w.e.f. July, 2019

B.E.III SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME 3303	**Machine Design and Drawing**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Exam Duration	4 Hours	3	0	2	4	70	22

Unit I

Drawing conventions, drawing and dimensioning, representation of machine parts such as external and internal threads, slotted heads, square ends, slotted shaft, splined shaft, bearing, spring, gears, surface finish.

Unit II

Basics of riveted and welded joint, design of joints; riveted joints, welded joints, knuckle joints, cotter joints, Basics of limit, fit and tolerance, Limit gauging and gauge design.

Unit III

Assembly Drawing: Detailed and assembly drawings of the following parts –

- Cotter and Knuckle joints.
- Solid bearing, bushed bearing, pedestal bearing (Plummer block), foot step bearing.
- IC Engine piston, connecting road, crossheads, stuffing box, eccentric.
- Muff coupling, flanged coupling, flexible coupling, universal coupling.
- Lathe tail stock, tool post.

Recommended Books:

1. Machine drawing by P.S.Gill; Katson Publication, New Delhi.
2. Machine drawing by R.K. Dhawan; S. Chand Publisher, New Delhi
3. Machine drawing by G. R. Nagpal; Khanna Publisher.
4. Machine drawing by N.D.Bhatt, Charotar; Publishing House.
5. Machine drawing by K.L.Narayan, P. Kannaiah and Venketa Reddy; New Age International Publisher.
6. Machine drawing by N. Sidheshwar, P. Kannaiah and V.V.S. Sastry; McGraw Hill Education (India) Pvt. Ltd. New Delhi.
7. Machine Design by RS Khurmi, JK Gupta, S. chand publication.
8. Design of machine element, Dr. Sadhu Singh, Khanna publisher

Suggested list of drawing:

1. To draw conventions of different machine component.
2. To draw Rivet heads and riveted joints.
3. To draw welded joints.
4. To draw assembly drawing of Knuckle joint and Cotter joint.
5. To draw assembly drawing of following bearings-
   i) Solid bearing ii) Bushed bearing
   iii) Foot step bearing iv) Pedestal bearing
6. To draw assembly drawing of following Engine parts-
   i) I.C. Engine Piston ii) Connecting rod
   iii) Cross head iv) Eccentric v) Stuffing box
7. To draw assembly drawing of following Couplings-
   i) Muff coupling ii) Flange coupling
   iii) Universal coupling iv) Oldham coupling
8. To draw assembly drawing of following Lathe parts-
   i) Lathe Tail stock ii) Tool post

(Dr. Sunil Pungotra) (Dr. M.K. Gupta) (Dr. Hemant Parmar)

Ujjain Engineering College, Ujjain (MP) 456010

SYLLABUS FOR FOUR YEARS **Bachelor of Technology** DEGREE COURSE as per **AICTE** Model Curriculum

(CE/CM/ME Branches :: July 2019)

Subject Code	Subject Name	Semester	Periods per Week			Scheme of Examination			Total Marks	Credits
			L	T	P	ESE	MST	QAR		
MA 3002	**Mathematics – III**	III	3	1	0	70	20	10	100	4

Prerequisite: Mathematics – I, Mathematics – II

Course Objective: Introduce students to Laplace transforms, inverse Laplace transforms of different type of functions and principles and use them to solve ordinary and partial differential equations. Also, introduce students to how linear and non linear Partial Differential are formed and solve them by different methods. This course also aims to provide an understanding of the basic concepts in probability, conditional probability and independent events. It will also focus on the random variable, mathematical expectation, and different types of distributions, sampling theory. Another objective of the course is to design a statistical hypothesis about the real world problem and to conduct appropriate test for drawing valid inference about the population characteristics. It is inevitable to have the knowledge of hypothesis testing for any research work. The course will provide an opportunity to learn R programming to substantial extent.

Detailed Course Contents

[Total contact hours required: 60 hours]

Module 1: Laplace Transform (9 lectures, 3 tutorials) **[Weightage 14 marks]**
Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method.

Module 2: Partial Differential Equations (9 lectures, 3 tutorials) **[Weightage 14 marks]**
First order partial differential equations, Solutions of first order linear and non-linear PDEs. Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Second-order linear PDE equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), Separation of variable method, Wave and Heat conduction equations.

Module 3: Basic probability and distributions (9 lectures, 3 tutorials) **[Weightage 14 marks]**
Probability spaces, conditional probability, independence; Total probability, Baye's theorem, Discrete random variables, Binomial distribution, Poisson distribution, Continuous random variables and their properties, Normal distribution, Evaluation of statistical parameters for these three distributions.

Module 4: Basic Statistics (9 lectures, 3 tutorials) **[Weightage 14 marks]**
Measures of Central tendency: Moments, Skewness and Kurtosis, Curve fitting by the method of least squares-fitting of straight lines, second degree parabolas and more general curves. Correlation and Regression, Rank correlation.

Module 5: Applied Statistics (9 lectures, 3 tutorials) **[Weightage 14 marks]**
Tests of significance: Introduction, Sampling and standard error. Test of significance for large samples: Null and alternate hypothesis, critical region, critical value, and level of significance, confidence interval, Errors in testing of hypothesis. Tests of significance for small samples: Student's *t*-distribution, Snedecor's *F*-distribution. Chi-Square distribution: Properties, applications, test for goodness of fit, independence of attributes, test for population variance.

Suggested Text/Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
3. R. K. Jain, S. R. K. Iyenger, Advanced Engineering Mathematics, Narosa Publications.
4. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
6. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
7. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

Table 01: Course Outcomes (COs)

On successful completion of this course students will be able to:

Course Outcome #	Course Outcome
CO1	Find Laplace transform and Inverse Laplace transforms of functions using different methods and able to apply them to solve initial and boundary value problems.
CO2	Classify PDE, solve linear PDEs of both first and second orders, solve nonlinear PDEs of first order and identify real phenomena as models of partial derivative equations (wave and heat equations)
CO3	Understand the concepts of probability, random variables and be familiar with some common probability distribution like Binomial, Poisson and Normal distributions and their properties.
CO4	Understand and apply the concepts of Moments, Skewness and Kurtosis, fit different curves by least square method, understand and apply the concepts of correlation and regressions.
CO5	Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.

Table 02: Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1	-	-	-	-	-	-	-
CO2	3	3	1	2	1	-	-	-	-	-	-	-
CO3	3	3	1	2	1	-	-	-	-	-	-	-
CO4	3	3	1	2	1	-	-	-	-	-	-	-
CO5	3	3	1	2	1	-	-	-	-	-	-	-
MA 3002	3	3	1	2	1	-	-	-	-	-	-	-

Policy for Attendance:

Attendance in lectures and tutorials is compulsory. Please ensure that your attendance is marked on the attendance sheet, and that this is done no later than the first five minutes of the class. There will be maximum 5% marks for attendance which will be awarded as follows:

Attendance	Marks	Attendance	Marks
$\leq$ 40%	1.0	61% $\leq$ 80%	3.5
41% $\leq$ 60%	2.5	81% $\leq$ 100%	5.0

Evaluation Plan:

1. There will be two assignments. Each assignment will carry 1% weightage. Dates, timings and syllabus for Assignment 1 and Assignment 2 will be announced later in the class.

2. There will be two quizzes. Quizzes will be conducted in the tutorial class. Each quiz will be of 30 minutes duration and will carry 1.5% weightage. Dates, timings and syllabus for Quiz 1 and Quiz 2 will be announced later in the class. Questions in Quiz 1 and Quiz 2 will be asked from the tutorial sheets. Missed quizzes cannot be made up.

3. The Mid-Semester examination, will be of 20% weightage. The syllabus for Mid-Sem examination will be announced later in the class. Questions in MSTs may be asked from the tutorial sheets. The End Semester Examination will be of 70% weightage, and will cover all the topics.

w.e.f. July, 2019

B.E.III SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME-3304	**Materials Science and Metallurgy**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Exam Duration	3 Hours	4	0	2	5	70	22

Unit I

Introduction: Historical perspective of materials, classification of engineering materials, advanced materials and future materials.

Inter-atomic bonding and crystal structure: Structure of atom, bonding in solids, covalent, ionic bonds, metallic bonds, Vander Waals bonding. Bravais lattices, crystal system arrangement of atoms in BCC, FCC and HCP crystal, atomic packing factor (APF), Miller indices, directional and plane indices, point, line and surface defects, geometry of screw and edge dislocations, Burger vector.

Unit II

Deformation and Strengthening Mechanisms of Metallic Materials: Elastic and plastic deformation, deformation of metal by slip and twinning, critical resolved shear stress, deformation in poly-crystalline materials viz. mild steel, cast iron and brass, work hardening, yield point phenomenon and related effects, various strengthening mechanisms, principle of recover, recrystallization and grain growth, cold and hot working of metals and their effect on mechanical properties.

Fracture Behaviour: Fracture in metal and alloys, ductile and brittle fracture, fracture toughness, Griffith's criterion, mechanism of creep and fatigue failure, S-N curve.

Unit III

Phase and Equilibrium Diagrams: Allotropy structure of alloys, various types of phase diagrams, Lever rule, Hume-Rothery's rules, solidification of pure metals and alloys, cooling curves, eutectic systems, eutectoid systems, peritectic and peritectoid systems, iron- iron carbide metastable diagram,development of microstructures in iron–carbon alloys TTT and CCT diagram.

Heat Treatment: Objectives of heat treatment, heat treatment procedure for steel, hardening, hardenability, surface hardening of steel, heat treatment of cast irons and Al and Cu alloys defects in heat treated parts.

Unit IV

Ferrous and Non-Ferrous-Metals and Alloys: Properties and applications of various steels and cast irons, effect of various alloying elements on steel. Non-Ferrous metals base alloys, bronze, brass, duralumin and bearing metals, designations of steels, cast irons and various non-ferrous alloys.

Plastics, Composites and Ceramics: Various types of plastics, their properties and selection, elastomers and their applications, composite materials and ceramics.

Unit V

Powder Metallurgy Manufacturing of metal powders, sintering and secondary operations, advantages and limitations of powder metallurgy, manufacturing of typical P/M products.

Metallography and Non-Destructive Techniques: Introduction to metallography, sample preparation for micro structural examination and metallurgical Microscope. Visual inspection, dye penetration, magnetic particle, ultrasonic, radiography test.

(Dr. Sunil Punyabi) (Dr. M.K. Gupta) (Dr. Hemant Parmar)

Recommended Books:

1. Material Science and Engineering by William D. Callister; Wiley.
2. Elements of Material Science and Engineering by Lawrence H. Van Vlack; Pearson Education.
3. Introduction to Physical Metallurgy by Sidney H. Avner, McGraw Hill.
4. Mechanical Metallurgy by George E. Dieter; McGraw Hill.
5. The Science and Engineering of Materials by Donald R. Askeland; Cengage India Pvt. Ltd.
6. Material Science by V. Raghvan; Prentice Hall of India.
7. Material Science by G. K. Narula, K.S. Narula, V.K. Gupta; Tata McGraw Hill Pub. Company.
8. Material Science and Metallurgy by O.P. Khanna; Danpat Rai Publications.
9. Non-Destructive Test and Evaluation of Materials by J Prasad and C.G. K Nair; McGraw Hill Publication

B.E. III SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME-HS3306	**Human Values and Ethics (Mandatory)**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
		2	-	-	0	-	-

Human Values, ethics, codes of ethics, integrity, virtues, spirituality, moral development, motivation, customs and religions, society and its role for development, sociological and psychological factors in crime, responsibility and human rights, whistle blowing, intellectual property rights.
Introduction to yoga for professional excellence and stress management.
Global issues: environmental issues, waste management, health hygiene and sanitations, Swachh Bharat Abhiyan, multinational corporations, Business ethics.

(Dr. Sunil Punyabi) (Dr. Hemant Parmar) (Dr. M. K. Gupta)

w.e.f. July, 2019

B.E.III SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME-3302	**Theory of Machines**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Exam Duration	3 Hours	3	1	2	5	70	22

Unit I

Mechanisms and Machine: Links, kinematics pairs, kinematics chains, degree of freedom and constrained motion, mechanisms, inversions, machines, higher and lower pairs, equivalent linkage, mechanism with lower pairs pantograph, straight-line motion mechanisms, Davis and Ackerman's steering mechanisms, introduction to mechanism synthesis.

Unit II

Motion: Plane motion, absolute and relative motion, displacement, velocity and acceleration of a point, velocity and acceleration in mechanisms - relative velocity method, instantaneous center method, centrodes, Kennedy's theorem, Klein's construction, acceleration diagram, acceleration center, Coriolis components.

Unit III

Belt Drives: Velocity ratio, belt materials, types of belt drive, length of belt, power transmitted by belt, centrifugal effect on belts, maximum power transmitted by belt, initial tension in belt, slip and creep in belt.

Clutches: Single plate and multi plate clutches, cone clutches.

Brakes: Analysis of simple brake assuming uniform pressures and uniform normal wear, band brake, band and block brakes, brakes, internal and external shoe brakes, braking of vehicles.

Dynamometers: Different types and their applications.

Unit IV

Gears: Classification of gears, spur gear terminologies, conjugate action, law of gearing, involute and cycloidal tooth profiles, interference and undercutting, contact ratio, helical, spiral, bevel and worm gears, equivalent spur gear concept, velocity of sliding, center distance, efficiency.

Gear Trains: Simple, compound, epicyclic gear trains, tabulation and formula method, tooth loads and torque calculations in gear trains.

Unit V

Cams: Classification of cams and followers, type of follower motion, uniform, simple harmonic, parabolic, cycloidal, cam profile by graphical method, cams with specified contours.

Gyroscopic Effects: Gyroscopic couple, gyro couple and gyro reaction couple, gyroscopic effect on aero plane, effect of gyroscopic couple on naval ship, stability analysis of four-wheel and two-wheel vehicle, gyro compass.

Recommended Books:

1. Theory of Machines and Mechanisms by A. Ghosh and A.K. Mallik, Affiliated East West Press.
2. Theory of Machine and Mechanism by J.E. Shigley and J.J. Uicker; Addison Wesley.
3. Fundamentals of Applied Kinematics by D.C. Tao; Addison Wesley.
4. Theory of Machines by Thomas Bevan; CBS Publisher.
5. Theory of Machines by S.S. Rattan; Tata McGraw Hill.
6. Mechanism and Machine Theory by Dr. A.G. Ambedkar; Prentice Hall of India.

(Dr. Manoj K Gupta) (Dr. Hemant Parmar)

Recommended Books:

1. Engineering Thermodynamics by P.K. Nag; Tata McGraw Hill Publication.
2. Thermodynamics – A practical approach by Y.A. Cengel; Tata McGraw Hill Publication.
3. Engineering Thermodynamics by V.Wylen; McGraw Hill Publication.
4. Engineering Thermodynamics by Omkar Singh; New Age International.
5. Engineering Thermodynamics by E.Rathakrishanan; Prentice Hall of India (PHI).

Suggested list of experiments:

1. To study the open system in the form two stage air compressor.
2. To study material, fabrication and functions of different parts of Locomotive boiler.
3. To study material, fabrication and functions of different parts of Cochran boiler.
4. To study material, fabrication and functions of different parts of Babcock and Wilcox boiler.
5. To study material, fabrication and functions of different parts of Lancashire boiler.
6. To study the cut section working model of four stroke Petrol Engine.
7. To study the cut section working model of four stroke Diesel Engine.
8. To study the cut section working model of two stroke Petrol Engine.
9. To study the cut section working model of two stroke Diesel Engine.
10. To obtain dryness fraction of steam using separating and throttling calorimeter.

Course Outcomes (CO's)

After completion of this course the student should be able to:

CO	Statement
CO1	Understand various thermodynamic processes and apply the first law of thermodynamics.
CO2	Apply second law of thermodynamics and evaluate entropy, availability and irreversibility.
CO3	Evaluate the phase transformations using P-V-T phase diagrams and the steam tables.
CO4	Compare real and ideal gases and determine properties of mixture of gases.
CO5	Derive thermodynamic relations and analyze different gas power cycles.

Mapping of Course Outcomes (CO's) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	-	-	-	-	1	-	-	1	3	1
CO2	3	3	2	1	-	-	1	-	1	-	-	1	3	2
CO3	2	3	2	2	-	-	-	-	1	-	-	-	3	1
CO4	3	2	-	-	-	-	1	-	1	-	-	1	3	1
CO5	3	3	2	1	-	-	1	-	1	-	-	1	3	2

1-Low, 2-Moderate, 3-High

w.e.f. July, 2019

B.E. III SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME-3305	**CAD Lab**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
		-	-	2	1	30	10

Introduction of CAD, Drawing commands, practices of modify commands, view commands, editing commands, dimensioning in CAD, drawing practices of elementary machine parts in 2D and 3D.

Recommended Books:

1. CAD/CAM theory and practice by Ibrahim Zeid and R. Siva Subramanian; Tata McGraw Hill.
2. Mastering CAD/CAM by Ibrahim Zeid; Tata McGraw Hill.
3. CAD/CAM Principles and application by P. N. Rao; Tata McGraw Hill.
4. CAD/CAM/CIM by P. Radhakrishana et. al.; New Age International Publisher.
5. Engineering drawing with Auto-CAD, Agrawal & Agrawal, TMH.
6. Beginning Auto-CAD, Cheryl R. Shrock, Steve Heather.

Suggested list of experiments:

1. To practice on drawing commands.
2. To practice on editing commands.
3. To practice on modify commands in Auto CAD.
4. To draw simple machine parts in 2D.
5. To draw simple machine parts in 3D.
6. To draw different machine components and assembled.
7. To draw simple machine parts and apply dimensions systems.

Course Outcomes (CO's)

After completion of this course the student should be able to:

CO	Statement
CO1	Illustrate simple drawing using drawing commands.
CO2	Imagine and Illustrate elementary machine parts in 2D.
CO3	Create elementary machine parts in 3D.
CO4	Modify drawings in CAD using modify commands.
CO5	Create drawing with dimensioning in CAD.

Mapping of Course Outcomes (CO's) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	-	-	3	-	-	-	2	-	-	1	-	1
CO2	1	-	-	-	3	-	-	1	2	1	1	1	-	2
CO3	1	-	-	-	3	-	-	2	3	2	2	2	-	1
CO4	1	1	-	-	3	-	-	2	3	3	2	2	-	2
CO5	1	1	-	-	3	-	-	3	3	2	1	3	-	2
1 – Low, 2 – Moderate, 3 – High														

(Sunil Punjabi) (Dr. MK Gupta) (Dr. H. Parmar)

w.e.f. July, 2019

B.E.III SEMESTER MECHANICAL ENGINEERING							
COURSE CONTENTS (AICTE FLEXIBLE CURRICULA)							
ME-3301	**Thermodynamics**	**L**	**T**	**P**	**C**	**Max. Marks**	**Min. Marks**
Exam Duration	3 Hours	3	1	2	5	70	22

Unit I

Basic concepts: Thermodynamic systems, thermodynamic properties, processes and equilibrium, quasi-static process, reversible and irreversible process, zeroth law of thermodynamics and concept of measurement of temperature, concept of an ideal gas, heat and work transfer.

First Law of Thermodynamics: First law applied to closed system undergoing a cycle and process, concept of energy, flow process and energy, steady flow process, application of steady flow energy equation (S.F.E.E) in engineering systems, simple non-steady flow processes, limitations of first law of thermodynamics.

Unit II

Second law of thermodynamics: Kelvin-Planck and Clausius statement, concept of heat engine, refrigerator and heat pump, calculation of thermal efficiency of heat engine cycle and coefficient of performance (C.O.P) of refrigerator and heat pump cycle, equivalence of two statements of second law, Carnot cycle and Carnot's theorem, Clausius theorem, Clausius inequality, concept of entropy and entropy principle, entropy change for ideal gas, available energy, availability and irreversibility.

Unit III

Properties of Pure Substance: Phase, phase-transformations, formation of steam, properties of steam, P-V-T surface of pure substance, T-S diagram, P-V diagram, H-S diagram for a pure substance, quality or dryness fraction of steam, use of steam table and Mollier chart, measurement of steam quality.

Properties of Gases: Deviation of real gas with ideal gas, Avogadro's hypothesis, equation of state of gas, Vander-Waal's equation, evaluation of its constants, limitations of the equation, law of corresponding states, compressibility factor and generalized compressibility chart, P-V-T surface of a real gas.

Unit IV

Thermodynamic Relations: Differential relations for systems of constant chemical composition, combined first and second law of thermodynamics equation, Maxwell relations and their applications, Joule-Kelvin effect and its coefficient.

Gas Mixtures: properties of mixture of ideal gases, Amagat and Leduc law, internal energy, enthalpy and specific heat of gas mixtures, entropy of gas-mixtures.

Unit V

Gas Power Cycles and its application: Air standard cycles: Otto, Diesel and Dual cycles and their comparison, Fuel-air cycle and actual cycle applied to IC engine, mean effective pressure, calculations for thermal efficiency, valve timing diagram for 4-stroke engine, port timing diagram of 2-stroke engine (SI & CI), Brayton cycle and its modifications.

(Dr. M K Gupta) (Dr. Sunil Punjabi) (Dr. Hemant Parmar)

Recommended Books:

1. Engineering Thermodynamics by P.K. Nag; Tata McGraw Hill Publication.
2. Thermodynamics – A practical approach by Y.A. Cengel; Tata McGraw Hill Publication.
3. Engineering Thermodynamics by V.Wylen; McGraw Hill Publication.
4. Engineering Thermodynamics by Omkar Singh; New Age International.
5. Engineering Thermodynamics by E.Rathakrishanan; Prentice Hall of India (PHI).

Suggested list of experiments:

1. To study the open system in the form two stage air compressor.
2. To study material, fabrication and functions of different parts of Locomotive boiler.
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4. To study material, fabrication and functions of different parts of Babcock and Wilcox boiler.
5. To study material, fabrication and functions of different parts of Lancashire boiler.
6. To study the cut section working model of four stroke Petrol Engine.
7. To study the cut section working model of four stroke Diesel Engine.
8. To study the cut section working model of two stroke Petrol Engine.
9. To study the cut section working model of two stroke Diesel Engine.
10. To obtain dryness fraction of steam using separating and throttling calorimeter.

Course Outcomes (CO's)

After completion of this course the student should be able to:

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CO1	Understand various thermodynamic processes and apply the first law of thermodynamics.
CO2	Apply second law of thermodynamics and evaluate entropy, availability and irreversibility.
CO3	Evaluate the phase transformations using P-V-T phase diagrams and the steam tables.
CO4	Compare real and ideal gases and determine properties of mixture of gases.
CO5	Derive thermodynamic relations and analyze different gas power cycles.

Mapping of Course Outcomes (CO's) with Program Outcomes (PO's) and Program Specific Outcomes (PSO's)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	1	-	-	-	-	-	1	-	-	1	3	1
CO2	3	3	2	1	-	-	1	-	1	-	-	1	3	2
CO3	2	3	2	2	-	-	-	-	1	-	-	-	3	1
CO4	3	2	-	-	-	-	1	-	1	-	-	1	3	1
CO5	3	3	2	1	-	-	1	-	1	-	-	1	3	2

1-Low, 2-Moderate, 3-High