, Tata Mc Graw Hill.
4. Strength of Materials by G.H.Ryder, Macmillan, India.
5. Strength of Materials by D.S. Bedi, S. Chand & Co. Ltd.
6. Advanced Mechanics of Solids and Structures by N. Krishan Raju and D.R.Gururaje, Narosa Publishing House.
7. Strength of Materials by Andrew Pytel and Fredinand L. Singer, Int. Student Ed. Addison, Wesley Longman.
8. Strength of Materials by Sadhu Singh, Khanna Publishers, India.
9. Strength of Materials by Timoshenko S, East-West Press Pvt. Ltd., New Delhi.

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MATERIAL SCIENCE LAB

General Course Information:

Course Code: ME-202-P Course Credits: 01 Mode: Practical Contact Hours: 02 hours per week Examination Duration: 03 hours	**Course Assessment Methods (internal: 30; external: 70):** Internal practical evaluation is to be done by the course coordinator. The end semester practical examination will be conducted jointly by external and internal examiners.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Understand structure-properties properties relationship
2. Understand the mechanical behavior of materials, phase & phase diagram, heat treatment, failure of materials & their protection, applications of recent materials.
3. Develop intuitive understanding of the subject to present a wealth of real world engineering examples to give students a feel of how material science is useful in engineering practices.

By the end of the course a student is expected to:

1. Analyze the Structure of materials at different levels, basic concepts of crystalline materials.
2. Explain the concept of phase & phase diagram & understand the basic terminologies associated with metallurgy. Construction and identification of phase diagrams and reactions.
3. Understand and suggest the heat treatment process & types.
4. Explain features, classification, applications of newer class materials like smart materials, piezoelectric materials, biomaterials, composite materials etc.

Lab Contents

1. To study crystal structures of a given specimen.
2. To study crystal imperfections in a given specimen.
3. To study microstructures of metals/ alloys.
4. To prepare solidification curve for a given specimen.
5. To study heat treatment processes (hardening and tempering) of steel specimen.
6. To study microstructure of heat-treated steel.
7. To study thermo-setting of plastics.
8. To study the creep behavior of a given specimen.
9. To study the mechanism of chemical corrosion and its protection.
10. To study the properties of various types of plastics.
11. To study Bravais lattices with the help of models.
12. To study crystal structures and crystals imperfections using ball models.

NOTE: The list is indicative. The teacher can alter/add more number of experiments as per the requirement

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FLUID MECHANICS LAB

General Course Information:

Course Code: ME-204-P Course Credits: 01 Mode: Practical Contact Hours: 02 hours per week Examination Duration: 03 hours	**Course Assessment Methods (internal: 30; external: 70):** Internal practical evaluation is to be done by the course coordinator. The end semester practical examination will be conducted jointly by external and internal examiners.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Enable the students to acquire knowledge of fluid flow concepts, working principles of flow meters
2. Understand flow discharge measuring device used in pipes channels.
3. Determine fluid and flow properties.
4. Characterize laminar and turbulent flows.
5. Know about major and minor losses during flow

By the end of the course a student is expected to:

1. Understand the working of flow meters.
2. Gain knowledge on different forms of energy of flowing fluids.
3. Determine flow discharge measuring device used in pipes channels
4. Understand about fluid and flow properties
5. Distinguish between laminar and turbulent flows
6. Find out the major and minor losses during fluid flow

Lab Contents

1. To verify the Bernoullis Theorem.
2. To determine the coefficient of discharge of an orifice meter.
3. To determine the coefficient of discharge of venturimeter.
4. To determine the coefficient of discharge of Notch (V and Rectangular types).
5. To determine the major loss due to friction in pipe flow.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To find critical Reynolds number for a pipe flow.
8. To determine the meta-centric height of a floating body.
9. To determine the minor losses due to pipe fittings in pipes
10. To determine the density and viscosity of any three fluids.

NOTE: The list is indicative. The teacher can alter/add more number of experiments as per the requirement.

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STEAM AND POWER GENERATION LAB

General Course Information:

Course Code: ME-206-P Course Credits: 01 Mode: Practical Contact Hours: 02 hours per week Examination Duration: 03 hours	**Course Assessment Methods (internal: 30; external: 70):** Internal practical evaluation is to be done by the course coordinator. The end semester practical examination will be conducted jointly by external and internal examiners.

Course Objectives and Outcomes:

The objectives of this course are to:

1. Understand the flue gases formation and calorific value of fuel.
2. Explain the construction and working of different components of high and low pressure boilers.
3. Analyze the flow of steam through steam turbines, engines, condensers, and cooling towers.

By the end of the course a student is expected to:

1. Estimate the composition of flue gases and calculate the calorific value of fuel.
2. Recognize the parts and operations of high and low pressure steam boilers.
3. Calculate the performance of steam turbines, steam engines, steam condensers, and cooling towers.

Lab Contents

1. To estimate the composition of flue gases by Orsat apparatus.
2. To find calorific value of fuel using bomb calorimeter.
3. To study the construction and working of low pressure boilers.
4. To study the construction and working of high pressure boilers.
5. To study the working and performance of impulse and reaction steam turbines.
6. To study the construction and working of steam engines.
7. To study the construction and working of jet and surface condensers.
8. To study the working of cooling tower.
9. A visit to nearby steam power plant can be organized to learn the working of different elements.

NOTE: The list is indicative. The teacher can alter/add more number of experiments as per the requirement.

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NUMERICAL METHODS LAB

General Course Information:

Course Code: MAT-202-P Course Credits: 01 Mode: Practical Contact Hours: 2 hours/week Examination Duration: 03 hours	**Course Assessment Methods (Internal: 30; External: 70)** Internal continuous assessment of 30 marks on the basis of class performance and attendance in practical classes. For the end semester practical examination the assessment will be done out of 70 marks by the external and internal examiners.

LIST OF EXPERIMENTS

Write down and execute the following programs using C/C++/MATLAB

1. To find the roots of non-linear equation using Bisection method.
2. To find the roots of non-linear equation using Newton's method.
3. Curve fitting by least- square approximations.
4. To solve the system of linear equations using Gauss -elimination method.
5. To solve the system of linear equations using Gauss -Seidal iteration method.
6. To solve the system of linear equation using Gauss –jordan method.
7. To integrate numerically using Trapezoidal rules.
8. To integrate numerically using Simpson's rules.
9. To find the largest eigen value of a matrix by Power -method.
10. To find numerical solution of ordinary differential equations by Euler's method.
11. To find numerical solution of ordinary differential equations by Runge -Kutta method.
12. To find numerical solution of ordinary differential equations by Milne's method.
13. To find the numerical solution of Laplace equation.
14. To find numerical solution of wave equation.
15. To find numerical solution of heat equation.

Note: At-least seven experiments are to be performed by students from the above list. The course coordinator may also design and set experiments in addition to the above list/topic as per the scope and requirement of syllabus.

Books Suggested:

1. Applied Numerical Analysis by Curtis F. Gerald and Patrick G. Wheatley - Pearson Education Ltd.
2. Numerical Methods: E. Balagurusamy. T.M.H.

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SKILLS AND INNOVATION LAB

General Course Information:

Course Code: ME-210-F Course Credits: 0 0 Mode: Practical Contact Hours: 03 hours per week Examination Duration: 03 hours	**Course Assessment Methods (internal: 30; external: 70):** This is a **non-credit course of qualifying nature**. Internal practical evaluation is to be done by the course coordinator. The end semester practical examination will be conducted jointly by external and internal examiners.

Course Objectives and Outcomes:

The objectives of this course are to enable students to:

1. Understand and identify research topics related to Mechanical Engineering through brain storming sessions.
2. Propose a novel idea/modified technique/new interpretation after identifying the existing research work.
3. Devise specific identified issue/problem in the form of research objectives.
4. Work in a group and communicate effectively the research topic though presentation and/or brain storming

By the end of the course a student is expected to:

1. Understand the research analysis of issues/problems on topics related to Mechanical Engineering.
2. Understand the techniques and tools used for research analysis.
3. Understand literature related to a research topic.
4. Communicate effectively the research topic though presentation and/or brain storming

Lab Contents

A group of 5-7 students are required to carry out a project related to current research & development in the field of Mechanical Engineering. Each group of students will try to propose a novel idea/modified technique/new interpretation after identifying an existing research work. They will work towards finding solutions to the identified problem such as cost reduction, enabling new processes and/or materials, creating a higher impact than the existing practices etc. using their innovative ideas and concept generation abilities.

The topic of the project will be decided by the students in consultation with the course coordinator. The project report will be submitted by a group at the end of semester. The students may use the equipments/machines/instruments available in the labs/workshops with the due permission of Chairperson on recommendation of the course coordinator.

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