Annasaheb Dange College of Engineering and Technology, Ashta
(An Autonomous Institute affiliated to Shivaji University, Kolhapur)
Department of Mechanical Engineering

Vision & Mission of Institute

Vision: To be a Leader in preparing professionally competent engineers

Mission: We, at Annasaheb Dange College of Engineering and Technology, Ashta, are committed to achieve our vision by

- Imparting effective outcome based education.

- Preparing students through skill oriented courses to excel in their profession with ethical values.

- Promoting research to benefit the society.

- Strengthening relationship with all stakeholders.

Vision & Mission of Department

Vision: To be a leader in developing mechanical engineering graduates with knowledge, skills & ethics

Mission: We, at the Department of Mechanical Engineering are committed to achieve our vision by,

- M1- Imparting effective outcome based education.

- M2- Preparing students to serve the society with professional skills and ethical values.

- M3- Cultivating skills and attitude among students and faculties to promote research

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Program Educational Objectives (PEOs)

The graduates of the Department of Mechanical Engineering at ADCET, Ashta will be able to,

PEO 1:	Provide solutions to the problems of mechanical and relevant engineering disciplines using the knowledge of fundamental science and skills developed during graduation studies.
PEO 2:	Demonstrate an understanding about selected specific areas of mechanical engineering in career development.
PEO 3:	Communicate and function effectively using professional ethics, social and environmental awareness.
PEO 4:	Engage in lifelong learning, for effective adaptation to technological changes.

Program Outcomes (POs)

PO 1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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PO 6	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	Environment and stainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	Project management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO 1	An ability to find out, articulate the local industrial problems and solve with the use of mechanical engineering tools for realistic outcomes.
PSO 2	Apply the knowledge of mechanical engineering domains to design and analyze the products or processes.

HOD
Mechanical Engineering

Annasaheb Dange College of Engineering and Technology, Ashta

An Autonomous Institute

Curriculum Structure

S. Y. B. Tech.
MECHANICAL ENGINEERING

SEM III – SEM IV
w.e.f. 2020-21

Department of Mechanical Engineering

Teaching and Evaluation Scheme
S.Y. B.Tech.: Sem-III

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks)		Practical (Marks)	
		L	T	P	Credits	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
1MEBS201	Engineering Mathematics-III	3	1	--	4	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEPC202	Kinematics of Machines	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEPC203	Thermodynamics	4	--	--	4	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEPC204	Strength of Materials	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEES205	Materials Science and Metallurgy	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEPC206	Manufacturing Processes and Machine Tools	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEMC207	Environment Studies	2	--	--	--	ISE	50	Grade	--	--
1MEPC251	Kinematics of Machines Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	OE	25	10
1MEES252	Materials Science and Metallurgy Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	OE	25	10
1MEPC253	Workshop Practice -II	--	--	2	1	ISE	--	--	25	10
						ESE	--	--	--	--
1MEHS254	General Proficiency Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	--	--	10
Total		21	01	8	24	Total	600		150	

Total Contact Hours/Week: 30 hrs

Course Category		HS	BS		ES	PC	PE	OE	PR
Credits		01	04		04	15	00	00	00
Cumulative Sum		04	20		24	19	00	00	00

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Teaching and Evaluation Scheme
S.Y.B. Tech.: Sem- IV

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks)		Practical (Marks)	
		L	T	P	Credits	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
1MEPC208	Dynamics of Machines	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEPC209	Fluid Mechanics	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEPC210	Design of Machine Elements-I	4	--	--	4	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEPC211	Tools Engineering	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEPC212	Metrology, Quality Control & Measurement	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEHS213	Economics for Mechanical Engineers	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
1MEPC255	Dynamics of Machines Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--		--	--
1MEPC256	Fluid Mechanics Laboratory	--	--	2	1	ISE	--		25	10
						ESE	--	POE	25	10
1MEPC257	Metrology, Quality Control & Measurement Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	--	--	--
1MEPC258	CAD Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	POE	25	10
1MEPC259	Workshop Practice III	--	--	2	1	ISE	--	--	25	10
						ESE	--	POE	25	10
Total		19	0	10	24	Total	600		200	

Total Contact Hours/Week: 29 hrs

Course Category	HS	BS	ES	PC	PE	OE	PR
Credits	03	00	00	21	00	00	00
Cumulative Sum	07	20	24	40	00	00	00

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Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	**1MEBS201,Engineering Mathematics- III**
Prerequisite/s	1MEBS102, 1MEBS107
Teaching Scheme: Lecture/Tutorial	03/01
Credits	04
Evaluation Scheme: ISEI/ MSE/ISEII/ESE	10/30/10/50

Course Objectives:

01	To improve mathematical skills for enhancing of logical thinking power of students.
02	To acquire knowledge with a sound foundation in mathematics and prepare them for graduate studies in Mechanical Engineering.
03	To aware about mathematics fundamental necessary to solve and analyze engineering problem.

Course Outcomes :

Upon successful completion of the course, students will be able to

1MEBS201_1	**Solve** the Mechanical Engineering problems using Linear Differential Equation, (K^3)
1MEBS201_2	**Solve** the problems of vector calculus, (K^3)
1MEBS201_3	**Construct** the Fourier Series for the any function, (K^3)
1MEBS201_4	**Evaluate** Laplace Transform and inverse Laplace Transform of any function, (K^3)
1MEBS201_5	**Solve** Algebraic and transcendental Equations using numerical method, (K^3)
1MEBS201_6	**Solve** the problems on Partial Differential Equation, (K^3)

Course content

Unit 1	**Linear Differential Equations and Its Application** Definitions, Complete solution, Operator D, Rules for finding Complementary function, Inverse operator, Rules for finding the Particular integral, Oscillations of a spring - Free oscillations, Damped Oscillations, Forced oscillations without damping.	**08 Hrs.**
Unit 2	**Vector Calculus** Introduction, Scalar and vector point functions - vector operator del, Del applied to scalar point functions - gradient, directional derivative, Del applied to vector point functions - Divergence and curl, Line integral, Green's theorem in the plane	**07 Hrs.**
Unit 3	**Fourier Series** Introduction, Euler's Formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Expansion of odd or even periodic functions, Half range series	**06 Hrs.**
Unit 4	**Laplace Transform** Introduction, Laplace transform of elementary functions. Properties of Laplace Transforms, Transforms of derivatives, Transforms of integrals, Multiplication by t^n, Division by t, Evaluation of integrals by Laplace Transforms. Inverse Laplace transforms - Method of Partial Fractions, convolution Theorem, Applications of Laplace transform to solve linear differential equations	**08 Hrs.**

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Unit 5	**Numerical Solution of Algebraic and Transcendental Equations** Bisection Method, Regular-Falsi Method, Newton-Raphson Method, Secant Method, Muller's Method, Multiple roots by Newton's method.	06 Hrs.
Unit 6	**Partial Differential Equations and its Application** Introduction –Formation of partial differential equations, linear equation of the first order (Lagrange's equation), Method of separation of variables, Vibration of a stretched string, one dimensional wave equation (using separation of variables), One dimensional heat flow equation (using separation of variables).	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publication	Fortieth	2007
02	Higher Engineering Mathematics.	H. K. Das	S. Chand and company ltd.,	First	2011
03	Higher Engineering Mathematics.	B.V. Ramana	Tata McGraw Hill Education Pvt., ltd.	First	2007
04	Engineering Mathematics I and II	ITL Education	Cengage Learing India Pvt. Ltd,	First	2012

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Advanced Engineering Mathematics	Erwin Kreyszig	John Wiley & Sons,Inc.	Ninth	2007
02	Advanced Engineering Mathematics.	Potter Merle C.	Oxford University Press,	Third	2005
03	Engineering Mathematics Volume I and II	ITL Education	Cengage Learning India Private limited	First	2015
04	Advanced Engineering Mathematics.	ONeil Peter V	Cengage Learing India Pvt. Ltd. ,	First	2012

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Course Details:

Class	S.Y.B. Tech, Sem.-III
Course Code and Course Title	1MEPC202, Kinematics of Machines
Prerequisite/s	1MEES103
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims:

01	To develop competency in drawing velocity and acceleration diagram for simple and complex mechanism
02	To explain various power transmitting devices, energy storage devices and characteristics of governor.
03	To provide knowledge of cams and followers with their applications.
04	To explain terminology of gears and characteristics of governors.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC202_1	Explain inversion of mechanisms with their applications. (K^2)
1MEPC202_2	Distinguish different types of power transmitting devices according to their applications. (K^2)
1MEPC202_3	Interpret different terminologies of toothed gears (K^3)
1MEPC202_4	Determine geometric parameters of gears, cams and characteristics of governors. (K^3)
1MEPC202_5	Analyze kinematic behavior of different mechanism by drawing velocity and acceleration diagrams $(K^3 S^2)$

Course Contents:

Unit 1	**Fundamentals of Mechanisms**	06 Hrs.
	Link, Kinematic pair, Kinematic chain, Mechanism, Inversions, Types of constrained motions, Grubbler's criterion, Grashof's criterion for mobility, Kutzbach criteria, Four bar chain and its inversions, Slider crank chain and its inversions, Double slider crank chain and its inversions, Steering Mechanism, Hooke's joint.	
Unit 2	**Mechanical Power Transmitting and Storing Devices**	06 Hrs
	Belt Drive- Calculation of power transmitted, Belt tension ratio, Actual tension in a running belt, Centrifugal and initial tension in belt, Slip and creep of belt, V Belts, Selection of Belts. [Numerical Treatment on flat belt only]	
	Flywheel- Turning moment diagrams, Fluctuation of energy, Coefficient of fluctuation of speed, Rimmed flywheel [Only Theoretical treatment for Flywheel]	
Unit 3	**Gears**	07 Hrs.
	Classification of gears, Spur Gears - terminology, fundamental law of toothed gearing, involutes and cycloidal profile, conjugate action, contact ratio, minimum number of teeth, interference and under cutting. Helical	

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		Gears- Nomenclatures, center distance, Spiral Gears- Center distance, efficiency.	
Unit 4	**Cams and Followers**	Classification of cams, Classification of followers, Terminologies of cam and follower, Motions of Follower a) Uniform velocity b) Simple harmonic motion c) Uniform acceleration and retardation d) Cycloidal motions, Displacement diagram of follower, Velocity and acceleration diagram of Follower, Construction of cam profile	07 Hrs.
Unit 5	**Velocity and Acceleration Analysis in Mechanism**	Graphical analysis- velocity and acceleration for different mechanisms using relative velocity and acceleration method, Corioli's component of acceleration (Simple Problems), Klein's construction for slider crank mechanism, Instantaneous center method (Up to 6 IC), Kennedy's theorem. Analytical analysis- Approximate analytical method for velocity and acceleration of piston	10 Hrs.
Unit 6	**Governors**	Comparison between governors and flywheel. Types-centrifugal governors, inertia governors. Force analysis - gravity loaded governors- Porter, Spring loaded governors-Hartnell, Performance characteristics of governors- stability, isochronism, hunting, governor effort and governor power, coefficient of insensitiveness. Applications of governors.	06Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Ratan S.S	Tata McGraw Hill New Delhi.	Third	13th reprint 2012
02	Theory of Machines	P.L.Ballany	Khanna Publication, New Delhi	Twenty fifth	2012
03	Theory of Machines	V.P. Singh	Dhanpat Rai and Sons	Third	2012
04	Kinematics & Dynamics of Machines	George Martin	Waveland Press, Inc.	Second	2002

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Thomas Bevan	CBS Publishers, New Delhi.	Third	reprint 2005
02	Theory of Machines and Mechanism	Shigley	Oxford International	Third	2009
03	Theory of mechanism and machines	Sadhu Singh	Pearson	First	2012
04	Theory of machines and Mechanism	Jagdish Lal	Metropolitin Book Company	First	2011
05	Mechanism and Machines	Gosh And Mallik	East West Press	Third	1998
06	Theory of Machine	Sarkar	Tata Mc Graw Hill	First	2002

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Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	**1MEPC203, Thermodynamics**
Prerequisite/s	1MEBS101, 1MEBS106, 1MEBS151, 1MEBS155
Teaching Scheme: Lecture/Tutorial	04/00
Credits	04
Evaluation Scheme: ISE I/MSE/ ISE II/ ESE	10/30/10/50

Course Objectives: The course aims:

01	To inculcate fundamentals of thermodynamic laws, concepts and principles.
02	To impart the principles of work and energy.
03	To comprehend knowledge about properties of pure substances.
04	To study different types of turbines and corresponding velocity diagrams.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC203_1	**Illustrate** first law and second law of thermodynamics and explain their application to wide range of system (K^2)
1MEPC203_2	**Describe** entropy, changes in entropy and increase in entropy principle. (K^2)
1MEPC203_3	**Determine** the availability of different system. (K^2)
1MEPC203_4	**Explain** governing and troubleshooting of turbine. (K^2)
1MEPC203_5	**Evaluate** Properties of pure substances (K^3)
1MEPC203_6	**Compute** performance of Impulse & Reaction turbine. (K^3)

Course Contents:

Unit 1	**First Law of Thermodynamics** Thermodynamic systems, properties of a system, state and equilibrium, processes and cycles, temperature and the zeroth law of thermodynamics, heat and work transfer, first law of thermodynamics, first law applied to closed system, limitations of first law of thermodynamics, energy- a property of system, different forms of stored energy , The first law of thermodynamics for a control volume, The steady-state process; Examples of steady-state processes	09 Hrs.
Unit 2	**Second Law of Thermodynamics** Qualitative difference between work and heat, cyclic heat engine, kelvin–planck statement, clausius statement, refrigerators and heat pumps, equivalence of the two statements, perpetual-motion machines, reversible and irreversible processes, the carnot cycle, the carnot theorem and its corollaries	09Hrs.
Unit 3	**Properties of Pure Substance**	

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	Definition of pure substance, phase change of pure substances, p-T, p-v-T Surface and triple point of water, phase rule formation and properties of steam, quality of steam, Superheated steam & Characteristic of superheated steam ,steam calorimeters, h-s chart or Mollier chart, use of steam table and Mollier chart. ideal gas equation of state and van der Waals equation of state	09 Hrs.
Unit 4	**Entropy and Exergy** Clausius theorem, inequality, entropy-property of system, clausius principle of increase of entropy, general expression of entropy of a perfect gas. available energy referred to cycle, law of degradation of energy, availability of steady flow system, closed system, useful work, dead state	10 Hrs.
Unit 5	**Impulse turbines** Rankine and modified Rankine cycle, principles of operation, classification, impulse and reaction steam turbine, compounding of steam turbines. flow through impulse turbine blades, velocity diagrams, work done, efficiencies, end thrust, blade friction, influence of ratio of blade speed to steam speed on efficiency of single stage turbines	09 Hrs.
Unit 6	**Reaction turbines** Flow through impulse reaction blades, velocity diagram, and degree of reaction, parson's reaction turbine, back pressure and pass out turbine. governing of steam turbines. losses in steam turbines, performance of steam turbines and different methods of improving performance, function of diaphragm, glands, turbine troubles like erosion, corrosion, vibration, fouling etc.	10Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Thermodynamics: An Engineering Approach	Yunus A. Cengel	McGraw Hill	Eighth	2015
02	Engineering Thermodynamics	P. K. Nag	McGraw Hill	Fifth	2013
04	Engineering Thermodynamics	Ethirajan R.	Prentice Hall India Learning Pvt. Ltd.	Second	2005
04	Engineering Thermodynamics	D.S. Kumar	S.K. Kataria and Sons	Fourth	2012

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fundamentals of Thermodynamics	Richard E. Sonntag, Claus Borgnakke	New Age International	Seventh	2009
02	Applied Thermodynamics	Onkar Singh	New Age International	Third	2009

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
03	Fundamentals of Thermodynamics	Borhnakke, Sonnatag	Wiley Publication	Seventh	2009
04	Introduction to Thermal System Engineering	M.J. Moran, H.N. Shapiro, B.R. Munson, D.P. Dewitt	Wiley Publication	Tenth	2013
05	Fundamentals of Engineering Thermodynamics	Michael J. Moran, Howard N. Shapiro, Daisie D. Boettner, Margaret B. Bailey	John Wiley & Sons, Inc.	Eighth	2014

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SY-ME-07150

Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	**1MEPC204, Strength of Materials**
Prerequisite/s	1MEES104
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Objectives: The course aims:

01	To explain various stress and strain determination methods and basic knowledge of principal stresses and strains.
02	To develop ability to draw shear force and bending moment diagram of the beam.
03	To explain methods for determining deflection of beams.
04	To explain methods for determining safe load on columns and find strain energy stored in the body.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC204_1	**Explain** different types of stresses, strains and elastic constants. (K^2)
1MEPC204_2	**Identify** and apply a particular theoretical method of stress and strain determination for mechanical elements under various loads. (K^3)
1MEPC204_3	**Determine** the deflection of beams under different loading conditions. (K^3)
1MEPC204_4	**Apply** different theories to determine safe load on the columns. (K^3)
1MEPC204_5	**Determine** strain energy absorbed in the body due to external load, torsion and bending. (K^3)
1MEPC204_6	**Analyze** the beam by drawing shear force and bending moment diagram. (K^4A^2)

Course Contents:

Unit 1	**Stresses and Strain** Stress, strain, normal and shear stresses, complementary shear stress, Factor of safety, Elasticity, Hooke's Law, Modulus of Elasticity, Poisson's ratio, Bulk modulus, Shear modulus, Inter-relationship between elastic constants, stresses in varying sections of normal and composite bars, thermal stresses.	08 Hrs.
Unit 2	**Principal Stresses and Strains (2D)** Normal and shear stresses on any oblique planes, concept of principal planes, derivation for principal stresses and maximum shear stress, positions of principal planes and planes of maximum shear, graphical solutions using Mohr's circle of stresses, introduction to 3D stresses.	07 Hrs.
Unit 3	**I) Shear Force annd Bending Moment:** Shear force and bending moment diagram for simply supported, cantilever and overhanging beam subjected to point load, inclined load, udl, uvl and couple. **II) Torsion:** Theory of torsion, assumptions, derivation of torsion	07 Hrs.

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	equation, Polar modulus, stresses in solid and hollow circular shaft, power transmitted by shaft.	
Unit 4	**Stresses in Beams** **I) Bending stresses:** Pure bending of beams, flexural formula, moment of inertia, bending stresses in beams of various commonly used sections such as I, T, C and cut-out sections. **II) Shear stresses:** Shear stress for different cross-section of beams, distribution of shear stress in beams of various commonly used sections.	07 Hrs.
Unit 5	**Deflection of Beams** Concept of slope and deflection, Strain curvature and moment curvature relation, Methods for determining deflections, Solution of beam deflection problem by Double integration method. (Simply supported, cantilever subjected to point load, udl).	06 Hrs.
Unit 6	**I) Columns:** Concept of critical load and buckling, derivation of Euler's formula for buckling load with various end conditions, limitations of Euler's formula, Rankine's buckling load, safe load on column. **II) Strain Energy:** Strain energy due to different types of loading, Pure bending (simply supported beam & cantilever), Shear stresses (Direct Shear & Pure Torsion).	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Mechanics of Materials	Ferdinand P Beer E.R. Johnston	McGraw Hill Book Company	Fifth	2009
02	Strength of Materials	Ramamurthum	Dhanpat Rai and Sons, New Delhi	Seventeenth	2011
03	Strength of Materials	Khurmi Gupta	S. Chand Publication.	Twenty sixth	2011
04	Strength of Materials	P. N. Chandramouli	PHI, New Delhi.	First	2013

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Advanced Strength of Materials	Den Hartong J P	Dover Publication Inc Mineola.	First	2002
02	Mechanical Analysis and Design	H. BURR and John Cheatam	PHI, New Delhi.	Second	1997
03	Machine Design	Robert Norton	Prentice Hall	Second	2003
04	Strength of materials	B.K.Sarkar	McGraw Hill Pub.	Second	2007

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Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	**1MEES205**, Materials Science and Metallurgy
Prerequisite/s	1MEBS101
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Objectives: The course aims:

01	To acquaint students the linking of composition-structure-property relationship in metals and alloys.
02	To explain the importance of different destructive and non-destructive material testing methods.
03	To identify the significant heat treatment process and apply for given component.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEES205_1	**Describe** properties of metals, defects and its possible causes, (K^2)
1MEES205_2	**Differentiate** various ferrous and non-ferrous metals along with their microstructure, (K^2)
1MEES205_3	**Describe** various destructive and non-destructive testing, (K^2)
1MEES205_4	**Select** appropriate heat treatment for metals and alloys for particular application, (K^2)
1MEES205_5	**Explain** the principle of mechanical testing to evaluate the mechanical properties, (K^2)
1MEES205_6	**Explain** powder metallurgy methods and their applications, (K^2)

Course Contents:

Unit 1	**Metals and Alloy Systems:** Introduction to Metallic and Non-metallic materials and its classification (metals/alloys, Crystal structure (SC, BCC, FCC, HCP), Imperfections in crystals, Alloy formation by crystallization, Nucleation and growth, Cooling curves, Dendritic structure and coring. Solid solutions and intermediate phases, Phases and Gibbs phase rule, Construction of equilibrium diagrams from cooling curves, Isomorphous system (Solid Solution), Eutectic, Partial solubility Peritectic and Intermetallic Compounds Lever arm principles.	08 Hrs.
Unit 2	**Study of Ferrous Alloys:** With respect to typical compositions, Properties and Applications for the following alloys.) Fe- Fe3C equilibrium diagram - Ferrous alloys (Plain carbon steels, cast iron) Alloy steels- Free cutting steels, HSLA high carbon low alloy steels, mar aging steels. Creep resisting steels, Stainless steels- different types. Tool steels- types, Specifications based on IS, BS, SAE, AISI.	07 Hrs.
Unit 3	**Study of Non Ferrous Alloys and Mechanical Testing:** [1] Copper based alloys- brasses (Cu- Zn), Bronzes (Cu- Sn), Cu- Be, Cu- Ni. aluminium alloys Al-Cu(Duralumin) Al-Si (Modification), Pb- Sn (Solders and fusible alloys) Sn-Sb alloys (Babbits) Ti (Ti-6Al-4V) super	06 Hrs.

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		alloy Precipitation hardening - Basic requirements, Stages. [2] Destructive Testing methods: Tensile, Compressive, Impact, Fatigue, Creep, Hardness (Rockwell, Brinell and Vickers) Non- Destructive Testing: Visual inspection, Dye Penetrant, Magnetic, Ultrasonic, Radiography, Eddy Current testing.	
Unit 4	**Principles of Heat Treatment:** Transformation of Pearlite into austenite upon heating, Transformation of austenite into Pearlite, Bainite and Martensite on cooling. TTT –Diagram and CCT - Diagrams - significance, Effect of alloying elements on TTT diagram and its Significance. Heat treatment of steels, Annealing – Types- Full, Partial and Sub critical annealing (Various types) and purposes, Normalising- Purposes.		08 Hrs.
Unit 5	**Heat Treatment Processes:** Hardening (Hardening types), Purposes, Austempering & Martempering, Mechanism of quenching and Quenching media, Hardenability-Grossmans critical diameter method and Jominy end quench test. Tempering Types, Structural transformations during tempering, purposes sub-zero treatment, Surface hardening - Flame and Induction, case hardening - Carburising, Nitriding, Cyaniding, Carbonitriding, Heat treatment defects and remedies.		07 Hrs.
Unit 6	**Powder Metallurgy:** Advantages, Limitations and Applications of Powder Metallurgy Powder manufacturing types- Mechanical, Physical, Chemical and Electro-Chemical, Mixing/ Blending- (Double cone and Y- Cone mixers) Compaction- types- Conventional, Isostatic, HERF, Powder rolling and extrusion, Sintering- Types liquid stage and solid stage sintering, Finishing operations: Sizing, Machining, Infiltration and Impregnation. Powder metallurgy defects and remedies.		06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Material science and metallurgy for engineers	V.D. Kodgire	Everest Publishers Pune	Twelth	2009
02	Introduction to physical metallurgy	S.H.Avner	McGraw Hill Book Company Inc	Second	1988
03	Engineering Metallurgy Part-I	R. A. Higgins	ELBS with Edward Arnold	Sixth	1994
04	Material Science and Engineering	V Raghwan	Prentice Hall of India Pvt. Ltd., New Delhi	Third	1995

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Materials Science & Engineering	W. Callister	John Wiley & sons	Second	Reprint 2017
02	Heat Treatments Principles and Practices	T.V. Rajan / G.P. Sharma	Prentice Hall of India Pvt Ltd,	Fourth	1994

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Reference Books:

			New Delhi		
03	Callister's Materials Science and Engineering	R. Balasubramaniam	Wiley India Pvt Ltd	Third	2008
04	Mechanical Behaviour and Testing of Materials	K. Bhargava	Publication PHI	Second	2011

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Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	1MEPC206, Manufacturing Processes and Machine Tools.
Prerequisite/s	1MEES154,
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Objectives:

01	To make students aware with different manufacturing processes and their applications.
02	To impart knowledge of forming, plastic shaping and joining processes.
03	To make students acquainted with machine tools, components and accessories
04	To make students aware of conventional and nonconventional machining processes.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC206_1	Explain the basic casting process and the various operations involved in casting process, (K^2)
1MEPC206_2	Explain different types of forming and plastic moulding processes, (K^2)
1MEPC206_3	Explain types of joining processes and their applications, (K^2)
1MEPC206_4	Identify and explain the function of the basic components of machine tools and its accessories, (K^2)
1MEPC206_5	Explain working principle and applications of nonconventional machining processes, $(K^2 A^2)$
1MEPC206_6	Select manufacturing process and machine tools required to manufacture the component. (K^3)

Course Contents:

Unit 1	Introduction to manufacturing processes	10 Hrs.
	Introduction and classification of manufacturing processes	
	Fundamentals of Casting	
	[1] Importance of casting, advantages, disadvantages and limitations of casting, introduction and types of patterns and core boxes, materials used and selection criteria for patterns, pattern allowances	
	[2] Moulding and core processes: Types of sands used in moulding and core making, their properties. Sand moulding types such as Green sand Moulding, shell Moulding, CO_2 Moulding, Investment casting. Equipments and tools used for moulding and core making. Components of gating system, functions and importance of runners and risers, solidification control devices: chills, ceramics.	
	[3] Introduction to permanent mould casting processes such as Continuous casting, Gravity die casting, pressure die-casting, Centrifugal casting, Vacuum die casting, Squeeze casting, etc. Sand mould casting such as shell mould casting, green sand casting , dry sand casting, lost foam casting investment casing etc. various casting defects.	

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		[4] Introduction to 3D printing for mould making.	
Unit 2	**Forming Processes and Plastic Working**	Various metal forming operations, hot and cold working of metals such as forging, rolling, extrusion, wire drawing, sheet metal working, spinning, swaging, thread rolling, metal forming defects etc. **Plastik Moulding:** Blow moulding, compression moulding, transfer moulding, injection moulding, extrusion, thermoforming, rotational moulding, foam moulding and calendaring etc.	08 Hrs.
Unit 3	**Joining Processes**	Overview and classification of joining processes, Surface preparation and various joints, Arc Welding- SMAW, TIG, MIG, Resistance welding- Spot, Seam and Projection welding process, Soldering and Brazing, riveted and bolted joints.	06 Hrs.
Unit 4	**Machine Tools 1**	[1] **Lathe:** Introduction, Working principle, types, specifications, principle parts, accessories, attachments, and various lathe operations. [2] **Grinding machines:** Introduction, types of grinding, classification of grinding machines, principle of grinding operations, grinding wheel, bonds and bonding processes, grit, grade and structures of wheel, wheel shapes and sizes, standard marking system for grinding wheel, mounting and balancing of grinding wheel and dressing of grinding wheel. [3] **Shaping and Planning machines:**-Crank shaper, hydraulic shaper, Table feed mechanism, various operations on shaper. Standard double housing planner, table drive and feed mechanism, various operations on planner.	10 Hrs.
Unit 5	**Machine Tools 2**	[1] **Drilling and Boring machines** - Classifications, construction & working of Radial drilling machine, Various operations on drilling machines. Horizontal and vertical boring machine, boring tools and bars used, Jig boring machine. Drill bit. [2] **Milling machine** – classification of milling machines, construction and working of column and knee type milling machine, milling operations, study of standard accessories - dividing head, gear cutting on milling machine	05 Hrs.
Unit 6	**Nonconventional machining processes.**	Need of nonconventional machining, Electro-chemical, electro-discharge, ultrasonic, LASER, electron beam, water jet machining etc., Introduction to Special machine tools.	03 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Manufacturing Technology- Foundry, Forming and Welding	P. N. Rao	Tata Mc- Graw Hill Publication	Second	2009
02	Foundry Technology	O. P. Khanna	Dhanpat Rai Publication	Fifteenth	2011
03	Production Technology: Vol.	P. C. Sharma	S. Chand	First	2006

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	1: Manufacturing Processes				
04	Production Technology: Vol. 2: Machine Tools	P.C.Sharma	S. Chand	Second	2006
05	Workshop technology vol.1	S.K.Hajra Choudhary S.K.Bose	Media promoters and publishers pvt ltd.	Twelfth	2012
06	Workshop technology vol.2 (Machine tools)	S.K.Hajra Choudhary S.K.Bose	Media promoters and publishers pvt ltd.	Twelfth	2012
07	Workshop Technology vol. II,	B.S. Raghuvanshi	Dhanpat Rai and Sons.	Sixth	2015

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Materials and Processes in Manufacturing	E. Paul DeGarmo, J.T. Black.	PHI Publication	Eighth	1997
02	Mechanical Metallurgy	George E. Dieter	Tata Mc Graw Hill Publication	Third	2013
03	Machine Tools and Manufacturing Technology	Steve F. Krar, Mario Rapisarda.	Delmar publisher	Second	2010
04	Workshop Technology", Vol.I 2001, Vol.II 2007 andVol.III 1995.	W.A.J.Chapman	CBS Publishing and Distributors, N. Delhi	Fifth	2001

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ADCET

ANNASAHEB DANGE COLLEGE OF ENGINEERING AND TECHNOLOGY, ASHTA
(An Autonomous Institute)
Department of Mechanical Engineering

Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	1MEMC207, Environmental Studies
Prerequisite/s	--
Teaching Scheme: Lecture	02
Credits	--
Evaluation Scheme: ISE	50 (Grade)

Course Objectives	
01	To discuss the importance of environmental elements
02	To explain characteristics of environmental pollutants and their impacts.
03	To promote practices for achieving better environmental conditions
04	To summarize the methods and laws relevant for environmental management,

Course Outcomes (COs)

Upon successful completion of the course students will be able to:

1MEMC207_1	Explain importance of environmental studies with necessary of acts.(K²)
1MEMC207_2	Explain importance of public awareness on environmental problems (K²)
1MEMC207_3	Write a technical report in team regarding course and impacts of environment related issues.(S²)
1MEMC207_4	Discuss current concern of environment issues.(A²)
1MEMC207_5	Describe the need of environment protection and ethics.(A²)

Course Contents:

Unit 1	**Nature of Environmental Studies** Definition, scope and importance. Multidisciplinary nature of environmental studies, Need for public awareness.	02Hrs
Unit 2	**Natural Resources and Associated Problems** a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people; b) Water resources: Use and over-utilization of surface and groundwater, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewable and non renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy, f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources.	04Hrs
Unit 3	**Ecosystems** Concept of an ecosystem. 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 the following ecosystem :- a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem d)Aquatic ecosystems	04Hrs

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		(ponds, streams, lakes, rivers, oceans, estuaries)	
Unit 4	**Biodiversity and its conservation**	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. India as a mega- diversity nation. Western Ghat as a biodiversity region. Hot-spots of biodiversity. Threats to biodiversity habitat loss, poaching of wildlife, man- wild life conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	05Hrs
Unit 5	**Environmental Pollution**	Definition: 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 an individual in prevention of pollution.	04Hrs
Unit 6	**Social Issues and the Environment**	Disaster management: floods, earthquake, cyclone, tsunami and landslides Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation. Consumerism and waste products.	03Hrs
Unit 7	**Environmental Protection**	From Unsustainable to Sustainable development Environmental Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest Conservation Act. Population Growth and Human Health, Human Rights	06Hrs

Mini project based on: (Mini Project report is Mandatory.)
Environmental assets River/Forest/Grassland/Hill/Mountain.
<div align="center">**OR**</div>
A local polluted site Urban/Rural/Industrial/Agricultural.
<div align="center">**OR**</div>
Study of common plants, insects, and birds.
<div align="center">**OR**</div>
Study of simple ecosystems - ponds, river, hill slopes, etc.

Assessment Method:
1. Mini Project report – 05 marks
2. Seminar – 05 marks
3. ISE question paper format will be Multiple Choice Questions- 40 Marks

Unit No.	Topic Name	Weightage
1	Nature of Environmental Studies.	4 Marks
2	Natural Resources.	7 Marks
3	Ecosystems	7 Marks
4	Biodiversity and its conservation	7 Marks
5	Environmental Pollution	7 Marks
6	Social Issues and the Environment	8 Marks

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IMPORTANT NOTES:
1. ISE will be conducted in 14th week of Sem.
2. Mini Project report will be submitted to course coordinator in 10th week of Sem.
3. Students should get minimum 40% marks to get PP (PASS) grade.
4. Students getting less than 40% marks will be offered NP (NOT PASS) grade.
5. To get B. Tech. Degree PP grade in Environmental Studies is mandatory.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Environmental Studies	Dr. B. S. Chauhan	University Science Press, New Delhi	First	2008
2	Environmental Studies	Dr. P. D. Raut	S. U. Kolhapur	Third	2011

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Principals of Environmental Science and Engineering	Raman Sivakumar	Cengage learning Singapore	Second	2005
02	Elements of Environmental Science and Engineering	P. Meenakshi	Prentice Hall of India Private Limited, New Delhi	-	2006
03	Environmental Science – working with the Earth	G.Tyler Miller Jr	Thomson Brooks /Cole	Eleventh	2006

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Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	**1MEPC251**, Kinematics of Machines Laboratory
Prerequisite/s	1MEES152,
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE/ ESE	25/25

Course Objectives: The course aims:

01	To explain different mechanism and machines kinematically.
02	To verify concepts, laws and terminologies of gears, cam and followers, belt drive etc.
03	To explain principles of governors and flywheel.
04	To impart the skills and ethics during practical sessions.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC251_1	**Identify** different types mechanisms, power transmission devices and mechanical energy storing devices, (K²)
1MEPC251_2	**Explain** the process of experimentation to calculate various parameters effectively. (K³)
1MEPC251_3	**Analyze** cam profiles, velocity and acceleration diagrams of various mechanism and machines effectively using graphical method, (K³)
1MEPC251_4	**Perform** the experimental task individually and in team in dynamics of machines laboratory, and interpret the results. (S²)
1MEPC251_5	**Respond** willingly to questions asked by faculty and asked to involve in experimental task of dynamics of machines laboratory. (A²)

Course Contents:

1. To demonstrate the basic mechanism, its inversion and applications by using board models.
2. Identify any mechanism used in practice/actual application. Draw its kinematic diagram with scale and determine its kinematics properties such as number of links, joints and degrees of freedom.
3. Verification of ratio of angular velocities of shafts connected by Hooks joint using board model.
4. Generation of involutes tooth profile by rack cutter method.
5. Use of graphical method to determine the positions, velocities and accelerations of any identified links in given mechanism using relative velocity and acceleration method.
6. Determination of kinematic properties of the links in given mechanism by using Kliens construction and Instantaneous centre method.
7. Determination of the governor characteristics of Hartnell governor with variation in the speed and load.
8. Design a flywheel for any practical application/ with given engine specification to identify the geometric parameters of the flywheel and to represent it on detailed drawing.

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Department of Mechanical Engineering

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Ratan S.S	Tata McGraw Hill New Delhi.	Third	13th reprint 2012
02	Theory of Machines	P.L.Ballany	Khanna Publication, New Delhi	Twenty fifth	2012
03	Theory of Machines	V.P. Singh	Dhanpat Rai and Sons	Third	2012
04	Kinematics & Dynamics of Machines	George Martin	Waveland Press, Inc.	Second	2002

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Thomas Bevan	CBS Publishers, New Delhi.	Third	reprint 2005
02	Theory of Machines and Mechanism	Shigley	Oxford International	Third	2009
03	Theory of mechanism and machines	Sadhu Singh	Pearson	First	2012
04	Theory of machines and Mechanism	Jagdish Lal	Metropolitin Book Company	First	2011
05	Mechanism and Machines	Gosh And Mallik	East West Press	Third	1998
06	Theory of Machine	Sarkar	Tata Mc Graw Hill	First	2002

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Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	1MEES252, Materials Science and Metallurgy Laboratory
Prerequisite/s	1MEBS101, 1MEBS151
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / ESE	25/25

Course Objectives: The course aims:

01	To acquaint students the linking of composition-structure-property relationship in metals and alloys.
02	To explain the importance of different destructive and non-destructive material testing methods.
03	To compute the phases in microstructure and estimate the mechanical properties of the metals and their alloys.
04	To explain the fundamentals of Powder Metallurgy

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEES252_1	Evaluate different mechanical properties of materials using various destructive testing techniques with their significance, (K^3)
1MEES252_2	Estimate percentage phases present in microstructure of ferrous and non-ferrous alloys with their effect on mechanical properties, (K^3)
1MEES252_3	Follow professional and ethical principles during laboratory work, (A^2)
1MEES252_4	Communicate effectively, both orally and in writing journals, (S^2)
1MEES252_5	Function effectively as an individual, and as a team member for study of microstructure of various metals and alloy, (S^3)
1MEES252_6	Engage in independent and life-long learning in the use various equipments/ instruments/machines which are used to study structures and properties of metals and alloys, (A^2)

Course Contents:

1. Spark tree analysis of different types of material.
2. Hardness testing (Brinell and Rockwell)
3. Impact testing (Izod and Charpy)
4. To locate the position of a crack employing ultrasonic test.
5. Surface damage analysis using dye-penetration test
6. Examination of microstructure of different types of steel
7. Examination of microstructure of different types of Cast Iron
8. Examination of microstructure of different types of Non Ferrous Alloys
9. Hardenability testing by Jominy end quench test
10. Tensile test for measurement of mechanical properties
11. Industrial visit to study sand casting processes.

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Department of Mechanical Engineering

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Material Science and Metallurgy,	V.D. Kodgire	Everest Publishers Pune	Twelth	2009
2	Heat Treatments Principles and Practices	T.V. Rajan / C.P. Sharma	Prentice Hall of India Pvt Ltd, New Delhi	Fourth	1994
3	Physical Metallurgy	S.H. Avner	McGraw Hill Book Company Inc	Second	1988
04	Material Science and Engineering	V Raghwan	Prentice Hall of India Pvt. Ltd., New Delhi	Third	1995

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Materials Science & Engineering	W. Callister	John Wiley & sons	Second	Reprint 2017
02	Physical Metallurgy	W.F. Hosford	CRC Press, Taylor and Francis Group, London	Second	2010
03	Callister's Materials Science and Engineering	R. Balasubramaniam	Wiley India Pvt Ltd	Third	2008
04	Mechanical Behaviour and Testing of Materials	K. Bhargava	Publication PHI	Second	2011

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Department of Mechanical Engineering

Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	1MEPC253, Workshop Practice -II
Prerequisite/s	1MEES154
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / ESE	25/00

Course Objectives: The course aims:

01	To explain pattern and its types, material used, allowances.
02	To demonstrate TIG/MIG welding process for different materials.
03	To provide basic knowledge of sand testing, size analysis, moisture percentage, permeability test.
04	To explain different manufacturing processes and machine tools during industrial visit.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC253_1	Explain different manufacturing processes and machine tools useful in industries, (K^2)
1MEPC253_2	Prepare a pattern as per drawing, (K^2S^2)
1MEPC253_3	Explain joining operation by application of TIG/MIG welding, (K^2)
1MEPC253_4	Conduct test on sand to check its various properties, (K^2S^2)
1MEPC253_5	Prepare a component by smithy/ forging operations as per given drawing. (K^2S^2)
1MEPC253_6	Function effectively as an individual, and as a team member for performing experimental task, (S^3)
1MEPC253_7	Follow professional and ethical principles during laboratory work. (A^2)

Course Contents:

1. Preparation of Pattern for solid casting with allowances.
2. Hands on practice on TIG/MIG welding process for different material.
3. Grain Size analysis.
4. Preparation and testing of standard Specimen for Green Compressive strength.
5. Preparation of green sand mould for mould Hardness testing.
6. Hands on practice on surface grinding machine.
7. Hands on practice on shaper/planer (mechanisms and stroke).
8. One job based on smithy/ forging.
9. Industrial visit

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Manufacturing Technology- Foundry, Forming and Welding	P. N. Rao	Tata Mc-Graw Hill Publication	First	2009

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02	Production Technology: Vol. 1: Manufacturing Processes	P. C. Sharma	S. Chand	First	2006
03	Production Technology: Vol. 2: Machine Tools	P.C.Sharma	S. Chand	Second	2006
04	Workshop technology vol.1	S.K.Hajra Choudhary S.K.Bose	Media promoters and publishers pvt ltd.	Twelfth	2012
05	Workshop technology vol.2 (Machine tools)	S.K.Hajra Choudhary S.K.Bose	Media promoters and publishers pvt ltd.	Twelfth	2012
06	Workshop Technology vol. II,	Raghuvanshi	Dhanpat Rai and Sons.	Sixth	2015
07	Foundry Technology	O.P. Khanna	Dhanpat Rai Publication	Fifteenth	2011

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Materials and Processes in Manufacturing	E. Paul DeGarmo, J.T. Black.	PHI Publication	Eighth	1997
02	Mechanical Metallurgy	George E. Dieter	Tata Mc Graw Hill Publication	Third	2013
03	Machine Tools and Manufacturing Technology	Steve F. Krar, Mario Rapisarda.	Delmar publisher	Second	2010
04	Workshop Technology", Vol.I 2001, Vol.II 2007 andVol.III 1995.	W.A.J. Chapman	CBS Publishing and Distributors, N. Delhi	Fifth	2001

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Department of Mechanical Engineering

Course Details:

Class	S. Y. B. Tech. Sem-III
Course Code and Course Title	1MEHS254, General Proficiency Laboratory
Prerequisite/s	1MEHS111
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / ESE	25/00

Course Objectives: The course aims:

01	To improve students' performance in formal communicative events.
02	To review students' competence of written communication and enrich it
03	To enhance students' team spirit and enable them to work in a team.
04	To nurture students' soft skills

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEHS254_1	Acquaint etiquettes of formal communicative event and perform better in formal communicative events. (A^2S^3)
1MEHS254_2	Collect relevant information and utilize it effectively, in formal communicative events. (A^2S^3)
1MEHS254_3	Construct meaningful and logically interwoven extracts necessary for professional correspondence like email professional letters. (A^3S^3)
1MEHS254_4	Write relevant professional e-mails and letters. (A^3S^3)
1MEHS254_5	Adapt in team and will contribute positively to strengthen team performance. (A^2S^3)

Course Contents:
1. Presenting technical topic -Tech-talk
2. Putting an argument - Debate
3. Group Discussion (General)
4. Composing professional e-mail
5. Application Letter and Resume Writing
6. Placing an Order
7. Group Discussion (Technical)
8. Performing a professional situation
9. Making a Power point presentation
10. Mock Interview

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	The Fundamental	Prajapati	S.K. Katariya and Sons	Fifth	2012

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Sr No	Title	Author	Publisher	Edition	Year
	Aspects of Communication Skills	Prasad	Publisher of Engineering and Computer Books.		
02	Effective Technical Communication	Ashraf Rizvi	Tata McGraw Hills	Fifth	2018
03	Group Discussion: A Practical Guide to Participation and Leadership	Julia T. Wood, Gerald M. Phillips	Waveland Press	Fourth	2007

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	High-school English Grammar and Composition	Wren and Martin	S. Chand and Co., New Delhi	First	2011
02	The Ace of Soft Skills	Gopalswami Ramesh, Mahadevan Ramesh.	Pearson Publication, Delhi.	Second	2011
03	Business Communication	P. Shubha Rao, B. Anita Kumar, C. Hima Bindu	Cengage Learning India, Pvt. Ltd. 418 FIE Pratapganj, Delhi, 110090	Third	2017
04	Business Correspondence and Report Writing	R. C. Sharma, Krishna Mohan	Tata McGraw Hills	Fifth	2016

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Course Details:

Class	S.Y. B. Tech, Sem.-IV
Course Code and Course Title	**1MEPC208, Dynamics of Machines**
Prerequisite/s	1MEPC202
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims:

01	To explain different types of gear trains
02	To explain basic theory related to vibrations.
03	To provide knowledge of gyroscopic effect in aero plane, Naval ship, Four and Two-wheeler.
04	To develop ability to different balancing systems and its engineering applications

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC208_1	**Describe** dynamic force analysis of slider crank chain mechanism. (K^2)
1MEPC208_2	**Solve** problems of gear train according to its application. (K^3)
1MEPC208_3	**Illustrate** the effects of gyroscopic couple in aero-plane, ship, two wheelers and four wheelers. (K^3)
1MEPC208_4	**Apply** balancing concept while designing machine components. (K^3)
1MEPC208_5	**Analyze** machines/mechanical system under free vibration and damped vibration. (K^3)

Course Contents:

Unit 1	**Gear train**	**07 Hrs.**
	Types of Gear trains- Simple, Compound, Reverted, Epicyclic gear train, Tabular method for finding the speeds of elements in Epicyclic gear train, Torques in Epicyclic gear train, Differential gear box.	
Unit 2	**Gyroscope**	**07 Hrs**
	Introduction Gyroscopic couple and its effect on spinning bodies. Gyroscopic effect on naval ships during steering, pitching and rolling. Ship stabilization with gyroscopic effect. Two-wheeler and four-wheeler on curved path– effect of gyroscopic and centrifugal couples, maximum permissible speeds on curve path.	
Unit 3	**Static and dynamic Force analysis of Mechanisms**	**07 Hrs.**
	Velocity and acceleration of slider crank mechanism by analytical method, Inertia force and torque, D'Alembert's principle, Dynamically equivalent system, force analysis of reciprocating engine mechanism and four bar chain mechanism	
Unit 4	**Balancing**	**09 Hrs.**
	Static and Dynamic balancing of rotary and reciprocating masses. Primary and Secondary forces and couples. Direct and Reverse cranks. Balancing of Single cylinder, Multi cylinder-Inline and V-Engines for four-wheeler.	
Unit 5	**Fundamentals of Vibrations**	**05 Hrs.**
	Basic concepts and definitions, vibration measuring parameters - Displacement, Velocity and acceleration, Free and forced vibrations,	

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Unit 6	Equivalent Springs. Types of damping. **Single degree of freedom systems** Free vibrations with and without damping (Rectilinear, Torsional & Transverse), degree of damping. Logarithmic decrement, equivalent viscous damping, Coulomb damping.	07Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Ratan S.S	Tata McGraw Hill New Delhi.	Third	13th reprint 2012
02	Theory of Machines	P.L.Ballany	Khanna Publication, New Delhi	Twenty fifth	2012
03	Theory of Machines	V.P. Singh	Dhanpat Rai and Sons	Third	2012
04	Kinematics & Dynamics of Machines	George Martin	Waveland Press, Inc.	Second	2002

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Thomas Bevan	CBS Publishers, New Delhi.	Third	reprint 2005
02	Theory of Machines and Mechanism	Shigley	Oxford International	Third	2009
03	Theory of mechanism and machines	Sadhu Singh	Pearson	First	2012
04	Theory of machines and Mechanism	Jagdish Lal	Metropolitin Book Company	First	2011
05	Mechanism and Machines	Gosh And Mallik	East West Press	Third	1998
06	Theory of Machine	Sarkar	Tata Mc Graw Hill	First	2002

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Course Details:

Class	S. Y. B. Tech. Sem-IV
Course Code and Course Title	**1MEPC 209, Fluid Mechanics**
Prerequisite/s	1MEBS106, 1MEBS155
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Objectives: This course aims:

01	To explain various properties and statics of fluids.
02	To describe kinematic and dynamic behavior of fluids.
03	To describe the concepts of flow through pipe and working of different piping systems.
04	To explain concept of forces acting on submerged bodies and boundary layers.

Course Outcomes (COs):-

After successful completion of this course, the student will be able to,

1MEPC209_1	**Explain** basic properties of fluid and fluid statics.(K^2)
1MEPC 209_2	**Identify** various types of flow and explain kinematic and dynamics behavior of fluid.(K^2)
1MEPC 209_3	**Describe** the concepts of flow through pipes and various types of losses in pipe flow. (K^2)
1MEPC209_4	**Explain** the concepts of boundary layer, forces on immersed bodies and dimensionless analysis.(K^2)
1MEPC209_5	**Derive** various equations in fluid mechanics such as Euler's equation, Bernoulli's equation, Continuity equation etc.(K^2)
1MEPC209_6	**Solve** the problems related to various concepts of fluid mechanics.(K^3)

Course Contents:

Unit 1	**Fluid Properties and Fluid Statics:** A) **Fluid Properties**: Definition of fluid, Fluid as a continuum, Properties of fluid, Viscosity, Types of fluid, Compressibility, Surface tension, Capillarity and vapor pressure. B) **Fluid Statics**: Pascal's law, Hydrostatic law of pressure, Total Pressure, Centre of Pressure, Buoyancy, Meta center (Theoretical treatment only for section B).	08 Hrs.
Unit 2	**Fluid Kinematics:** Eulerian and Lagrangian approach of fluid flow, Types of flow, Streamline, Path line, Streak line, Stream tube, Continuity equation in Cartesian coordinates in three dimensional forms. Velocity and Acceleration of fluid particles.	06 Hrs.
Unit 3	**Fluid Dynamics:** Forces acting on fluid, Euler's equation. Bernoulli's equation, Energy correction factor, Venturimeter, Orifice meter, Flow over triangular and rectangular notches.	08 Hrs.

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Unit 4	**Laminar Flow and Pipe Flow:** **A) Laminar Flow:** Laminar flow through circular pipes. Laminar flow through parallel plates. **B) Pipe Flow:** Major and Minor Energy losses in pipes, Series and Parallel pipe, Siphon pipes, Branching pipes.	08 Hrs.
Unit 5	**Boundary Layer Theory and Dimensional Analysis, Similitude** **A) Boundary Layer Theory:** laminar and turbulent boundary layer, Boundary layer thicknesses, its characteristics, Boundary layer separation, boundary layer control. **B) Dimensional Analysis, Similitude:** Dimensionally homogeneous equations, Buckingham's Pi-theorem, Calculation of dimensionless parameters. Similitude, complete similarity, Model Scales.	07 Hrs.
Unit 6	**Forces on Immersed Bodies:** Lift and Drag, Drag on a flat plate and on aerofoil. Types of drags, Development of lift, Magnus effect, Stalling condition of an aerofoil.	05 Hrs.

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fluid Mechanics and Hydraulic Machines	R.K.Rajput	S. Chand Publication	Ninth	2011
02	Fluid mechanics and hydraulic machines	P. N. Modi, S.M.Seth	Standard Book House	Eighth	2011
03	Fluid Mechanics and Hydraulic Machines	S. Ramamrutham	Dhanpat Rai Publishing Company	Eighth	2010
04	Fluid Mechanics	K.L.Kumar	S.Chand Publication	Fifth	2010
05	Fluid Mechanics and Fluid Power engineering	Dr.D.S.Kumar	S.K.Kataria& sons	Seventh	2008

Reference Books

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Fluid Mechanics	V.L.Streeter & E.B.wylie	Tata McGraw- Hill	Second	1997
02	Introduction to fluid Mechanics	Edward J. Shaughnessy	Oxford university press	Third	2008
03	Fluid Mechanics	Y.A.Cengel	McGraw-Hill,	Second	2009
04	Fluid Mechanics	White	Tata McGraw-Hill, New Delhi	Seventh	2014
05	Fundamentals of Fluid Mechanics	Munson Young	Wiley India Pvt.Ltd	Sixth	2013
06	Fluid Mechanics	Fox McDonald Pritchard	Wiley India Pvt.Ltd	Eighth	2014

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(An Autonomous Institute)
Department of Mechanical Engineering

Course Details:

Class	S. Y. B. Tech. Sem-IV
Course Code and Course Title	**1MEPC210, Design of Machine Elements -I**
Prerequisite/s	1MEPC109, 1MEPC204
Teaching Scheme: Lecture/Tutorial	04/00
Credits	04
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Objectives: The course aims:

01	To explain the various theories of failures and basic design principles.
02	To describe, derive and use design methodology for designing various components of machine.
03	To design the machine elements under static and dynamic loading conditions.
04	To develop an ability to use manufacturer's catalogues and design data book.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC210_1	**Describe** the appropriate selection of material for various machine elements, (K^2)
1MEPC210_2	**Explain** the functions and working of machine element like joints, levers, power screws and springs, (K^2)
1MEPC210_3	**Apply** the basic design procedure based on material strength for various components using design data book, (K^3)
1MEPC210_4	**Solve** problems by applying acquired knowledge of machine elements to compute design dimensions under static conditions, (K^3)
1MEPC210_5	**Solve** problems on mechanical components subjected to fluctuating/ reversed loading conditions. (K^3)

Course Contents:

Unit 1	**Fundamentals of Machine Design**	08 Hrs.
	Concept of Machine design, basic procedure of design of machine elements, requirements of machine elements, Types of loads, Factor of safety- its selection & significance, Theories of elastic failure & their applications, Design considerations for cast and forged components, Selection of various engineering materials, I.S. coding for ferrous materials, Factors governing the selection of engineering materials.	
Unit 2	**Design against static load:**	09 Hrs.
	Static Load, Modes of failure, Eccentric axial loading, Design of machine parts subjected to combined, direct and bending stress. Design of machine elements under static loading- Knuckle joint, Turn buckle and Levers.	
Unit 3	**Design of bolted and welded joints**	11 Hrs.
	a) **Bolted joints** - subjected to following conditions- 1) Joints in shear 2) joints subjected to load perpendicular to the axis of bolt.	
	b) **Welded joints** - 1) Strength of transverse and parallel fillet welds 2) Eccentric load in the plane of weld 3) Welded joint subjected to bending moment.	
Unit 4	**Design of Springs**	08 Hrs.

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	Types of springs and their applications, Selection of material, Types of failures, terminology of helical spring, styles of end, Design of helical compression spring subjected to static loading. Terminology of leaf spring, design of leaf spring, nipping of leaf spring	
Unit 5	**Design of Power Screw**	09 Hrs.
	Forms of threads, Terminology of threads, Torque requirement (lifting and lowering load) Self-locking and overhauling properties, Efficiency of square threaded, Self-locking screw, Collar friction torque, Design of power screw & nuts, Introduction to Recirculating ball Screw. Design of Roller screw.	
Unit 6	**Design for fluctuating loads**	11 Hrs.
	Stress concentration - causes & remedies, fluctuating stresses, S-N diagram under fatigue load, Endurance limit, Notch sensitivity, Endurance strength- modifying factors, Design for finite and infinite life under reversed stresses, Cumulative damage in fatigue failure, Soderberg and Goodman diagrams, Modified Goodman diagram, Fatigue design for components under combined stresses such as shafts, springs, Beams subjected to point loads etc.	

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Design of Machine Elements	V.B. Bhandari	Tata Mc- Graw Hill Publication	Third	2012
02	Design of Machine Element	J.F. Shigley	Tata Mc-Graw Hill Publication	Eighth	2010
03	Machine Design	R. K. Jain	Khanna Publication	Seventh	2004
04	Mechanical Engineering Design	Shigley and C. R. Miscke	Tata Mc- Graw Hill Publication	Eighth	2010
05	Design of Machine Elements	M. F. Spotts	Pearsons Edu. Inc.	Eighth	2004
06	Design of Machine Elements	P. Kannaiah	Scitech Publication.	Second	2008

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Machine Design an Integrated Approach	R.L Norton	Pearson Education Publication	Second	2007
02	Fundamentals of Machine Component Design	J Marshek	Willey Eastern Ltd.	Third	2011
03	Mechanical Analysis & Design	H. Burr & Cheatam	Prentice Hall Publication.	Second	1997
04	Machine Design	Hall, Holowenko, Laughlin	Tata Mc-Graw Hill Publication.	First	2008
05	Standard Handbook of	J. Shigley,	Tata Mc-Graw Hill	Third	2004

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Reference Books:

			Publication.		
	Machine Design	C. Mischke,			
06	Design data book	PSG	PSG	--	--
07	Design data book	V.B. Bhandari	Tata Mc- Graw Hill Publication	First	2014

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Course Details:

Class	S. Y. B. Tech. Sem-IV
Course Code and Course Title	**1MEPC211, Tools Engineering**
Prerequisite/s	1MEES103, 1MEPC157, 1MEPC109, 1MEBS106, 1MEES152
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Objectives: The course aims:

01	To study the metal cutting technology, cutting tools, various machining affecting parameters.
02	To design of the jigs and fixtures by using various elements of it.
03	To study various types of presses and press working operations.
04	To compute various economic aspects of tooling.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC211_1	**Explain** the fundamentals of metal cutting and cutting tools, (K^2)
1MEPC211_2	**Explain** the fundamentals of press tools operations and it's cutting forces, (K^2)
1MEPC211_3	**Determine** the effect of cutting parameters on metal cutting, (K^3)
1MEPC211_4	**Compute** the parameters related with economics of tooling, (K^3)
1MEPC211_5	**Conceptual design** of drilling jigs and fixtures, (K^3)

Course Contents:

Unit 1	**Fundamentals of cutting tools:** Fundamentals of metal cutting processes, Concept of speed, Feed and depth of cut. Tool geometry, angles and types of single point cutting tools, Milling, drilling and broaching tool geometry. Cutting tool materials and their properties.	06 Hrs.
Unit 2	**Theory of metal cutting:** Mechanics of metal cutting-Chip formation, orthogonal and oblique cutting, Types of chips, cutting ratio, shear plane and shear angle, velocity relationships, force calculations, Merchant circle (numerical). Types of wear and failure, optimum cutting speed, tool life, factors affecting tool life, computation of tool life (numerical). Machinability and factors affecting it.	07 Hrs.
Unit 3	**Drilling Jigs** Applications, basic elements, principles and types of locating, clamping and indexing elements, Type of Drilling jigs, Design consideration of Jigs, Design and drawing of drilling Jig.	10 Hrs.
Unit 4	**Machining Fixtures:** Applications, basic elements, principles and types of locating, clamping and indexing elements, auxiliary elements like tenon, setting block etc.	08 Hrs.

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		Type of Milling fixtures-Design consideration of fixtures with respect to different operations, Design and drawing of milling fixtures.	
Unit 5	**Press Tools:** Press Operations, press-type, press components, metal cutting in a press work, types of dies, clearance, strip layout, stripper, cutting forces.		06 Hrs.
Unit 6	**Economic aspect of tooling:-** Elements of costs, cost estimation and method of estimating (numerical), Calculations of machining times, Estimation of total unit time, Depreciation, Tool Replacement, Break even analysis (theoretical).		05 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Text Book of Production Engg.	P.C. Sharma	S. Chand Publication	Eleventh	2008
02	Machine Tool Engg.	G.R. Nagpal	Khanna Publication	Eighth	2013
03	Manufacturing Technology Vol.2	P. N. Rao	McGraw-Hill Publishing Ltd	Seventh	2015
04	A Textbook of Manufacturing Technology - II,	P.C. Sharma	S. Chand Publication	First	2008
05	Textbook of Production Engineering	K. C. Jain, A.K. Chitale	PHI Learning Pvt. Ltd	Second	2014

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Manufacturing Engineering and Technology	S. Kalpakjian, S. Schmid	Pearson	Seventh	2013
02	Production Technology	HMT	Tata McGraw-Hill Publishing Ltd	First	Reprint 2001
03	Metal Cutting- Theory and Practice	A. Bhattacharya	New central book agency pvt. Ltd.	First	Reprint 2008
04	Jigs and Fixtures	P. H. Joshi	Tata McGraw-Hill.	Third	2013
05	Jig and Fixtures Design	Hiram Grant	McGraw Hill Education	First	1989
06	Principles of Modern manufacturing	M. P. Groover	Wiley	Fifth	2013

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NDCET

Course Details:

Class	S. Y. B. Tech. Sem-IV
Course Code and Course Title	**1MEPC212, Metrology, Quality Control & Measurement**
Prerequisite/s	1MEES154,1MEPC109
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Objectives: The course aims:	
01	To describe the measuring principle and scope of measurement in engineering.
02	To explain the characteristics & selection of instrument and its use.
03	To elaborate the procedure for designing different gauges.
04	To give the importance of cost, quality, quality control and various statistical quality control tools.

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEPC212_1	**Explain** construction, working and characteristics of measuring instruments, (K^2)
1MEPC212_2	**Determine** the least count of instrument and use for the measurement and interpret the data, (K^3)
1MEPC212_3	**Identify** the measuring parameters from screw threads, gears and select appropriate measuring instrument, (K^3)
1MEPC212_4	**Solve** the problems on limits, fits and tolerances and surface roughness, (K^3)
1MEPC212_5	**Solve** the problems on process control charts. (K^3)

Course Contents:		
Unit 1	**Metrology, limits, fits and tolerances:** Importance and need for measurements, International standards of length, line and end measurement, linear measuring instruments errors in measurement, nomenclature in metrology like true value, accuracy, precision, error, bias, uncertainty, repeatability, resolution, interchangeability, limits, fit and tolerances, limit gauging, Taylor's principle, design of limit gauges and its numerical.	08 Hrs.
Unit 2	**Comparators and measurement of angles:** Features of comparators, classification of comparators, different comparators like mechanical, optical, electrical, pneumatic comparators and their uses in inspection. Bevel protractor, spirit level, clinometers, angle decker, angle slip gauges.	06 Hrs.
Unit 3	**Straightness, flatness and surface finish measurement:** Concept of straightness and flatness, use of straight edge, level beam comparator and auto collimator for testing of flatness of surface plate. Principle of interferometry and application for checking flatness. Surface roughness terminology, specifying roughness on drawings, surface roughness parameters, roughness measurement methods and its numerical	07 Hrs.

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Unit 4	**Screw thread metrology and gear measurement:** Errors in screw threads, measurement of forms of thread, pitch measurement, measurement of thread diameter with standard wire, screw thread micrometer, floating carriage micrometer. measurement of spur gears run out checking, pitch measurement, profile checking, backlash checking, tooth thickness measurement, alignment checking, errors in gears, checking of composite errors, profile projector.	06 Hrs.
Unit 5	**[1] Quality control:** Concept of Quality, Quality control and quality assurance, Factors controlling quality of design and conformance, Cost of quality, QC tools. **[2] Statistical quality control and acceptance sampling:** ND curve, different types of control charts (x bar, r, p and c charts),their constructions, interpretation and applications, numericals on control charts, basic concept of sampling inspection, operating characteristic curves, conflicting interests of consumer and producer, producer and consumers risks, single and double sampling plans.	08 Hrs.
Unit 6	**[1] Temperature measurement:** Thermocouples, thermistor, thermometers, pyrometer, calibration of temperature measuring devices. **[2] Speed measurement:** Mechanical tachometers, electrical tachometer, contactless electrical tachometers **[3] Acceleration measurement:** Piezo-electric and seismic accelerometer	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Metrology	M. Mahajan	Dhanpat Rai Publications,Delhi	Nineth	2010
02	Statistical Quality control	M. Mahajan	Dhanpat Rai Publications,Delhi	Third	2008
03	Engg. Metrology	I.C. Gupta	Dhanpat Rai Publications,Delhi	Twentieth	2010
04	Engg. Metrology	P. Narayana	Scitech Publication,Chennai	Third	2009
05	Mechanical Measurement fand Control	D.S.Kumar	Metropolitan Book Co.Pvt.Ltd,Delhi	Forth	2011

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Statistical Quality control	R.C. Gupta	Dhanpat Rai Publications,Delhi	Fifteenth	2009
02	Metrology for Engineers	J.F.W. Gayler and C.R.	Cassell,London	Fifth	1990

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Reference Books:

		Shotbolt			
03	Practical Engineering Metrology	K.W.B. Sharp	Pitman London	First	1973
04	Engg. Metrology	R.K.Jain	Khanna Publisher,Delhi	Twentieth	2012
05	Standard Handbook of Machine Design	J. Shigley, C. Mischke,	McGraw Hill Publication.	Third	2004

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SY-ME-38150

Course Details:

Class	S. Y. B. Tech. Sem-IV
Course Code and Course Title	**1MEHS213, Economics for Mechanical Engineers**
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	03/00
Credits	00
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Objectives: The course aims:

01	To explain different financial concepts in economics.
02	To explain elements of costs related to production.
03	To compare and Select Application of different Investment analysis methods

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEHS213_1	**Explain** concept of microeconomics and macroeconomics. (K^2)
1MEHS213_2	**Describe** forecasting tools of demand and supply management. (K^2)
1MEHS213_3	**Explain** different monetary policy tools.(K^2)
1MEHS213_4	**Explicate** elements of costs related to production.(K^2)
1MEHS213_5	**Illustrate** basic concept of budget and its analysis. (K^3)

Course Contents:

Unit-I	**Introduction to Economics:** Role of Engineer as an Economist, Types and problem of economies, Basics of economics, Flow in an economy, Concept of Engineering Economics, Engineering efficiency, Economic efficiency, Scope of engineering economics, Nature of Company.	05 Hrs.
Unit-II	**Basic Concepts of Microeconomics and Macroeconomics:** Law of supply and demand, Concept of Demand & Elasticity of Demand. Concept of Supply & Elasticity of Supply, Supply, Demand, and Equilibrium, Elasticity and Its Applications, GDP, Unemployment and Labor Force Participation, Components of Monetary and Financial System, Central Bank, Commercial Banks, Monetary and Fiscal Policy Tools, Taxes.	10 Hrs.
Unit-III	**Cost of Production:** Element of costs, accounting cost, sunk cost, marginal cost and opportunity cost. Break even analysis, Cost estimation, Material Costs, Direct Labor Costs, Fixed Over-Heads, Factory cost, Administrative Over-Heads, Transportation Costs, Repair and Maintenance.	07 Hrs.
Unit-IV	**Value Engineering**	09 Hrs.

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	Make or buy decision, Value engineering, Function, Aims, Value engineering procedure. Interest formulae and their applications, Time value of Money, PAT, PBT, Financial sources available of Firms.		
Unit-V	**Capital Budgeting:** Budgets, Capital Budgeting, Investment Analysis-Net Present Value, Return on Investment, Internal Rate of Return, Payback Period, Financial Statement analysis, Balance sheet.		07 Hrs.
Unit-VI	**Depreciation and Financial Accounting** Introduction, Depreciation and Depreciation Accounting, Reasons for Depreciation, Value of an Asset, Straight Line Depreciation, Declining Balance Depreciation, Elements of Financial Accounting, Measuring the Performance of a Firm, Asset to Liability Ratio.		06Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fundamentals of Engineering Economics	Pravin Kumar	Wiley Precise Text book Series	First	2015
02	Principles of Economics	Mankiw Gregory	Thompson Asia	First	2002
03	Managerial Economics	V. Mote, S. Paul, G. Gupta	Tata McGraw Hill	Third	2004
04	Textbook of Business Economics	Pareek Saroj	Sunrise Publishers	Second	2003

Other Books/E-material

Sr. No	Title	Publisher
1	Moneycontrol.com	CNBC

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Course Details:

Class	S.Y.B. Tech, Sem.-IV
Course Code and Course Title	1MEPC255, Dynamics of Machines Laboratory
Prerequisite/s	1MEES251
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE/ ESE	25/00

Course Objectives: The course aims:

01	To explain different methods for calculation of M.I.
02	To solve problems on gear trains & balancing of reciprocating masses.
03	To perform experiments on gear train, gyroscope, balancing of rotary masses & longitudinal vibrations.
04	To explain the practical application of various principles of dynamics of machines.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC255_1	Calculate M.I of bifilar, Trifilar & Compound pendulum. (K^2)
1MEPC255_2	Perform the experiments on Gyroscope, Epicyclic gear train, Governor, balancing of rotary masses, Longitudinal vibrations of helical springs and logarithmic decrement. (K^3)
1MEPC255_3	Solve the problems on Gear trains & Balancing of reciprocating masses. (K^3)
1MEPC255_4	Use the computer aided force analysis software for slider crank mechanism or four bar mechanism. (K^3)
1MEPC255_5	Communicate effectively, both orally and in writing journals. (S^2)
1MEPC255_6	Respond willingly to questions asked by faculty and asked to involve in experimental task of dynamics of machines laboratory. (A^2)

Course Contents:
1. Determination of M.I. by compound pendulum method.
2. Determination of M.I. by Bifilar suspension method.
3. Determination of M.I. by Trifilar suspension method.
4. Determination of gear output speeds of different gear trains by tabular method.
5. Determination of torques in Epicyclic gear train by tabular method.
6. Determination of gyroscopic couples on motorised gyroscopic instrument.
7. Computer aided force analysis of any one of following
    a) Slider crank mechanism   b) Four bar mechanism
8. Determination of angular settings of rotary masses and find out system balanced or out of balanced (Statically and Dynamically).
9. Determination of primary and secondary forces and couples of reciprocating engines.
10. Experiment on Longitudinal vibrations of helical springs.
11. Determination of logarithmic decrement of free damped system.

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Ratan S.S	Tata McGraw Hill New Delhi.	Third	13th reprint 2012
02	Theory of Machines	P.L.Ballany	Khanna Publication, New Delhi	Twenty fifth	2012
03	Theory of Machines	V.P. Singh	Dhanpat Rai and Sons	Third	2012
04	Kinematics & Dynamics of Machines	George Martin	Waveland Press, Inc.	Second	2002

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Thomas Bevan	CBS Publishers, New Delhi.	Third	reprint 2005
02	Theory of Machines and Mechanism	Shigley	Oxford International	Third	2009
03	Theory of mechanism and machines	Sadhu Singh	Pearson	First	2012
04	Theory of machines and Mechanism	Jagdish Lal	Metropolitin Book Company	First	2011
05	Mechanism and Machines	Gosh And Mallik	East West Press	Third	1998
06	Theory of Machine	Sarkar	Tata Mc Graw Hill	First	2002

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Department of Mechanical Engineering

Course Details:

Class	S. Y. B. Tech. Sem-IV
Course Code and Course Title	**1MEPC256, Fluid Mechanics Laboratory**
Prerequisite/s	1MEBS106, 1MEBS155
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / ESE	25/25

Course Objectives: The course aims:

01	To demonstrate the concept of flow visualization and pipe friction.
02	To demonstrate the Reynolds experiment and its significance.
03	To demonstrate Bernoulli's theorem and its practical applications.
04	To explain importance of fluid mechanics with real life applications.

Course Outcomes (COs):-

Upon successful completion of this course, the student will be able to:

1MEPC256_1	Identify various types of flow by using Reynolds Experiment, flow pattern, velocity profile.(K^2)
1MEPC256_2	Perform various experiments to calculate the discharge through various flow measuring devices and coefficient of friction values for different pipes.(K^3)
1MEPC256_3	Communicate effectively, both orally and in writing journals, (S^2)
1MEPC256_4	Function effectively as an individual, and as a team in fluid mechanics laboratory and interpret the results. (S^2)
1MEPC256_5	Follow professional and ethical principles during laboratory work. (A^2)

Course Contents:

1. Flow visualization by Heleshaw's apparatus.
2. To identify the type of flow by using Reynolds's experiment.
3. Verification of Bernoulli's theorem.
4. Determination of coefficient of discharge for given venturimeter.
5. Determination of coefficient of discharge for given orifice meter.
6. Determination of coefficient of discharge for given triangular notch.
7. Orifice under steady flow condition to determine hydraulic coefficients.
8. Determination of velocity profile through circular pipes for laminar flow.
9. Determination of coefficient of friction for different pipes.
10. Case study on discharge measurement (Field work)

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fluid Mechanics and Hydraulic Machines	R.K.Rajput	S. Chand Publication	Ninth	2011

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02	Fluid mechanics and hydraulic machines	P. N. Modi, S.M.Seth	Standard Book House	Eighth	2011
03	Fluid Mechanics and Hydraulic Machines	S. Ramamrutham	Dhanpat Rai Publishing Company	Eighth	2010
04	Fluid Mechanics	K.L.Kumar	S.Chand Publication	Fifth	2010
05	Fluid Mechanics and Fluid Power engineering	Dr.D.S.Kumar	S.K.Kataria& sons	Seventh	2008

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fluid Mechanics	V.L.Streeter & E.B.wylie	Tata McGraw- Hill	Second	1997
02	Introduction to fluid Mechanics	Edward J. Shaughnessy	Oxford university press	Third	2008
03	Fluid Mechanics	Y.A.Cengel	McGraw-Hill,	Second	2009
04	Fluid Mechanics	White	Tata McGraw-Hill, New Delhi	Seventh	2014
05	Fundamentals of Fluid Mechanics	Munson Young	Wiley India Pvt.Ltd	Sixth	2013
06	Fluid Mechanics	Fox McDonald Pritchard	Wiley India Pvt.Ltd	Eighth	2014

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Department of Mechanical Engineering

Course Details:

Class	S. Y. B. Tech. Sem-IV
Course Code and Course Title	1MEPC257,Metrology,Quality Control & Measurement Laboratory
Prerequisite/s	1MEES154
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / ESE	25/00

Course Objectives: The course aims:

01	To explain the scope and need of metrology and measurement.
02	To describe various methods used for measurement of data.
03	To demonstrate the various measuring instruments used for the measurement.
04	To discuss the concept of quality and statistical tools of quality control.

Course Outcomes (COs):-
Upon successful completion of this course, the student will be able to:

1MEPC257_1	**Explain** different technologies used in metrology, quality control & measurement domain,(K^2)
1MEPC257_2	**Demonstrate** the construction and working of various instruments,(K^2)
1MEPC257_3	**Use** measuring instruments and equipments to measure and calculate various parameters,(K^3)
1MEPC257_4	**Communicate** effectively, both orally and in writing journals,(S^2)
1MEPC257_5	**Follow** professional and ethical principles during laboratory work.(A^2)

Course Contents:
1. Measure various parameters using line and end measuring Instruments.
2. Hans on and demonstration of dial indicator.
3. Measurement of major diameter, minor diameter & effective diameter of screw thread by using floating carriage micrometer.
4. Measurement of gear tooth thickness, height and angle by using optical profile projector.
5. Measurement of angle by using sine bar.
6. Control charts (X bar and R chart, P chart) and its application for given process.
7. Angular speed measurement using stroboscope, photo-electric pick up and magnetic pick up.
8. Measurement of temperature using, thermocouple RTD, thermistors and pyrometers.
9. Industrial visit to study various measuring instruments.

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Metrology	M. Mahajan	Dhanpat Rai Publications,Delhi	Ninth	2010
02	Statistical Quality control	M. Mahajan	Dhanpat Rai Publications,Delhi	Third	2008

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03	Engg. Metrology	I.C. Gupta	Dhanpat Rai Publications,Delhi	Twentieth	2010
04	Engg. Metrology	P. Narayana	Scitech Publication	Third	2009
05	Mechanical Measurement andControl	D.S.Kumar	Metropolitan Book Co.Pvt.Ltd,Delhi	Forth	2011

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Statistical Quality control	R.C. Gupta	Dhanpat Rai Publications,Delhi	Fifteenth	2009
02	Metrology for Engineers	J.F.W. Gayler and C.R. Shotbolt	Cassell	Fifth	1990
03	Practical Engineering Metrology	K.W.B. Sharp	Pitman London	First	1973
04	Engg. Metrology	R.K.Jain	Khanna Publisher,Delhi	Twentieth	2012

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Course Details:

Class	S. Y. B. Tech. Sem - IV
Course Code and Course Title	**1MEPC258, CAD Laboratory**
Prerequisite/s	1MEPC109, 1MEPC157
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / ESE (POE)	25/25

Course Objectives: The course aims:

01	To explain Computer Aided Design, its advantages and scope.
02	To develop skills in different modules of the CAD software for solid modeling.
03	To prepare 2D drafting of the 3D model generated.
04	To develop skills in animation using DMU Kinematics.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC258_1	Prepare solid, asSembly, surface model with suitable constraints and 2D drafting using 3D modeling software. (S^2)
1MEPC258_2	Demonstrate kinematics of simple asSembly using 3D modeling software. (S^2)
1MEPC258_3	Communicate effectively, both orally and in writing journals. (S^2)
1MEPC258_4	Practice professional and ethical behavior to carry forward in their life. (A^3)
1MEPC258_5	Recognize the need of modeling software and utilize it for their project work. (A^3)

Course Contents:

Unit 1	Introduction to CAD/CAM/CAE	02 Hrs.
	Introduction to CAD, CAM, CAE, modeling, simulation, analysis and optimization. Different CAD software, file format IGES, STEP, applications. Introduction to Graphical User Interface (GUI) of 3D modeling software, 2D sketching.	
Unit 2	Solid Modeling	08 Hrs.
	Parametric solid modeling – fundamentals, transform the parametric 2-D sketch into a 3D solid, introduction to different commands in 3-D solid modeling, feature operations.	
Unit 3	AsSembly Modeling	06 Hrs.
	Introduction to AsSembly modeling, defining relationship between various parts of machine, top down approach, bottom up approach, creation of constraints, generation of exploded view.	
Unit 4	2–D Drafting	02 Hrs.
	Introduction to Drafting, Production drawing – Generation of 2-D sketches from solid model and asSembly model, Geometric Dimensioning and Tolerance, straightness, perpendicularity, flatness, angularity, roundness, concentricity, cylindricity, run out, profile, true position, parallelism, orientation.	

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Unit 5	**Surface Modeling**	06 Hrs.
	Introduction to surface modeling, difference between part modeling and surface modeling, various commands in surface modeling, creation of different surfaces.	
Unit 6	**DMU Kinematics**	02 Hrs.
	Introduction to DMU Kinematics, defining constraints, simulating motion of different parts of the asSembly, velocity and acceleration of asSembly parts.	

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	CAD/CAM	Ibrahim Zeid, R. Sivasubramanian	Tata McGraw Hill Pvt. Ltd.	First	2008
2	CAD/CAM (Principles & Applications)	P.N.Rao	Tata McGraw Hill Pvt. Ltd.	Fifth	2012
3	CAD/CAM	Kuldeep Sareen, Chandandeep Grewal	S.Chand	First	2009
4	CATIA V6R16/17	ShyamTickoo Deepak Maini.	DreamTech Press.	-	2009

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	CAD/CAM	M.P.Grover, E.W.Zimmer.	Prentice Hall of India Pvt. Ltd.	First	2007
2	CAD/CAM/CIM	Radhakrishnan, Subramanyam,	New Age Int. Publishers.	Third	2004, 2008
3	Computer Aided Mechanical Design & Analysis	V. Ramamurti	Tata McGraw Hill Pvt. Ltd.	Fourth	2000
4	Computer Aided Design	C.S.Krishnamoorthy,S. Rajeev, A.Rajaraman	Narosa Publishing House	Second	2005
5	CAD/CAM/CAE	N.K. Chougule	Scitech	First	2009
6	Computer Aided Design	S.S.Khandare	Charotar Publishing House	Third	2011
7	CAD/CAM – Concepts and applications	Chennakesava R. Alavala	Prentice Hall of India Pvt. Ltd.	Second	2009
8	Machine Drawing	N. D. Bhatt and V.M. Panchal	Charotar Publications	Second	2009

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Course Details:

Class	S. Y. B. Tech. Sem-IV
Course Code and Course Title	1MEPC259, Workshop Practice III
Prerequisite/s	1MEES154, 1MEPC253
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / (ESE)POE	25/25

Course Objectives: The course aims:

01	To explain construction and working of conventional machines.
02	To develop the skills about manufacturing aspects.
03	To aware students about safety measures while machining on different machines.
04	To demonstrate different machining operations on machine tools.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC259_1	Plan the sequence of machining operations and prepare process sheet to manufacture a component and implement the same. (K^3)
1MEPC259_2	Perform various machining operations on Lathe machine. (K^2S^2)
1MEPC259_3	Prepare the design procedure and conceptual drawings of assembly of jig and fixture for a given component, (K^3)
1MEPC259_4	Function effectively as an individual, and as a team member for performing experimental task. (S^3)
1MEPC259_5	Follow professional and ethical principles during laboratory work.(A^2)

Course Contents:

1. Exercise on thread manufacturing processes and gear train calculations.
2. One job of plain turning, taper tuning, external threading and knurling operation with its process sheet.
3. Conceptual design and drawing of drilling jig on A3 size drawing sheet for two different components.
4. Conceptual design and drawing of milling fixture on A3 size drawing sheet for two different components.
5. Industrial visit.

Text Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Manufacturing Technology- Foundry, Forming and Welding	P. N. Rao	Tata Mc- Graw Hill Publication	Second	2009
02	Production Technology: Vol. 1: Manufacturing Processes	P. C. Sharma	S. Chand	First	2006
03	Production Technology: Vol. 2: Machine Tools	P.C.Sharma	S. Chand	Second	2006

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04	Workshop technology vol.1	S.K.Hajra,Choudhary S.K.Bose	Media promoters and publishers pvt ltd.	Twelfth	2012
05	Workshop technology vol.2	S.K.Hajra,Choudhary S.K.Bose	Media promoters and publishers pvt ltd.	Twelfth	2012
06	Workshop Technology vol. II,	Raghuvanshi	DhanpatRai and Sons.	Sixth	2015
07	Foundry Technology	O.P. Khanna	DhanpatRai Publication	Fifteenth	2011

Reference Books:

Sr. No.	Title	Author	Publisher	Edition	Year of Edition
01	Materials and Processes in Manufacturing	E. Paul DeGarmo, J.T. Black.	PHI Publication	Eighth	1997
02	Mechanical Metallurgy	George E. Dieter	Tata McGraw Hill Publication	Third	2013
03	Machine Tools and Manufacturing Technology	Steve F. Krar, Mario Rapisarda.	Delmar publisher	Second	2010
04	Workshop Technology", Vol.I 2001, Vol.II 2007 andVol.III 1995.	W.A.J. Chapman	CBS Publishing and Distributors, N.	Fifth	2001

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Curriculum Structure

T.Y. B. Tech.
MECHANICAL ENGINEERING

SEM V – SEM VI
w.e.f.   2021-22

Department of Mechanical Engineering

Teaching and Evaluation Scheme
T.Y.B. Tech: Semester-V

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks)		Practical (Marks)	
		L	T	P	Credits	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
1OE***	Open Elective-I	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPC301	Turbo Machinery	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPC302	Heat and Mass Transfer	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPC303	Design of Machine Elements -II	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPC304	Industrial Hydraulics and Pneumatics	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPE***	Professional Elective-I	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPC351	Turbo Machinery Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	POE	25	10
1MEPC352	Heat and Mass Transfer Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	POE	25	10
1MEPC353	Design of Machine Elements –II Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	OE	25	10
1MEPC354	Industrial Hydraulics and Pneumatics Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	--	--	--
1MEPC355	CAM Laboratory	--	--	2	1	ISE	--	--	25	20
						ESE	--	--	--	--
Total		18	0	10	23	Total	600		200	

Total Contact Hours/Week: 28 hrs

Course Category	HS	BS	ES	PC	PE	OE	PR
Credits	00	00	00	17	03	03	00
Cumulative Sum	07	20	24	57	03	03	00

1MEPE3** Professional Elective-I

1MEPE305- Power Plant Engineering	1MEPE306- Mechanical System Design	1MEPE307- Advanced Manufacturing Technology

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Open Elective-I (Semester-V)		
Courses Code	**Course Name**	**Department**
1AEOE311	Introduction to Flight	Aeronautical Engineering
1AEOE312	Introduction to Experimental Aerodynamics	
1AEOE313	Introduction to Gas Dynamics and Jet Propulsion	
1AEOE314	Introduction to Unmanned Aerial Vehicles	
1AUOE301	Product Design and Development	Automobile Engineering
1AUOE302	Automotive Refrigeration and Air Conditioning	
1CVOE301	Air Pollution & Control	Civil Engineering
1CVOE302	Remote Sensing & GIS Applications	
1CSOE301	Database Essentials and Business Intelligence	Computer Science and Engineering
1CSOE302	Software Engineering and Project Management	
1CSOE303	Data Structures and Algorithms	
1EEOE301	Electrical Technology	Electrical Engineering
1EEOE302	Electrical and Electronics Measurements	
0FTOE311	Packaging Technology	Food Engineering
1MEOE301	Industrial Automation and Robotics	Mechanical Engineering
1MEOE302	Composite Materials	
1MEOE303	Solar Technology	

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Department of Mechanical Engineering

Course Details:

Class	T.Y. B. Tech, Sem.-V
Course Code and Course Title	**1MEOE301, Industrial Automation & Robotics**
Prerequisite/s	1BSES111, 1BSES109, 1BSES103, 1BSES153, 1BSES157, 1BSES160
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I / MSE/ ISEII / ESE	10/30/10/50
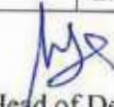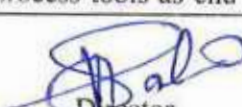
Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEOE301_1	**Explain** basic elements of automation systems, types of automation, advanced automation functions and low-cost automation and actuators.
1MEOE301_2	**Illustrate** effectively utilization of hydraulic and pneumatic systems in automation.
1MEOE301_3	**Comprehend** specifications, characteristics, applications, anatomy and related attributes of industrial robot.
1MEOE301_4	**Interpret** different programming methods, program statements and different application areas of robotic system.
1MEOE301_5	**Analyze** of transfer lines with and without storage buffers.

Course Contents:		
Unit 1	**Introduction to automation** Automated manufacturing systems, fixed /programmable/ flexible automation, need of automation, basic elements of automated systems-power, program and control. Low-cost automation, advanced automation functions, levels of automation, ten strategies for automation, transfer line, analysis of transfer line, automated assembly line.	07 Hrs.
Unit 2	**Sensors and controllers in automation** Introduction, transducers and sensors, sensors in automation and their applications, continuous and discrete control, programmable logic controllers.	05 Hrs.
Unit 3	**Hydraulic and pneumatic systems for automation** Basic laws and principles, basic hydraulic and pneumatic system, hydraulic systems elements, hydraulic circuits for engineering applications, pneumatic system elements, pneumatic circuits for engineering applications.	09 Hrs.
Unit 4	**Fundamentals of industrial robots** Specifications and characteristics, configurations, criteria for selection, robotic control systems: drives, robot motions, actuators, power transmission systems, dynamic properties of robots- stability, control resolution, spatial resolution, accuracy, repeatability, compliance, work cell control, interlocks.	07 Hrs.
Unit 5	**Robot end effectors** End effectors- types, grippers, various process tools as end effectors, robot	07 Hrs.

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	end effectors interface, active and passive compliance, gripper selection and design.	
Unit 6	**Robot programming, applications and recent trends in automation** Lead through method, robot program as a path in space, methods of defining positions in space, applications of robot in different disciplines of engineering, Internet of things, industry 4.0	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Automation, Production Systems & Computer Integrated Manufacturing	Mikell P. Groover	PHI Learning Pvt. Ltd. New Delhi	Third	2012
2	Industrial Robotics, Technology, Programming & Applications	Groover, M.P. Weiss, M. Nagel, R.N. & Odrey, N.G. Ashish Dutta	Tata McGraw Hill Education Pvt. Ltd. New Delhi	Second Edition	2012
3	Pneumatic Systems- Principles and Maintenance	S. R. Majumdar	Tata McGraw Hill, Publishing Company Ltd. New Delhi	Twenty second	2010
4	Oil Hydraulic Systems- Principles and Maintenance	S. R. Majumdar	Tata McGraw Hill, New Delhi	Twenty fourth	2012
5	Introduction to Fluid Power	James Johnson	Delmer Thomason Learning, New Delhi	First	2003

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Robot Technology Fundamentals	Keramas, James G.	Thomson Learning-Delmar) ISBN: 981-240-621-2	Second Edition	2002
2	Introduction To Robotics Mechanics & Control	J. J. Craig	Pierson Education	Third Edition	2004
3	Robotics-Control, Sensing, Vision and Intelligence	Fu, K. S. Gonzalez, R.C. & Lee	(McGraw Hill Intl. Ed.) ISBN:0-07-100421-1	Second Edition	2010
4	Robotics Technology and Flexible Automation	S. R. Deb	Tata McGraw-Hill Education Pvt. Ltd. New Delhi	Second Edition	2010
5	Industrial hydraulic	J. J. Pipenger	McGraw Hill	Third	1979

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TY ME - 05180

Department of Mechanical Engineering

Course Details:

Class	T. Y. B. Tech. Semester-V
Course Code and Course Title	1MEOE302, Composite Material
Prerequisite/s	1MEES205
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEOE302_1	**Explain** the basics of composite material and their significance.
1MEOE302_2	**Describe** the fabrication techniques of different types of composite materials.
1MEOE302_3	**Distinguish** the phases & characteristics of the composite materials.
1MEOE302_4	**Identify** the strengthening mechanics adopted in a particular type of composite material.
1MEOE302_5	**Describe** the significance of advanced materials.

Course Contents:

Unit		
Unit 1	**Introduction to Composites** Matrices, Reinforcements, Classifications, Applications, Comparison with Metals and Importance over other materials, design fabrication and economic consideration, General requirements.	07 Hrs.
Unit 2	**Manufacturing methods** Injection molding, resin injection, filament winding, pultrusion, centrifugal casting and prepregs. Fibre/Matrix Interface, mechanical. Measurement of interface strength. Characterization of systems.	07 Hrs.
Unit 3	**Testing of Composites** Mechanical testing of composites, tensile testing, Compressive testing, Intra-laminar shear testing, Inter-laminar shear testing, Fracture testing etc.	06 Hrs.
Unit 4	**Strengthening mechanisms** Aspect Ratio, Rule of Mixture, discontinuous and continuous fiber composites and their comparison, Characteristics and materials of reinforcements and matrices. Critical Fiber Length	07 Hrs.
Unit 5	**Role of interfaces in composites** Interfacial Bonding Mechanisms. Pullout & Push-out Testing. Control of Bond Strength. Toughening mechanisms in PMCs, MMCs, and CMCs	07 Hrs.
Unit 6	**Applications of advanced composite materials** Environmental effects in Composites, Green composites, Synthesis and Properties of Nanocomposites. Surface Composites & Surface metal matrix composites: Need, Synthesis, Properties and applications	08 Hrs.

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Composite Materials – Science and Engineering	K K Chawla	Springer	Third	2012
02	Mechanisms and Mechanics of Composite Fracture	R B Bhagat	ASM International	First	1993
03	Engineering Materials: Polymers, Ceramics and Composites	A. K. Bhargava	Prentice Hall of India	Second	2005

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Engineering Mechanics of Composite Material,	I. S. Daniel and Ori Ishai	Oxford University Press	Third	2012
02	Mechanics of Composite Materials	R. M. Jones	CRC Press	Second	2015
03	The Behavior of Stuctures Composed of Composite Materials	J.R.Vinson	KLUWER	Second	2002
04	Composites Manufacturing : Materials, Product and Process Engineering	Sanjay K Mazumdar	CRC Press New York.	First	2001

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TY ME – 07 180

Department of Mechanical Engineering

Course Details:

Class	T.Y. B. Tech, Sem.-V
Course Code and Course Title	**1MEOE303, Solar Technology**
Prerequisite/s	1MEPC203, 1MEPC302
Teaching Scheme: Practical	03/00
Credits	03
Evaluation Scheme: ISE	10/30/10/50

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEOE303_1	**Understand** the fundamentals of solar energy and its conversion techniques
1MEOE303_2	**Explain** the different solar applications such as low temperature, medium and high temperature, PV cell
1MEOE303_3	**Analyze** different solar collector and its performance.
1MEOE303_4	**Describe** importance of energy audit and economics analysis
1MEOE303_5	**Design** of solar energy system like solar PV system.

Course Contents:		
Unit 1	**Introduction:** Renewable energy sources, Indian scenario, need, characteristics and challenges in the successful utilization of renewable energy sources, **Solar energy resources:** Energy from the sun, solar extraterrestrial radiation, spectral distribution, earth sun angles, observer sun angles, tilt factor, solar radiation intensity incident on tilted surface, measurement of solar radiation	07 hrs
Unit 2	**Low temperature application of solar thermal energy** Water and air heating application, flat plate collector, classification, types, losses, performance evaluation, storage, testing and standards	06 hrs
Unit 3	**Medium and high temperature applications of solar thermal energy** Concentrating collectors, classification, types and suitability, tracking, performance evaluation, industrial process heating systems, solar thermal power generation, technologies, storage issues and challenges in the commercialization	08 hrs
Unit 4	**Solar photovoltaic conversion** Basic semiconductor physics, a generic photovoltaic cell, modules and arrays, use of solar cell in various instruments, impact of temperature and shading on the performance of a PV module	06 hrs
Unit 5	**Solar photovoltaic design** Solar photovoltaic systems and components, Design of standalone PV system, calculations, and technical aspects. Grid connected PV system types, and	07 hrs

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	component and technical aspects				
Unit 6	**Auditing and economics of energy** Types of energy audits, methodology, instruments used in energy auditing, protocol, carbon footprint, carbon credit and clean development mechanism (CDM) **Economic analysis:** Introduction, initial and annual costs, definitions, annual solar saving, payback period, life cycle savings P1, P2 methods				08 hrs

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Solar Energy	Sukhatme S.P	Tata McGraw Hill New Delhi	Third	1996
02	An Introduction to Power plant Technology	Rai G.D.	Khanna Publishers	Third	1996
03	Principle of solar engineering	Krieth and Krieder	Tata McGraw Hill New Delhi	Second	1996
04	Solar Engineering of Thermal Processes	Duffie John A. Beckman William A	John Wiley and Sons, Inc.	Second	1991

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Handbook of solar energy, Springer				
02	Energy conservation – related booklets Published by National productivity Council (NPC) & Petroleum Conservation Assn. (PCRA).				
03	Solar Energy	Walker Andy	John Wiley and Sons, Inc.	First	2013
04	Solar Photovoltaics Technology, system Design, Reliability and Vialbility	N.D. Kaushika, Anuradha Mishra, Anil Rai	Springer	First	2018

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ADCET Department of Mechanical Engineering

Course Details:

Class	T.Y. B. Tech, Sem.-V
Course Code and Title	**1MEPC301, Turbo Machinery**
Prerequisite/s	1MEPC209
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC301_1	**Explain** the construction, working and applications of turbines, pumps, air compressors, fans and blowers.
1MEPC301_2	**Apply** similarity principles related to the performance of turbines and pump.
1MEPC301_3	**Construct** the performance characteristics of turbines, pumps, air compressors, fans and blowers.
1MEPC301_4	**Compute** various design and operational parameters of turbines, pumps, air compressors, fans and blowers.
1MEPC301_5	**Select** an appropriate turbo machine for given application.

Course Contents:

Unit 1	**Impulse Water Turbines:** Euler's equation for work done in Rotodynamic Machines, classification of water turbines, Pelton wheel, its construction and working, velocity triangles, Pelton wheel design (bucket dimensions, number of buckets, jet diameter, wheel diameter, jet ratio, speed ratio, number of jets) calculation of efficiency, power, discharge etc. Governing of Pelton wheel.	07 Hrs.
Unit 2	**Reaction Water Turbines:** Principle of operation, construction and working of Francis and Kaplan Turbine, effect of modification of velocity triangles on runner shape, draft tube, cavitation calculation of various efficiencies, power, discharge, blade angles, runner dimensions etc. Draft tube-types, Governing of Francis and Kaplan turbine, performance characteristics of turbines, Recent advances in turbines (Pump as turbines).	07 Hrs
Unit 3	**Centrifugal Pumps:** Working principles, Construction, types, various heads, multistage pumps, velocity triangles, minimum starting speed, cavitation, MPSH and NPSH. Methods of priming, calculations of efficiencies, discharge, blade angles, head, power required, impeller dimensions etc., performance characteristics of pumps, Recent advances in pumps (Electrical submersible pump).	07 Hrs.
Unit 4	**Similarity Principles:** Model testing, unit quantities, specific speed of turbine, specific speed of pumps, prediction of performance at other operating conditions, scale effect.	06 Hrs.

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Unit 5	**Rotodynamic Air Compressors:** Centrifugal compressor, velocity diagram. Work done, Theory of operation, losses, adiabatic efficiency, Effect of compressibility, Diffuser, Prewhirl, Pressure coefficient, Slip factor, performance. Axial flow compressors, Velocity diagram, Polytrophic efficiency, Surging, Chocking, Stalling, Performance, Recent advances in compressors.	08 Hrs.
Unit 6	**Fans and blowers** Introduction, Velocity triangles, Parametric calculations (work done, efficiency), Performance curves for fans and blowers, Fan laws, Recent advances in fans and blowers.	07Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fluid Mechanics and Hydraulic Machines	Dr.R.K. Bansal	Laxmi Publication	Ninth	2010
02	Fluid Mechanics and Hydraulic Machines	R.K.Rajput	S. Chand Publication	Ninth	2011
03	Thermal Engineering	R.S.Khurmi J. K. Gupta	S. Chand	Fourteenth	2016
04	Thermal Engineering	R.K.Rajput	Laxmi Publications	Seventh	2009

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fluid mechanics and hydraulic machines	Modi and Seth	Standard Book House	Eighth	2011
02	Fluid mechanics including hydraulic machines	Dr. A. K. Jain	Khanna publishers	First	2009
03	Fluid mechanics and hydraulic machines	S. C. Gupta	Pearson	Sixth	2011
04	Fluid mechanics and hydraulic machines	Domkundwar and Domkundwar	Dhanpat Rai and Co.	First	2006
05	Hydraulic Machines	K Subramanya	Tata McGraw-Hill Education	Fifth	2013

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Department of Mechanical Engineering

Course Details:

Class	T. Y. B. Tech. Semester-V
Course Code and Course Title	**1MEPC302, Heat and Mass Transfer**
Prerequisite/s	1MEPC203, 1MEPC209
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC302_1	**Explain** the mechanism and basic concept of heat and mass transfer
1MEPC302_2	**Apply** the boundary conditions in equation of heat and mass transfer
1MEPC302_3	**Derive** different forms of heat equations in heat and mass transfer
1MEPC302_4	**Solve** the problems on conduction, convection, and radiation heat transfer
1MEPC302_5	**Analyze** the performance of heat exchanger.

Course Contents:

Unit 1	**INTRODUCTION TO HEAT TRANSFER:** **Basic Concepts:** Modes/laws of heat transfer, Combined modes of heat transfer, Thermal conductivity and its variation with temperature. Derivation of Generalized differential equation of Heat Conduction in Cartesian co-ordinates, its reduction to Fourier, Laplace and Poisson's equations. Generalized Heat conduction equation in cylindrical and spherical coordinates (no derivations). **One-dimensional steady state heat conduction without heat generation:** Temperature boundary conditions, heat flux boundary condition, convection boundary condition and radiation boundary condition. Reduction of Generalized differential equation of Heat Conduction to one dimension (1D), Heat conduction through plane wall, cylinder, sphere; electrical analogy; concept of thermal resistance and conductance, composite slab, composite cylinder and composite sphere, critical radius of insulation for cylinder and sphere.	08 Hrs.
Unit 2	**HEAT CONDUCTION WITH HEAT GENERATION AND UNSTEADY STATE HEAT CONDUCTION** **One-dimensional steady state heat conduction with heat generation:** One dimensional steady state heat conduction with uniform heat generation for plane wall cylinder, and sphere. **One-dimensional unsteady State Heat Conduction** Lumped Heat capacity Analysis, Biot and Fourier number and their significance, (Numerical based on Lumped Heat capacity Analysis).	07 Hrs.
Unit 3	**HEAT TRANSFER THROUGH EXTENDED SURFACES** Types and applications of fins, Heat transfer from rectangular and pin fins	06 Hrs.

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	(with different boundary conditions). Fin effectiveness and efficiency, Error estimation in temperature measurement in thermo well	
Unit 4	**HEAT TRANSFER THROUGH CONVECTION**	07 Hrs.
	Fundamentals of convection: Mechanism of natural and forced convection. Concept of Hydrodynamic and thermal boundary layer, local and average convective coefficient for laminar and turbulent flow for flat plate and pipe	
	Natural or Free Convection: Dimensional analysis, Physical significance of dimensionless numbers, correlations for natural convection over vertical plate cylinder sphere and flow patterns	
	Forced Convection: Dimensional analysis, Physical significance of dimensionless numbers, Reynolds analogy for laminar flow, correlations for forced convection over flat plate and closed conduits.	
Unit 5	**HEAT TRANSFER THROUGH RADIATION**	07 Hrs.
	Nature of thermal radiation, absorptivity, reflectivity, transmissivity, emissive power and emissivity, spectural and total concept, black body, gray body and white body. Kirchoff's law, Wein's law and Planck's law, and deduction of Stefan Boltzmann law. Lambert cosine rule, Intensity of radiation. Energy exchange by radiation between two black surfaces with non-absorbing medium in between and in absence of reradiating surfaces. Shape factor and its characteristics. Energy exchange by radiation between two gray surfaces without absorbing medium, concept of radiosity and irradiation. Radiation network method, network for two surfaces, radiation shields.	
Unit 6	**HEAT EXCHANGERS AND MASS TRANSFER**	07 Hrs.
	Heat Exchangers: Classification and types of Heat exchangers, Fouling factor, and Overall heat transfer coefficient, Heat Exchanger Analysis using LMTD and NTU methods for parallel and counter flow, shell and tube type HEX, Design consideration of Heat exchangers	
	Mass Transfer: Introduction to mass transfer, Modes of mass transfer, comparison between heat and mass transfer, Fick's law of diffusion	

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Heat and Mass Transfer	R K Rajput	S. Chand & Company Ltd., New Delhi	Third	2007
02	Fundamentals of Heat and Mass Transfer	R.C. Sachdeva	New Age International	First	2000

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| 03 | Heat and Mass Transfer | Dr. D.S. Kumar | S. K. Kataria & Sons, Delhi | Third | 2013 |
| 04 | Heat and Mass Transfer | P. K. Nag | Tata Mc- Graw Hill Publication | Third | 2011 |

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Heat and Mass Transfer	J P Holman S Bhattacharya	Tata MacGraw Hill, New Delhi	Tenth	2011
02	Heat and Mass Transfer	Yunus. A Cengel	Tata MacGraw Hill, New Delhi	Fourth	2011
03	Heat and Mass Transfer	S C Arora S Domkunwar	Dhanpatrai and Sons, Delhi	Seventh	2012
04	Fundamentals of Heat	Frank P. Incropera,	John Wiley & Sons	Fourth	1996

Other Books/E-material

Sr. No	Title	Author	Publisher
01	NPTEL video lectures	NPTEL Author	www.nptel.ac.in

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Department of Mechanical Engineering

Course Details:

Class	B. Tech. Semester-V
Course Code and Course Title	**1MEPC303, Design of Machine Elements II**
Prerequisite/s	1MEPC109, 1MEPC204, 1MEES205, 1MEES252, 1MEPC210
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC303_1	**Explain** considerations and methodologies used for the design and selection of gears, shafts, keys, couplings and bearings.
1MEPC303_2	**Solve** the design problems of gears and bearings using design data book and manufacturer's catalogue.
1MEPC303_3	**Use** the standard design procedures of shaft, key, coupling, and anti-friction bearings.
1MEPC303_4	**Select** the bearing by using manufacturer's catalogue.
1MEPC303_5	**Design** and/or select the components of a transmission system for static and dynamic loading conditions and by using the standard design procedure and design data book.

Course Contents:

Unit 1	**Design of Shaft, Keys, and Couplings** **a) Shaft** - Types of transmission shaft, selection of material, Design of solid & hollow shafts – strength and torsional rigidity basis, ASME code for shaft design, Introduction to circlips. **b) keys** – Types of keys, selection of material, design of keys, splines **c) Couplings** - Types of couplings, design of rigid flanged coupling and flexible bush pin type coupling.	07 Hrs.
Unit 2	**Spur and Helical Gear** Gear terminology, material selection, inspection of gears, types of gear failure. **a) Spur Gear** – Review of gear terminology, types, force analysis, type of gear failure, selection of material, minimum number of teeth, beam strength (Lewis equation), estimation of module based on beam strength, Barth equation, wear strength (Buckingham's equation), estimation of module based wear strength, dynamic tooth load (Spot's equation and Buckingham's equation), calculation of effective load on a gear tooth,	10 Hrs.

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	gear design for maximum power transmission capacity	
	b) **Helical Gear** – Gear terminology, types, formative number of teeth, force analysis, type of gear failure, beam & wear strength, effective load, design of helical gear.	
Unit 3	**Bevel Gear** Gear terminology, types of bevel gears, Guideline for selection of dimensions and minimum number of teeth, force analysis, type of gear failure, beam and wear strength, dynamic load, effective load, design of straight bevel gear, mounting of bevel gear.	06 Hrs.
Unit 4	**Worm Gears** Terminology and geometrical relations, standard dimensions and recommendation of worm gearing, force analysis, types of failures, friction, efficiency of worm gear drive, design of worm drive as per IS 7443-1974 based on beam strength and wear strength rating, thermal consideration in worm drive.	05 Hrs.
Unit 5	**Design of Rolling Contact Bearing** - Types, static and dynamic load capacities, Stribeck's equation, equivalent bearing load, load-life relationship, bearing life, load factor, Selection of bearing from manufactures catalogue. Ball and Roller bearing, Design for variable load and speed, Bearings with probability of survival other than 90%. Lubrication and mountings, dismounting and preloading of bearings, Oil seal and packing.	07 Hrs.
Unit 6	**Design of Sliding contact Bearings** a) **Sliding contact bearing** - Bearing material and their properties: Sintered bearing materials, bearing types and their construction details. b) **Hydro-dynamic lubrication** - Basic theory, thick and thin film lubrication, Reynolds's equation, Somerfield Number, Design consideration in hydrodynamic bearings, Raimondi and Boyd method relating bearing variables, Heat balance in journal bearings, Temperature rise.	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Design of Machine Elements	V. B. Bhandari	Tata Mc- Graw Hill Publication	Fourth	2017
02	Design of Machine Element	J. F. Shigley	McGraw Hill Publication.	Eight	2010
03	Machine Design	R. K. Jain	Khanna Publication	Seventh	2004

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
04	Machine Design	Pandya Shah	Charotar Publication	Seventh	2009
05	Mechanical Engineering Design	Shigley and C. R. Miscke	Tata Mc- Graw Hill	Eight	2010
06	Design of Machine Elements	M. F. Spotts	Pearsons Edu. Inc.	Eight	2004

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Machine Design An Integrated Approach	R.L Norton	Pearson Education Publication	Second	2007
02	Fundamentals of Machine Component Design	J Marshek	Willey Eastern Ltd.	Third	2011
03	Mechanical Analysis & Design	H.Burr & Cheatam	Prentice Hall Publication.	Second	1997
04	Standard Handbook of Machine Design	J. Shigley, C. Mischke,	McGraw Hill Publication.	Third	2004
05	Design data book	PSG	PSG	--	--

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Course Details:

Class	T.Y. B. Tech, Sem.-V
Course Code and Course Title	1MEPC304, Industrial Hydraulics and Pneumatics
Prerequisite/s	1MEPC209
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC304_1	Explain the principles, working, ISO/JIC symbols, applications of hydraulic, pneumatic systems and electro systems.
1MEPC304_2	Discuss the construction and working of hydraulic and pneumatic system components.
1MEPC304_3	Solve the numerical on pump power, cylinder force and speed etc.
1MEPC304_4	Construct the hydraulic and pneumatic circuits for industrial application.
1MEPC304_5	Design of hydraulic and pneumatic systems for industrial application.

Course Contents:

Unit 1	**Introduction to Fluid Power** a) Classification, general features applications in various fields of engineering. ISO/JIC Symbols, transmission of power at static and dynamic states, advantages and disadvantages. b) Principle of hydraulic system, basic hydraulic circuit, types of hydraulic fluids and their properties, selection of fluid, effect of temperature on fluids. c) Introduction of pneumatics, physical properties, principles, basic requirement of pneumatic system, basic pneumatic circuit, comparison with hydraulic system. d) Classification & types of seals, sealing material, compatibility of seal with fluid, sources of contamination and its control. e) Maintenance- troubleshooting and safety of hydraulic and pneumatic systems.	08Hrs.
Unit 2	**Hydraulic System Elements** a) **Pumps-** types, classification, principle of working, selection of pumps from vane, radial piston, axial piston, screw, ball pump etc. for various applications, power calculations, efficiency, characteristics curve. b) **Actuators-**linear and rotary, hydraulic motors, types of hydraulic cylinders and their mountings. Calculation of piston Force and velocity. c) Accumulators, intensifier, jack and their applications. d) Pipes, hoses, strainer, filter, heat-exchanger, reservoir, power pack.	07 Hrs
Unit 3	**Hydraulic Control Elements** a) Principle of pressure control valves, directly operated and pilot operated	07Hrs.

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	pressure relief valve, pressure reducing valve, sequence valves, counter balance valve. b) Principles and Types of direction Control valves-2/2, 3/2, 4/2, 4/3, 5/2. Open center, close center, tandem center, manual operated, mechanical operated, solenoid, pilot operated direction control valves, check valves. c) Principles of flow control valves, temperature compensated, pressure compensated, temperature and pressure compensated flow control valve.	
Unit 4	**Pneumatic System Elements** a)**Air compressor**- Types, selection criteria, capacity control, piping layout, fitting and connectors. b)**Pneumatic actuators**, Rotary and reciprocating cylinders–types and their mountings, Air motor – types, Comparison with hydraulic and electric motor. c)**Serving of compressed air** – types of filters, regulators, lubricators (FRL unit), mufflers, dryers. d)**Pneumatic Control** - check valves, Direction control valves (two way, three way, four way), Solenoid operated, pilot operated valves, flow control valves, quick exhaust valves, time delay valve, shuttle valve and twin pressure valve, Impulse Valve.	09Hrs.
Unit 5	a) **Hydraulic Circuits and its Application** i) Regenerative circuit. ii) Speed control circuits – Meter-in, Meter-out, Bleed off, iii) Fast approach and slow traverse. iv) Sequence circuits – Travel dependent and Pressure dependent. v) Synchronizing circuit. b) **Pneumatic Circuits and its Application** i) Speed control circuits ii) Sequence circuits iii) Time delay circuit. iv) Quick Exhaust circuit v) twin pressure valve circuit. c) **Electro Systems-**Introduction to Electro-hydraulic and Electro-pneumatic Systems and PLC.	05Hrs.
Unit 6	Design of hydraulic system for industrial applications includes following 1. Load, Pressure and flow calculations 2. Sizing and selection of components 3. Design constraints considerations 4. Circuit preparation 5. Energy losses in systems	06Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Pneumatic Systems- Principles and Maintenance	S. R. Majumdar	Tata McGraw Hill, Publishing Company Ltd. New Delhi	Twenty second	2010
02	Oil Hydraulic Systems-Principles and Maintenance.	S. R. Majumdar	Tata McGraw Hill, Publishing Company Ltd. New Delhi	Twenty fourth	2012

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| 03 | Fluid Power with Application | Anthony Esposito | Pearson Education South Asia, New Delhi | Seventh | 2009 |
| 04 | Fluid Power | Jagadeesha T | Wiley India, New Delhi | First | 2013 |

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Introduction to Fluid Power	James Johnson	Delmer Thomason Learning, New Delhi	First	2003
02	Pneumatics and Hydraulics	H. L. Stewart	Taraporevala Sons & co, Mumbai	Sixth	2002
03	Industrial Hydraulics	J. J. Pipenger	McGraw Hill, New Delhi	Third	1979
04	Pneumatic Control	Joji P	Wiley India, New Delhi	First	2008
05	Hydraulics And Pneumatics	Andrew Parr	Jaico Publication House, New Delhi	sixth	2002

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Course Details:

Class	T.Y. B. Tech, Semester-V
Course Code and Title	**1MEPE305, Power Plant Engineering**
Prerequisite/s	1MEPC203
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEPE305_1	**Describe** present status and future trends in power generation.
1MEPE305_2	**Apply** the principle of thermodynamic to analyze different power plant.
1MEPE305_3	**Explain** functions, components and working principle of different power plants.
1MEPE305_4	**Solve** various problems related to power plant engineering
1MEPE305_5	**Discuss** the measuring instrument and pollution controls in power plant.

Course Contents:		
Unit 1	**Introduction** Resources and development of power in India, NTPC, NHPC and their role in Power development in India, Power generation in Private sector, Power distribution, National Grid, Indian Electricity Grid Code, Structure of IEGC, Operating Policies and Procedures, Present Power position in India and Maharashtra.	06 Hrs.
Unit 2	**Steam power plant:** classification, Layout, components used, site selection, Fluidized bed combustion, capacity of steam power plant, choice of steam conditions, coal reserves in India and abroad	06 Hrs.
Unit 3	**Hydro power plant:** Site selection, components of hydro power plant, classification, auxiliaries used, combined hydro and steam power plants, underground hydro plants, calculation of hydropower, cost of hydro power, hydro power potential in India.	08 Hrs.
Unit 4	**Nuclear power plant:** General aspects of nuclear engineering: atomic structure, atomic mass unit, isotopes, radioactive decay, nuclear reactions, fertile materials, nuclear fission, nuclear fusion, comparison, nuclear reactors classification, components of nuclear power plant, site selection, nuclear fuel reserves.	06 Hrs.
Unit 5	**Power Plant Analysis:** Load Curves, Load duration curves, Performance and operational characteristics of power plants, Peak load, Intermediate load and Base load plants and their characteristics, Input output characteristics of power plants, Economic division of between Base load plant and peak load plants. Cost of energy generation, Tariff methods.	10 Hrs.

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Unit 6	Power plant instruments and pollution control	06 Hrs.
	Importance of instruments in power plant, Measurement of water purity, dissolved solids in water, dissolved oxygen recorder, PH measurement, gasanalysis, O2,CO2,and CO measurement **Air pollution control:**Pollution from thermal power plant. Pollution from nuclear power plant	

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Non-Conventional Energy Sources	G.D.Rai	Khanna Publishers	Fifth	2011
02	Power Plant Engineering	Domkundwar and Arora	Dhanpatrai and Sons	Fifth	2005
03	Power Plant Engineering	R K Rajput	Laxmi publication	Fourth	2008
04	Power Plant Engineering	K. K. Ramalingam	SCITECH	--	2010

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Renewable energy Technology	C.Palaniappan	Narosa publication	First	2001
02	Introduction to Non-Conventional Energy Resources	Raja	SciTech Publi	First	2005
03	Power Plant Technology	M.M.El Wakil	Mc Graw Hill. Int edition	1984	5th Reprint 2012
04	Power System Analysis	Grainger John J, and tevenson Jr.. W.D.	McGraw Hill	2003	20th Reprint 2012
05	Modern Power System Analysis	D. P. Kothari, I. J. Nagrath	McGraw Hill	Fourth	2012

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Department of Mechanical Engineering

Course Details:

Class	T.Y. B. Tech, Semester - VI
Course Code and Course Title	**1MEPE306, Mechanical System Design**
Prerequisites	1MEPC202, 1MEPC204, 1MEPC210, 1MEPC303, 1MEPC353
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISEII/ESE	10/30/10/50

Course Outcomes (COs):
After successful completion of this course, the student will be able to:

1MEPE306_1	**Explain** design considerations used in products or various mechanical systems.
1MEPE306_2	**Derive** the expression to find out the dimensions of components of various mechanical systems.
1MEPE306_3	**Apply** the considerations used for the design and selection of components of various mechanical systems.
1MEPE306_4	**Design** of various mechanical systems for the given specifications.
1MEPE306_5	**Evaluate** optimum design solution for a given mechanical systems considering product quality and performance.

Course Content:

Unit 1	**Aesthetic and Ergonomic Consideration in Design:** *Aesthetic Design-* Basic aspects/principles: product form &its types, designing for appearance, shape, materials, finishes, proportions, symmetry, contrast etc., Morgan's colour code, Practical examples of products or equipment's using aesthetic design principles. *Ergonomic Design-* Relation between man, machine and environmental factors, Design of displays and controls, Practical examples of products or equipment's using ergonomic design. Creativity concept in design.	06 Hrs.
Unit 2	**Design of Cylinders & Pressure Vessels:** *Design of Cylinder-* Thin and thick cylinders, Failure criteria of vessels: Lame's equation, Clavarino's and Birnie's equation, Methods used for construction and prestressing for thick cylinders. *Design of Pressure Vessel-* Types of pressure vessels& its general applications, Pressure vessel codes, Design of unfired pressure vessel as per IS2825:1969 code: Introduction, Classification of unfired pressure vessel, Categories and types of welded joints, Design parameters, thickness of cylindrical shells and design of end closures, Effect of opening & nozzles in shell and covers, Types of pressure vessel support (theoretical treatment only)	09 Hrs.
Unit 3	**Design of Braking and Clutch System:** *Clutches-* Classification of clutches, Design requirement of friction clutches,	07 Hrs.

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	Selection criteria, Torque transmitting capacity: single plate, multidisc clutch, cone clutch and centrifugal clutch *Brakes-* Classification of brakes, Basic design consideration in brakes, Braking torque capacity: Block brake, Drum & shoe brake, Disk brake & Band brake		
Unit 4	**Design of Belt Conveyor System for material handling:** Classification, objective &guidelines in selecting material handling equipment's, Types of conveyors, Flat & troughed belt conveyors components: rubber covered steel cord/rope & fabric ply belt, pulleys, idlers, tension take-up units. Design of belt conveyor: capacity calculation, determination of various force acting on belt by conveyor components, belt tensions, estimation of power requirement of conveyors etc.		07 Hrs.
Unit 5	**Optimum Design:** Adequate and optimum design, Different methods & techniques for optimization& its applications, objectives of optimum design, Classical Johnsons Method of Optimum Design: design parameters, primary, subsidiary & limit equations, Optimum design with normal specifications of simple machine elements like tension bar, transmission shaft, helical spring& Pressure vessel, Introduction to optimum design with Langrange Multiplier.		06Hrs.
Unit 6	**Design of Gear pump for hydraulic applications:** Design of main components of gear pump: Motor selection, Gear design, Shaft design and bearing selection, Casing and bolt design, Suction and delivery pipe.		07 Hrs

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Design of machine elements	V.B. Bhandari	Tata Mc- Graw Hill Publication	Third	2012
02	Mechanical System Design	S.P.Patil,	Jaico Publication House,New Delhi	First	2004
03	Design of Machine Elements	P. Kannaiah	Scitech Publication.	Second	2008
04	Machine Design	R. K. Jain	Khanna Publication	Seventh	2004
05	Process Equipment Design	M. V. Joshi	Machmillan India Ltd.,New Delhi	Third	1996
06	Pumps: Theory, design & applications	G.K.Sahu	New age international	---	2000

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory and Design of pressure vessels	John F.Harve	CBS Publishers	First	2001
02	Mechanical Engineering Design	Shigley and C.R.Miscke	Tata Mc- Graw Hill	Eighth	2010
03	Design of Machine Elements	M.F.Spotts	Pearsons Edu. Inc.	Eighth	2004
04	Design of Machine Element	J.F. Shigley	McGraw Hill Publication.	Eighth	2010
06	Design Data: Data Book of Engineers	PSG College, of technology	Kalaikathir Achchagam, Coimbatore, India	--	1994
07	Design data book	V.B. Bhandari	Tata Mc- Graw Hill Publication	First	2014
08	IS Codes for Pressure Vessel Design	--	Bureau of Indian standards, New Delhi	Eight	1998

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Course Details:

Class	T. Y. B. Tech. Semester-V
Course Code and Course Title	**1MEPE307 Advanced Manufacturing Technology**
Prerequisite/s	1MEES205, 1MEPC206
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPE307 _1	**Explain** various materials and advanced manufacturing techniques with a schematic diagram.
1MEPE307 _2	**Select** suitable advanced manufacturing processes and materials for a particular application.
1MEPE307 _3	**Choose** an appropriate welding process and the consumables depending upon the requirement.
1MEPE307 _4	**Examine** the composite material in terms of various properties.
1MEPE307 _5	**Analyze** various process parameters involved in different advanced machining processes.

Course Contents:

Unit 1	**Advanced Machining Processes (AMPs) - Mechanical** Introduction, Historical background, Classification, Hybrid processes, Macro/micro/nano machining, process capabilities and related comparison. Principle, equipment, processes parameters & applications of Abrasive Jet Machining (AJM), Water Jet Machining (WJM), Abrasive Water Jet Machining (AWJM), Ultrasonic Machining (USM), Numerical.	07 Hrs.
Unit 2	**AMPs - Thermo-electric & Electro-chemical** Introduction, principle, equipment, process parameters, and applications of Electric Discharge Machining (EDM) and types, Laser Beam Machining (LBM), Electron Beam Machining (EBM). Electrochemical Machining (ECM), Numerical.	07 Hrs.
Unit 3	**Welding Technology** Special welding process, designing weld joint with stress distribution, Welding parameter layer, sequence, expansion, contraction, Selection of rates of deposition, Residual stresses in welded structures. Indian standards for welding electrodes, fluxes, Selection of welding consumables, Case studies for consumables selection	07 Hrs.

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Unit 4	**Additive Manufacturing – Liquid based**	07 Hrs.
	Introduction, Traditional Vs. Rapid Prototyping (RP), Classification: Additive, Subtractive, Formative, Generic RP process, Data path – CAD model, slicing, G & M code. Stereo lithography Apparatus (SLA), Solid Object Ultraviolet-Laser Printer (SOUP), PolyJet 3D printing, MultiJet Printing (MJP), Rapid Freeze Prototyping	
Unit 5	**Additive Manufacturing – Solid & Powder based**	07Hrs.
	Solid based- Fused deposition modeling (FDM), Selective Deposition Lamination (SDL), Laminated Object Manufacturing (LOM), Ultrasonic Consolidation **Powder based -** Selective Laser Sintering (SLS), Color Jet Printing (CJP), Laser Engineered Net Shaping (LENS), Electron Beam Melting (EBM)	
Unit 6	**Composite Materials**	07Hrs.
	Fibers, Whiskers, Matrix, and Composites materials, Classification, Types of materials - Isotropic, Orthotropic, Anisotropic, Homogeneous and terminologies used, Various manufacturing processes - Hand lay-up, Bag Molding, Filament winding, Pultrusion, Resin transfer molding, Mechanical testing of composites- tensile, compressive, flexural, torsional, shear etc.	

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Advanced Machining Processes	V. K. Jain	Allied Publishers Pvt. Ltd.	Sixth	2007
02	Manufacturing Processes	B.H. Amsteal, Philip F. Ostwald & Myron L. Begeman	John Wiley & Sons	Eight	1987
03	Processes & Materials of Manufacture	A. K. Chitale R.C. Gupta	Springer Prentice Hall of India	Sixth	2013
04	Rapid Prototyping: Principle and Applications	Rafique I. Noorani	John Wiley & Sons	First	2005
05	Engineering Materials: Polymers, Ceramics and Composites	A. K. Bhargava	Prentice Hall of India	Second	2005

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Mechanical Metallurgy	George E Dieter	McGraw Hill Education	Third	2013
02	Advanced Manufacturing Processes	G.F. Benidict	Marcel Deker Publisher	First	1987
03	Processes & Materials of Manufacture	Roy A Lindberg	Prentice Hall of India	Third	2007
04	Non-Conventional Machining Processes	P. K. Mishra	Narosa Publication	First	2007
05	Composites Manufacturing : Materials, Product and Process Engineering	Sanjay K Mazumdar	CRC Press New York,	First	2001

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Department of Mechanical Engineering

Course Details:

Class	T.Y.B. Tech, Sem.-V
Course Code and Course Title	1MEPC351, Turbo Machinery Laboratory
Prerequisite/s	1MEPC301, 1MEPC256
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / ESE	25/25

Course Outcomes (COs)

Upon successful completion of this course, the student will be able to,

1MEPC351_1	**Identify** the various parts of turbines, pumps and blower
1MEPC351_2	**Compute** the operational parameters of turbines, pumps, and blowers.
1MEPC351_3	**Construct** the performance characteristics of turbines, pumps and blowers.
1MEPC351_4	**Compare** the experimental results of turbo machineries with the standard performance curves.
1MEPC351_5	**Evaluate** the performance characteristics of various turbines, pumps and blower

Course Contents:

1. Trial on Pelton Wheel Turbine for plotting main characteristics.
2. Trial on Francis turbine for plotting main characteristics.
3. Trial on Francis turbine for plotting operating characteristics.
4. Trial on Kaplan turbine for plotting main characteristics.
5. Trial on Kaplan turbine for plotting operating characteristics.
6. Trial on centrifugal pump for plotting operating characteristics.
7. Trial on reciprocating pump for plotting operating characteristics.
8. Demonstration of hydraulic ram.
9. Trial on centrifugal blower to determine the performance.
10. Industrial or hydro power plant visit.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fluid Mechanics and Hydraulic Machines	Dr.R.K. Bansal	Laxmi Publication	Ninth	2010
02	Fluid Mechanics and Hydraulic Machines	R.K.Rajput	S. Chand Publication	Ninth	2011
03	Thermal Engineering	R.S.Khurmi J. K. Gupta	S. Chand	Fourteenth	2016

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| 04 | Thermal Engineering | R.K.Rajput | Laxmi Publications | Seventh | 2009 |

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fluid mechanics and hydraulic machines	Modi and Seth	Standard Book House	Eighth	2011
02	Fluid mechanics including hydraulic machines	Dr. A. K. Jain	Khanna publishers	First	2009
03	Fluid mechanics and hydraulic machines	S. C. Gupta	Pearson	Sixth	2011
04	Fluid mechanics and hydraulic machines	Domkundwar and Domkundwar	Dhanpat Rai and Co.	First	2006
05	Hydraulic Machines	K Subramanya	Tata McGraw-Hill Education	Fifth	2013

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Department of Mechanical Engineering

Course Details:

Class	T. Y. B. Tech. Semester-V
Course Code and Course Title	**1MEPC352, Heat and Mass Transfer Laboratory**
Prerequisite/s	1MEPC203, 1MEPC209
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / ESE	25/25

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC352_1	**Carry** out experiment and calculate various heat transfer parameters,
1MEPC352_2	**Interpret** the experimental results of heat transfer properties.
1MEPC352_3	**Communicate** effectively, both orally and in writing journals,
1MEPC352_4	**Function** effectively as an individual, and as a team member for performing laboratory work,
1MEPC352_5	**Follow** professional and ethical principles during laboratory work,

Laboratory Plan

Expt. No.	Title of Experiment
1	Determination of thermal conductivity of insulating powder
2	Determination of thermal conductivity of metal rod
3	Determination of thermal conductivity of Composite wall or lagged pipe.
4	Determination of heat transfer coefficient for natural convection.
5	Determination of heat transfer coefficient for forced convection.
6	Determination of Emissivity.
7	Determination of Stefan Boltzmann Constant.
8	Determination of critical heat flux by boiling heat transfer.
9	Determination of heat transfer coefficient in drop and film condensation.
10	Trial on heat exchangers.
11	Program of thermal conductivity
12	Program on natural convection

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Heat and Mass Transfer	R.K.Rajput	S. Chand & Company Ltd	Revised	2008
02	Heat and Mass Transfer	Dr.D.S. Kumar	S.K.Kataria & Sons,Delhi	7th	2007
03	Heat and Mass transfer	M.M.Rathod	Laxmi Publications	2nd	2015
04	Fundamentals of Heat and Mass Transfer	R.C. Sachdeva	NEW AGE INTERNATIONAL PUBLISHERS	5th	2017
05	A course in Heat and Mass Transfer	S C Arora S Domkunwar A Domkunwar	Dhanpatrai and Sons, Delhi	7th	2012

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fundamentals of Heat & Mass Transfer	Frank P.Incropera, DavidP.Dewitt	Wiley	7th	2013
02	Heat and Mass Transfer	P. K. Nag	Tata MacGraw Hill Publication	3rd	2011
03	Heat and Mass Transfer	J P Holman S Bhattacharya	Tata MacGraw Hill, New Delhi	10th	2011
04	Heat and Mass Transfer: Fundamentals and Applications	Yunus A Cengel; Afshin J. Ghajar	McGraw Hill Education	5th	2017
05	Fundamentals of Heat and Mass Transfer	C.P. Kothandaraman	New Age International Private Limited	4th	2012
06	Heat Transfer	Alan Chapman	Pearson Education India	4th	2016
07	Heat Transfer	S.P. Venkateshan	Paperback	3rd	2016

Other Books/E-material

Sr. No	Title	Author	Publisher
01	Heat Transfer	Adrian Bejan	Wiley
02	A Heat Transfer Textbook	John H. Lienhard IV and John H. Lienhard V	Phlogiston Press

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Course Details:

Class	T. Y. B. Tech. Semester-V
Course Code and Course Title	**1MEPC353, Design of Machine Elements - II Laboratory**
Prerequisite/s	1MEPC109, 1MEPC204, 1MEES205, 1MEES252, 1MEPC210
Teaching Scheme: Practical/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE / ESE (OE)	25/25

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC353_1	**Explain** types of gearboxes and design procedures for optimum design of gearboxes for machine tool applications.
1MEPC353_2	**Select** the belt, pulley using manufacturer's catalogue.
1MEPC353_3	**Design** the multispeed gearbox spur/helical/bevel/worm gearbox.
1MEPC353_4	**Compare** various belt, pulley, bearings, gears available in market
1MEPC353_5	**Prepare** a report on multispeed gearbox

Course Contents:

The term work consists of,

1. Study of selection of flat and V belt pulley, selection of flat belt, V belt and Chain drives from the standard manufacturer's catalogue.
2. **Design project – Design of Multispeed Gearbox.**

Determination of variable speed range- Graphical representation of speeds- Structure diagram- Deviation diagram- Ray diagram- Selection of optimum ray diagram- Difference between number of teeth of successive gears in a change gear box- Analysis of six speed gear box- Compound ray diagram, methods of gear lubrication, construction of gears such as hub, web, arm, rim type etc., design considerations of gear box.

A detail design report and A-2 size sheet containing working drawing of details and assembly of a Multispeed Gearbox. The project must include minimum two different types of gear pairs, one pair spur/helical gear and second pair bevel/worm gear.

The detailed design project report in a following step:

a. Selection of belt as per standard manufacturer catalogue
b. Kinematic gearing design
c. Design of gears (Spur/helical/bevel/worm)
d. Design of Shaft, key and circlip
e. Design of bearing

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f. Design of casing

g. A2 size sheet containing working drawing of details and assembly of a multispeed gearbox

3. **Industrial visit**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Design of machine elements	V.B. Bhandari	Tata Mc- Graw Hill Publication	Fourth	2012
02	Design of Machine Element	J.F. Shigley	McGraw Hill Publication.	Eight	2010
03	Mechanical Engineering Design	Shigley and C.R.Miscke	Tata Mc- Graw Hill	Seventh	2010
04	Design of Machine Elements	M.F.Spotts	Pearsons Edu. Inc.	Seventh	2004
05	Design of machine Tools	S.K. Basu and D.K. Pal	Oxford And IBH Publication	Eight	2009
06	Machine Tools Design	N.K. Mehta	Tata Mc- Graw Hill Publication	Eight	2011
07	Mechanical System Design	S.P.Patil,	Jaico Publication House,New Delhi	Second	2004

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Machine Design -An Integrated Approach	R.L Norton	Pearson Education Publication	Second	2007
02	Fundamentals of Machine Component Design	J Marshek	Willey Eastern Ltd.	Third	2011
03	Mechanical Analysis & Design	H.Burr & Cheatam	Prentice Hall Publication.	Second	1997
04	Machine Design	Hall, Holowenko	Tata McGraw Hill Publication.	First	2008
05	Standard Handbook of Machine Design	J. Shigley, C. Mischke,	McGraw Hill Publication.	Third	2004
06	Design data book	PSG	PSG	--	--
07	Design data book	V.B. Bhandari	Tata Mc- Graw Hill Publication	First	2014

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Course Details:

Class	T.Y.B. Tech, Sem.-V
Course Code and Course Title	**1MEPC354, Industrial Hydraulics and Pneumatics Laboratory**
Prerequisite/s	1MEPC256
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE/ ESE	25/00

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEPC354_1	**Explain** the construction and working of hydraulic and pneumatic system components.
1MEPC354_2	**Demonstrate** the maintenance and troubleshooting of fluid power systems.
1MEPC354_3	**Show** the operation and control of hydraulic and pneumatic systems.
1MEPC354_4	**Construct** hydraulic & pneumatic circuits for industrial applications.
1MEPC354_5	**Use** fluid simulation software to build the circuits.

Course Contents:
1. Demonstration of hydraulic power pack and elements of hydraulic kit.
2. Circuit preparations on hydraulic trainer kit.
3. Demonstration of pneumatic trainer kit and study of various elements.
5. Circuit preparations on pneumatic trainer kit.
6. Circuit preparations using Fluid simulation software.
7. Demonstration of hydraulic/Pneumatic circuit using PLC
8. Maintenance of fluid power system.
9. Industrial Visit
10. Group Activity: Maximum 4 to 5 students in one group
Detailed survey of collection literature/case studies related to any one of the
  1. Hydraulic/pneumatic system application - a) JCB machine, b) dumper
  2. Automobiles - a) Power steering, b) power brakes, c) suspension system, d) hydraulic transmission
  3. Construction equipment's - a) Concrete mixture, b) brick making machine
  4. Surface grinding machine / CNC turning / Shaper machine / Hydraulic Milling
  5. Jig and fixtures
  6. Material handling equipment's
  7. Paper and packaging machine
  8. Sand/ core molding machine
  9. Pharmaceuticals and medical
  10. Plastic and rubber industries
  11. Press tools
  12. Textiles and printing industry

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13. Agriculture equipments etc

Survey/case studies includes following points-

1. Introduction/Relevance
2. Objectives
3. Schematic diagram
4. Circuit diagram
5. Selection of components- design considerations
6. Theory/description and specifications of system components
7. Principle of working operation
8. Design calculations/theoretical analysis
9. Concluding remarks/comments

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Pneumatic Systems-Principles and Maintenance	S. R. Majumdar	Tata McGraw Hill, Publishing Company Ltd. New Delhi	Twenty second	2010
02	Oil Hydraulic systems-Principles and Maintenance.	S. R. Majumdar	Tata McGraw Hill, New Delhi	Twenty fourth	2012
03	Fluid Power with Application	Anthony Esposito	Pearson Education South Asia, New Delhi	Seventh	2009
04	Fluid Power	Jagadeesha T	Wiley India, New Delhi	First	2013

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Introduction to Fluid Power	James Johnson	Delmer Thomason Learning, New Delhi	First	2003
02	Pneumatics and Hydraulics	H. L. Stewart	Taraporevala Sons & co, Mumbai	Sixth	2002
03	Industrial Hydraulics	J. J. Pipenger	McGraw Hill, New Delhi	Third	1979
04	Pneumatic Control	Joji P	Wiley India, New Delhi	First	2008
05	Hydraulics and Pneumatics	Andrew Parr	Jaico Publication House, New Delhi	sixth	2002

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Course Details:

Class	T.Y. B. Tech, Semester-V
Course Code and Course Title	**1MEPC355, Computer Aided Manufacturing Laboratory**
Prerequisite/s	1MEPC206,1MEPC258
Teaching Scheme: Practical	02/00
Credits	01
Evaluation Scheme: ISE / ESE	25/00

Course Outcomes (COs)

Upon successful completion of this course, the student will be able to:

1MEPC355_1	**Explain** different terms of CAD, CAM and CNC machine.
1MEPC355_2	**Write** part programs for various operations of CNC machine using G and M codes.
1MEPC355_3	**Develop** skills in using CAM simulation software to generate tool path, G and M codes.
1MEPC355_4	**Analyze** the part programs of any industrial part and improvise it.
1MEPC355_5	**Produce** a part on a CNC machine individually or in group using CAD/CAM.

Course Contents:

The term work consists of following experiments/assignments.

1. Introduction to CAM, CAPP, CAI, CAQC, CIM.
2. Introduction to NC, CNC and machining centers.
3. Part programming, G and M codes, co-ordinate system.
4. Part program for facing and tool path generation.
5. Part program for turning and tool path generation.
6. Part program for step-turning, grooving and tool path generation.
7. Part program using canned cycles.
8. Part program for pocket milling and tool path generation.
9. Part program for island, contour milling and tool path generation.
10. Part program for drilling and tool path generation.
11. Case study to analyze the existing programs and the ways to improve it.
12. Manufacture a useful part using CAD/CAM tools.
13. Visit to industry related to CNC and CAD/CAM.

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	CAD/CAM	Ibrahim Zeid, R. Sivasubramanian	Tata McGraw Hill Pvt. Ltd.	First	2008
2	CAD/CAM (Principles & Applications)	P.N.Rao	Tata McGraw Hill Pvt. Ltd.	Fifth	2012
3	CAD/CAM	KuldeepSareen, Chandandeep Grewal	S.Chand	First	2009
04	Computer Aided Manufacturing	P.N.Rao, N.K.Tewari, T.K.Kundra	Tata McGraw Hill Publishing company ltd., New Delhi.	Third	2009

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	CAD/CAM	M.P.Grover, E.W.Zimmer.	Prentice Hall of India Pvt. Ltd.	First	2007
02	CAD/CAM/CIM	Radhakrishnan, Subramanyam,	New Age Int. Publishers.	Third	2004, 2008
03	Computer Aided Mechanical Design & Analysis	V. Ramamurti	Tata McGraw Hill Pvt. Ltd.	Fourth	2000
04	CAD/CAM/CAE	N.K. Chougule	Scitech	First	2009
05	CAD/CAM – Concepts and applications	Chennakesava R. Alavala	Prentice Hall of India Pvt. Ltd.	Second	2009

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ANNASAHEB DANGE COLLEGE OF ENGINEERING AND TECHNOLOGY, ASHTA
(An Autonomous Institute)
Department of Mechanical Engineering

Teaching and Evaluation Scheme
T.Y.B. Tech: Semester-VI

Course Code	Course	Teaching Scheme				Evaluation Scheme					
							Theory (Marks)			Practical (Marks)	
		L	T	P	Credits	Scheme	Max.	Min. for Passing		Max.	Min. for Passing
1OE***	Open Elective-II	3	--	--	3	ISE I	10			--	--
						MSE	30		40	--	--
						ISE II	10			--	--
						ESE	50	20		--	--
1MEPC308	Control Engineering	3	--	--	3	ISE I	10			--	--
						MSE	30		40	--	--
						ISE II	10			--	--
						ESE	50	20		--	--
1MEPC309	Refrigeration & Air Conditioning	3	--	--	3	ISE I	10			--	--
						MSE	30		40	--	--
						ISE II	10			--	--
						ESE	50	20		--	--
1MEPC310	Noise and Vibration	3	--	--	3	ISE I	10			--	--
						MSE	30		40	--	--
						ISE II	10			--	--
						ESE	50	20		--	--
1MEPC311	Mechatronics and Robotics	3	--	--	3	ISE I	10			--	--
						MSE	30		40	--	--
						ISE II	10			--	--
						ESE	50	20		--	--
1MEPE***	Professional Elective-II	3	--	--	3	ISE I	10			--	--
						MSE	30		40	--	--
						ISE II	10			--	--
						ESE	50	20		--	--
1MEPC356	Refrigeration & Air Conditioning Laboratory	--	--	2	1	ISE	--	--		25	10
						ESE	--	POE		25	10
1MEPC357	Noise and Vibration Laboratory	--	--	2	1	ISE	--	--		25	10
						ESE	--	OE		25	10
1MEPC358	Mechatronics & Robotics Laboratory	--	--	2	1	ISE	--	--		25	10
						ESE	--	OE		25	10
1MEPE***	Professional Elective-II Laboratory	--	--	2	1	ISE	--	--		25	10
						ESE	--	--		--	--
1MEPR362	Mini Project	--	--	2	1	ISE	--	--		25	10
Total		**18**	**--**	**10**	**23**	**Total**	**600**			**200**	

Total Contact Hours/Week: 28 hrs

Course Category	HS	BS	ES	PC	PE	OE	PR
Credits	00	00	00	15	04	03	01
Cumulative Sum	07	20	24	72	07	06	01

1MEPE3** Professional Elective-II	1MEPE3** Professional Elective-II Laboratory
1MEPE312- I C Engine	1MEPE359- I C Engine
1MEPE313- Machine Tool Design	1MEPE360- Machine Tool Design
1MEPE314- Foundry and Forming Technology	1MEPE361- Foundry and Forming Technology

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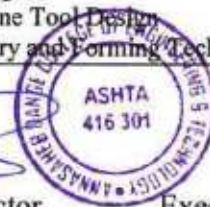
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IMEPE3** Professional Elective-II	IMEPE3** Professional Elective-II Laboratory
IMEPE312- I C Engine	IMEPE359- I C Engine
IMEPE313- Machine Tool Design	IMEPE360- Machine Tool Design
IMEPE314- Foundry and Forming Technology	IMEPE361- Foundry and Forming Technology

Open Elective-II (Semester-VI)

Courses Code	Course Name	Department
1AEOE321	Lighter Than Air Systems	Aeronautical Engineering
1AEOE322	Airline and Airport Management	
1AEOE323	Flight Scheduling and Operations	
1AUOE310	Vibration based fault diagnosis	Automobile Engineering
1AUOE311	Engineering Tribology	
1CVOE310	Operation Research	Civil Engineering
1CVOE311	Economics And Management	
1CSOE311	Internet of Things	Computer Science and Engineering
1CSOE312	Cyber Laws and Ethical Hacking	
1EEOE306	Electrical Wiring Harnessing	Electrical Engineering
1EEOE307	Electrical Economics & Energy Audit	
0FTOE321	Process Modeling and Simulation	Food Engineering
1MEOE304	Industrial Management and Operation Research	Mechanical Engineering
1MEOE305	Non-Destructive Testing	
1MEOE306	Computational Fluid Dynamics	

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Course Details:

Class	T.Y. B. Tech, Sem.-VI
Course Code and Course Title	1MEOE304, Industrial Management & Operation Research
Prerequisite/s	1BSBS102, 1BSBS113, 1MEES201
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEOE304_1	**Explain** the principles of management in organizations. Basics of EDP SSI and safety guidelines.
1MEOE304_2	**Describe** structure of small scale industries and Entrepreneurship development program.
1MEOE304_3	**Formulate** Linear Programming problems for various OR models.
1MEOE304_4	**Solve** various types of problems related with Operational Management.
1MEOE305_5	**Construct** network diagrams and determine critical path, floats for deterministic and PERT networks.

Course Contents:

Unit 1	Functions of Management and Marketing Management, **Management:** Definition of Management, Management environment. **Planning:** Need, Objectives, Strategy, Policies, Procedures, Steps in Planning. **Organizing:** Process of Organizing importance and principle of organizing, Departmentation, Organizational relationship. **Staffing:** Nature, Purpose, Scope, Human resource management, Policies. **Leading:** Communication process, Barriers, Remedies, Motivation- Importance, Theories, Herzberg's theory, Maslow's theory, McGrager's theory. **Marketing Management:** Marketing Concepts –Objective –Types of markets – Market Segmentation, Market strategy, Market Research, Salesmanship, and Advertising.	08 Hrs.
Unit 2	**Materials Management, EDP, SSI and Industrial Safety** **Materials Management:** Definition, Scope, advantages of materials management, functions of materials management, Purchase Objectives, 5-R Principles of purchasing, Functions of Purchase department. **EDP:** Concept of an entrepreneur, Entrepreneurship development, Qualities required to become entrepreneurs, **SSI:** Definition, Procedure to start Small Scale Industry. Assistance and incentives offered to SSI, Problems of SSI, Feasibility report writing **Industrial Safety** – Reasons for accidents, Prevention of accidents, Promotion of Safety mindset.	08 Hrs.

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Unit 3	**Introduction to OR and Linear Programming Problems** **Introduction**: History and development of OR, Applications, modeling in OR, OR models and their applications. **Linear Programming Problems**: Formulation of problem, Graphical solution, Simplex procedure for maximization and minimization, Big M Method (Only theoretical treatment), Duality concept.	05 Hrs.
Unit 4	**Assignment Model and Transportation Model** **Assignment Model:** Mathematical statement, Methods to solve balanced and unbalanced assignment problems, Maximization problems, Assignment with restrictions, Traveling salesman problem. **Transportation Model:** Mathematical formulation, methods to obtain initial basic feasible solution (IBFS), NWCR, Least Cost and VAM, Conditions for testing optimality, MODI method for testing optimality solution of balanced and unbalanced problems,	08 Hrs.
Unit 5	**Decision Theory and Sequencing** **Decision Theory:** Introduction, Pay off table, Opportunity loss or regret table, Decisions under uncertainty, Laplace criterion, Maximin or Minimax principle, Maximax or Minimin principle, Hurwicz principle, Decisions under risk–maximum likelihood criteria, Expectation principle, Expected opportunity loss, decision trees. **Sequencing:** Sequencing of n jobs on two machines, n jobs on three machines	08 Hrs.
Unit 6	**Project Management:** Introduction to PERT and CPM, critical Path calculation, float calculation and its importance. **Replacement theory:** Computation Replacement - need, Replacement of items whose maintenance cost increases with time (with and without considering time value of money), Replacement of items that fail suddenly	05 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Introduction to Operation Research	Hamdy A. Taha	Prentice Hall India Publication, New Delhi	Eighth	2011
2	Operations Research	D.S. Hira & P.K. Gupta	S. Chand & Co., New Delhi	Fifth	2011
3	Industrial Engineering and Production Management	M.T.Telsang	S. Chand & Co., New Delhi	Fourth	2013
4	Production and operation management	R.B.Khanna	PHI	Second	2015

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Business Management	J.P. Bose, S. Talukdar	New Central Agencies (P) Ltd., Delhi	Third	2010
2	Operation Research	J.K. Sharma	McMillan India Publication, Delhi	Eighth	2011
3	Operations Research	Manohar Mahajan	Dhanapat Rai And Sons, Delhi	Eighth	2009
4	Production and operation management	S.N.Chary	Tata Mc Graw hill Delhi	Fifth	2015

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Course Details:

Class	T.Y. B. Tech, Sem.-VI
Course Code and Course Title	**1MEOE305, Non Destructive Testing**
Prerequisite/s	0MEPC204, 0MEPC213,
Teaching Scheme: Lecture/Tutorial	3/0
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEOE305_1	**Choose** the appropriate testing techniques as per raw material and manufacturing process.
1MEOE305_2	**Apply** the ultrasonic wave theory for flaw determination using angle probes and calibration blocks
1MEOE305_3	**Analyze** the surface and subsurface discontinuities by magnetic particle inspection test.
1MEOE305_4	**Compute** the applications of eddy current testing technique.
1MEOE305_5	**Examine** the different inspection techniques under radiography test.

Course Contents:

Unit 1	**Introduction:** What is NDT, comparison and difference between DT & NDT, Importance and scope of NDT, Methods, problems and difficulties of NDT, Selection of NDT process, Future and economic aspects of NDT	04 Hrs.
Unit 2	**Ultrasonic testing:** Principle, wave propagation, types of waves, frequency, velocity, wavelength, reflection, divergence, attenuation, mode conversion in ultrasonic, UT testing methods, contact testing and immersion testing, normal beam and straight beam testing, angle beam testing, dual crystal probe testing, resonance testing, through transmission testing, pulse echo testing, instruments used in UT, accessories such as transducers, testing of materials such as products like plates and round bars, weld joints, castings, forgings UT of non metals, defects in different products.	08 Hrs.
Unit 3	**Radiography testing:** Basic principle, Electromagnetic radiation sources: X-ray source, production of X-rays, high energy, X-ray source, gamma ray source, radiography, Standards, advantages and limitations, panoramic exposure, real time radiography, films used in industrial radiography, quality of a good radiograph, film processing interpretation, evaluation of test results, Inspection techniques like SWSI, DWSI, DWDI,	08 Hrs.
Unit 4	**Eddy current testing :** Principle of ECT, physical aspects of ECT like conductivity, permeability, resistivity, inductance, inductive reactance, impedance etc, field factor and lift of effect edge effect, end effect, impedance plane diagram in brief, Depth of penetration of ECT: relation	08 Hrs.

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	between frequency and depth of penetration in ECT, Equipments and accessories, various application of ECT such as conductivity measurement, hardness measurement, defect detection, coating thickness measurement, coating of materials etc.	
Unit 5	**Magnetic particle testing:** Principles of MPI, basic physics of magnetism, permeability, flux density, cohesive force, magnetizing force, resistivity, residual magnetism etc., methods of magnetization, magnetization techniques such as head shot technique, cold shot technique, central conductor testing, magnetization using products using yokes, direct method magnetism, indirect method of magnetization. Continuous testing of MPI, residual technique of MPI, system sensitivity, checking devices in MPI, interpretation of MPI, indications, advantage and limitation of MPI.	08 Hrs.
Unit 6	**Dye penetrant testing:** Principles of DPT, qualification, of penetrant testing consumable, properties required in a good penetrant and development which are used as consumable in dye penetrant testing, types of penetrant, types developers, use of various types of penetrant and developers for various application, DPT technique, test procedure, interpretation and evaluation of penetrant test indication such as relevant indications, non relevant indications, false indication, safety precaution required in penetration testing.	06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Basics of Non-Destructive Testing	Lari, Kumar	S.K. Kataria & Sons	4	2013
02	Non-Destructive Testing Techniques	Ravi Prakash	New Age International Private Limited	4	2010
03	Non-destructive Evaluation - A tool in Design, Manufacturing and Service	D.E. Bray and R. K. Stanley	CRC Press,	8	1996
04	Non-Destructive Testing	Ramchandran S.	AIR WALK Publications (India)	1	2017

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Non-destructive testing	Krant krammer	McGraw Hill Education	5	2012
02	Practical NDT	Baldev Raj	Narosa Book Distributors	4	2010

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
03	Ultrasonic Testing of Materials	Josef Krautkramer, Herbert Krautkramer	Springer-Verlag	4	1990
4	Non-Destructive Test and Evaluation of Materials	J Prasad, C. G. Krishnadas Nair	McGraw Hill Education	2	2011

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Course Details:

Class	T.Y. B. Tech, Semester-VI
Course Code and Course Title	**1MEOE306, Computational Fluid Dynamics**
Prerequisite/s	0MEPC203, 0MEES206, 0MEPC302, 0MEPC308
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEOE306_1	**Explain** the methodology of grids generation and discretization.
1MEOE306_2	**Solve** the governing equations for fluid flow.
1MEOE306_3	**Apply** various discretization methods to fluid flow problems.
1MEOE306_4	**Interpret** the suitable turbulence models to engineering fluid flow problems.
1MEOE306_5	**Analyze** the effect of solution algorithm for pressure velocity coupling in steady flow.

Course Contents:

Unit 1	**Introduction to Computational Fluid Dynamics & Principles of Conservation**	08 Hrs.
	Computational Fluid Dynamics: What, When, and Why? CFD Applications, Numerical vs. Analytical vs. Experimental, Modeling vs. Experimentation, typical problems, Summary Equations for Viscous Flow (the Navier-Stokes Equations) Equations for Inviscid Flow (the Euler Equations) Forms of the Governing Equations Particularly Suited for CFD, Working of Commercial CFD Software, Solution methodology-pre-processing, Solver, Post processing	
Unit 2	**Basics of discretization & Grid generation**	07 Hrs.
	Basic concepts of discretization, Discretization techniques - Finite difference, Finite volume and Finite element method, Comparison of discretization methods, Transformation of non-uniform grids to uniform grids, General transformation of the equations, Form of the governing equations suitable for CFD, Compressed grids, Boundary fitted co-ordinate systems, Elliptic grid generation, Adaptive grids, Modern developments in grid generation.	

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Unit 3	**Finite Difference Method**	06 Hrs.
	Finite Difference Formulations: Introductory remarks, Taylor Series Expansions, Finite difference equations, Central Forward, Backward Numerical error, Explicit, Implicit, Semi-implicit (Crank- Nicholson method). Applications of direct, Iterative, Thomas algorithm, Gauss- Jacobi, Gauss-Seidal method. Alternate directional implicit, Applications. 1-D examples, 2-D examples.	
Unit 4	**Finite Volume Method** **i. For Diffusion** Introduction, FVM for 1D steady state Diffusion, FVM for 2 D Diffusion **ii. For Convection Diffusion** Introduction, Steady 1-D Convection and Diffusion, Central Differencing, Upwind Differencing, Hybrid Differencing, Power Law Scheme, QUICK scheme.	07 Hrs.
Unit 5	**Introduction to solution algorithms for pressure velocity coupling in steady flows & turbulence and multiphase modeling (Introductory treatment)** Introduction, staggered grid, introduction to SIMPLE, SIMLEC, SIMPLER, PISO algorithms, Modeling of multiphase problems, Level set methods, VOF method. Coupled LS+VOF	07 Hrs.
Unit 6	**Introduction to Turbulence and its modeling:** What is turbulence?; Transition from laminar to turbulent flow; Effect of turbulence on time averaged Navier -Stokes equations; Characteristics of simple turbulent flows; Introduction to Turbulent Models like Mixing length Model, k-epsilon model, Reynolds stress equation models, Algebraic stress equation models; Some recent Advances, introduction to LES, DNS.	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Computational Fluid Dynamics	Gautam Biswas	Narosa Publishing House, New Delhi	Third	2013
02	Fundamentals of Incompressible Fluid Flow	Babu V	Anne Books Pvt Ltd. New Delhi, India	First	2010
03	Introduction to Fluid Dynamics	Batchelor G. K.	Cambridge University Press. New Delhi, India	Second	1999
04	Fluid Dynamics	Raisinghania M.D.	S Chand & Company, New Delhi	Fifth	2003

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Computational Fluid Mechanics the Basics with applications	Anderson J. D. Jr.	McGraw Hill Education Pvt. Ltd.	Sixth	2014
02	An introduction to computational fluid dynamics; the finite volume method	H. K. Versteeg and W. Malalasekera	Pearson Publication	Second	2009
03	Numerical heal transfer fluid flow	Suhas V. Patankar	Taylor & Francis	First	2014
04	Computational fluid dynamics	T. J. Chung	Cambridge University Press.	Third	2014
05	Computational Fluid Dynamics: A Practical Approach	Jiyuan Tu, Guan Heng Yeoh, Chaoqun Liu,	Butterworth – Heinemann	Second	2008

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Course Details:

Class	T. Y. B. Tech. Semester-VI
Course Code and Course Title	1MEPC308, Control Engineering
Prerequisite/s	1MEES201
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/ MSE/ ISE II/ ESE	10/30/10/50

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC308_1	**Explain** the type of control system, their applications, limitations & concepts of feedback.
1MEPC308_2	**Compute** the analogies of the given physical system by using grounded chair representation.
1MEPC308_3	**Use** technique of linearization and block diagram algebra.
1MEPC308_4	**Calculate** transient response using Laplace transform and time specifications.
1MEPC308_5	**Identify** the stability of control systems using Root-Locus Technique and Routh's Stability Criteria.
1MEPC308_6	**Analyze** control systems using frequency response technique (Bode plot).

Course Contents:

Unit 1	**Introduction to Automatic Control** Introduction to Automatic Control: Generalized Control System Types, Open Loop and Closed Loop, Linear and Non-Linear, Time Variant and Time invariant Systems with examples, advantages of Automatic Control Systems, Laplace Transforms.	03 Hrs.
Unit 2	**Mathematical Model of Control System** Mechanical Translational Systems, Mechanical Rotational Systems, Grounded Chair Representation, Electrical Elements, Analogous Systems, Force –Voltage Analog, Force – Current Analog.	07 Hrs.
Unit 3	**Linearization and Block Diagram Reduction** Linearization of non linear functions, Block Diagram Algebra, Rules for Reduction of Block Diagram.	08 Hrs.
Unit 4	**Transient Response** General form of Transfer Function, Response of systems (First and Second Order) to Various Inputs (Impulse, Step, Ramp), Damping Ratio and Natural Frequency, Transient Response Specification. P,I,D controllers.	08 Hrs.
Unit 5	**Stability and Root Locus Technique** Concept of Poles and Zeros, Distinct, Repeated and Complex Zeros, Effect of Poles and Zeros on the System Stability, Routh's Stability Criteria, Significance of Root Locus, Construction of Root Loci, General Procedure.	08 Hrs.

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Unit 6	Frequency Response Analysis	08 Hrs.
	Frequency Response (Bode plot): Log Magnitude Plots and Phase angle Plots, Gain Margin, Phase Margin, and Stability analysis. Introduction to system compensation: Types of Compensators, Lead, Lag, Lead-Lag Compensators (No numerical).	

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Control System Engineering	R Anandnatarajan, P. Ramesh Babu	SciTech Publi	3	2012
02	Control Systems	A. Anand Kumar	Prentice Hall Publi	4	2010
03	Automatic Control Engineering	D. Roy and Choudhari	Orient Longman Publi	6	2012
04	Control Systems Engineering	I.J. Nagrath, Madan Gopal	New Age International Publishers Ltd.- New Delhi	5	2007

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Automatic Control Engineering	F.H. Raven	Tata McGraw Hill Publi.	5	1995
02	Modern Control Systems	K Ogata	Prentice Hall Publi	3	2010
03	Automatic Control Systems	B.C. Kuo	Willey India Ltd.	7	2011
04	MatLab for Control Engineers	Katsuhiko Ogata	Pearson	4	2007

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Course Details:

Class	T.Y. B. Tech, Semester-VI
Course Code and Title	**1MEPC309, Refrigeration and Air Conditioning**
Prerequisite/s	1MEPC203, 1MEPC209,1MEPC302,
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPC309_1	**Explain** the basics of Refrigeration and air conditioning systems.
1MEPC309_2	**Apply** the basic of VCR to multi-pressure, multi evaporator refrigeration system
1MEPC309_3	**Select** refrigerant for various applications by referring to standards
1MEPC309_4	**Evaluate** cooling and heating loads in an air-conditioning system.
1MEPC309_5	**Analyze** the performance of various refrigeration & air conditioning systems using psychrometric chart, steam table, p-h charts etc.

Course Contents:

Unit 1	**Simple Vapour Compression System** Reversed Carnot cycle, simple vapor compression cycle: schematic & on p-h & T-s chart, Types of VCRS, calculations and performance of above cycles, actual vapor compression cycle, BEE star rating, Energy efficiency, Bell Coleman - Reversed Brayton cycle (descriptive treatment), air cycles for aircrafts (descriptive treatment) Conventional and non-conventional methods of refrigeration. Applications, Chillers, Cold chain, process industry etc.	08 Hrs.
Unit 2	**Multi Pressure System** Effect of suction & discharge pressures, effect of sub-cooling & superheating on performance of the system, liquid to suction vapor heat exchanger, Removal of flash gas, flash inter-cooling, water-intercooling, sub-cooling, multistage (two stages), multi-evaporator (at same & different temperatures) and cascade system (two stage). variable refrigerant flow systems (VRF), Inverter technology in compressors Introduction to cryogenic engineering and application, Claude cycle, Linde cycle. Vapor absorption system (descriptive treatment): aqua ammonia system, lithium bromide -water vapor absorption system, Electrolux refrigerator	07 Hrs.

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Unit 3	**Refrigerants** ASHRAE Classification and nomenclature, desirable properties like thermodynamic, physical, & chemical, comparison among commonly used refrigerants, selection of refrigerants, effect on ozone depletion and global warming, international protocols on these issues, alternative refrigerants and secondary refrigerants, recent development in refrigerants.	03 Hrs.
Unit 4	**Psychrometry & Human Comfort** Psychrometry - moist air as a working substance, psychrometric properties of air, use of psychrometric tables and charts, processes, combinations and calculations, ADP, sensible heat factor, bypass factor, air washer and it's applications. Human Comfort - Thermal exchange between human body and environment, factors affecting comfort, Effective temperature comfort chart and modified comfort chart, ventilation requirements	09 Hrs.
Unit 5	**Heating & Cooling Load Calculations** Introduction to unitary products viz. room/split and packaged air conditioners, central air conditioning systems, Automobile AC, Design of air conditioning systems, inside and outside design condition, different heat sources, cooling load estimation, RSHF, GSHF, ERSHF, room apparatus dew point and coil apparatus dew point, ventilation and infiltration. Insulation- importance, types and applications.	08 Hrs.
Unit 6	**Air Distribution System** Re-circulated air, ventilation air, importance of air ventilation, duct work, duct material, use of friction loss & rectangular equivalent of round duct, pressure drops in duct design , ideal velocity of air in duct, principle of duct sizing, ISHRAE standard for duct designing, duct layout, heat recovery system in recirculation of air, duct systems for auditorium, assembly shop. Accessories -diffusers, dampers, filters etc.	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Refrigeration and Air Conditioning	C. P. Arora	Mc- Graw Hill Education (India) Pvt. Ltd.	Third	2008
02	Refrigeration and Air Conditioning	Arora Domkundwar	Dhanpat Rai & Co Ltd	Seventh	2006
03	Refrigeration and Air Conditioning	R.S.Khurmi	S Chand & Company Ltd	Fifth	2011
04	Refrigeration and Air Conditioning	S.N.Sapali	PHI Learning Private Limited	Second	2014

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Basic Refrigeration and Air Conditioning	P.N. Ananthnarayan	Mc- Graw Hill Education (India) Pvt. Ltd.	Fourth	2013
02	Air Conditioning Engineering	W. P. Jones	Spon Press	Fifth	2001
03	Air Conditioning Principles and Systems- An Energy Approach	Edward G Pita	John Wiley & Sons Inc	Second	1993
04	Handbook Of Air Conditioning and Refrigeration	Shan K. Wang	McGraw-Hill Education	Second	2000
05	Principles of Refrigeration	Roy J. Dossat	Pearson Education India	Fourth	2002

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Course Details:

Class	TY BTech, Sem.-VI
Course Code and Course Title	**1MEPC310, Noise and Vibration**
Prerequisite/s	1MEBS106,1MEPC208, 1MEPC255
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC310_1	**Explain** fundamentals of noise, vibration and measuring instruments,
1MEPC310_2	**Determine** natural frequency of mechanical vibrating system/element,
1MEPC310_3	**Analyze** vibratory response of mechanical system/element,
1MEPC310_4	**Illustrate** the mechanical system to reduce the vibrations,
1MEPC310_5	**Estimate** the noise and vibration parameters of mechanical system.

Course Contents:

Unit 1	**Single degree forced vibration: Damped and Undamped** Overview of Single Degree of Freedom Free damped and undamped vibration. Types of excitation, forced excitation, support excitation, excitation due to unbalance in machines, response of systems to above types of harmonic excitations, transmissibility, force transmissibility and motion transmissibility, vibration isolators, commercial isolation materials and shock mounts. Critical speed of shaft.	07 Hrs
Unit 2	**Two Degree Free and Forced Vibration** (1) **Undamped free vibrations:** Principal modes and natural frequencies, co-ordinate coupling and principal co-ordinates. (2) **Undamped forced vibrations:** Harmonic excitation, vibration, dampers and absorbers, dynamic vibration absorber, tuned and un-tuned type.	08Hrs
Unit 3	**Torsional Vibration** Natural frequency of free torsional vibrations, effect of inertia of the constraint on torsional, vibrations, free torsional vibrations of a single rotor system, two rotor system and three rotor system. Torsionally equivalent shaft, free torsional vibrations of a geared system.	06 Hrs
Unit 4	**Introduction to Multi degrees of Freedom:** Free vibrations of Multi DOF, Equation of motion, System-Flexibility and stiffness influence coefficient, Eigen value and Eigen vectors, Rayleigh's method, Matrix Method, Matrix iteration method, Holzer's method.	07Hrs
Unit 5	**Vibration Measurement and Control** (1) **Vibration Measurement** Instruments for measurement of displacement, velocity, acceleration and frequency of vibration, Accelerometers, Impact hammer, Vibration shaker, Vibration Analyzer, FFT analyzer, Time and frequency domain plot, Signal	07 Hrs

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	analysis - Analysis of Vibration Spectrum, Standards related to measurement of vibration, Machine Conditioning and Monitoring, fault diagnosis. **(2) Vibration Control** Introduction to control of vibration, Vibration control methods, Passive and active vibration control, Reduction of excitation at the source, Control of natural frequency.	
Unit 6	**Noise** **(1) Basics of Noise** Basic definitions, human response to sound, Decibel scale, Relation among sound power, Sound intensity and sound pressure level, Octave band analysis, Noise- Effects, Rating and regulation Non auditory and Auditory effects of noise, Noise standards and limits, Ambient emission noise standards in INDIA, Hazardous noise explosion, Day night noise level. **(2) Noise measurement and control** Noise measuring systems and instruments, Sound in enclosures, Sound energy absorption, Sound transmission through barriers, Noise reduction: at source, at path and at receiver. Automotive noise control principles.	07Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Mechanical Vibrations	Rao S.S.,	Wiley Publishing Co	Forth	1990
02	Mechanical Vibration	Dr. V. P. Singh	S. Chand and Sons, New Delhi.	Fifth	2007
03	Mechanical Vibration	G. K. Grover	Nemchand and Brothers Roorkee	Second	1972
04	Mechanical Vibration and Noise Engineering	A. G. Ambekar	PHI	First	2006
05	Engineering Vibration	Inmann Daniel J	Pearson	Forth	2001
06	Mechanical Vibration	Austin Church	Wiely Eastern	Second	1963
07	Mechanical Vibrations	J.P. Den Hartog	McGrawhill Book Company Inc.	First	1956
08	Fundamentals of Acoustics	Kinsler Lawrence E. & Frey Austin R.	Wiley Eastern Ltd.	Second	1987.

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Thomas Bevan	CBS Publishers, New Delhi.	Third	reprint 2005
02	Theory of Machines and Mechanism	Shigley	Oxford International	Third	2009
03	Theory of Machines and	G.S. Rao and	New Age Int.	Second	1992

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	Mechanism	R.V. Dukipatti	Publications Ltd. Delhi.		
04	Mechanical Vibrations	SingiresuS.Rao	Pearson Education	Sixth	2004
05	Noise and Vibration Control	Leo L. Bernack	Tata Mc- Graw Hill	Second	1956

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Course Details:

Class	T.Y. B. Tech, Sem.-VI
Course Code and Course Title	1MEPC311, Mechatronics and Robotics
Prerequisite/s	1MEES108, 1MEES156
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC311_1	**Demonstrate** integration of knowledge from different disciplines in order to realize engineering and consumer products consisting of sensors, actuators etc.
1MEPC311_2	**Select** the components of signal conditioning for acquisition of data from field devices
1MEPC311_3	**Make** use of knowledge gained from microprocessor, microcontroller and digital circuits in various applications.
1MEPC311_4	**Apply** fundamentals of ladder diagram and PLC to construct logic for lighting and sequencing operations.
1MEPC311_5	**Develop** the ladder logic used to program PLC for real time cases such as workstation for stamping, drilling etc.

Course Contents:

Unit 1	**1. Sensors and Signal Conditioning devices** 1.1 Introduction to key elements: Introduction to Mechatronics, Mechatronics systems, Measurement systems, Multi discipline scenario, Case studies of Mechatronics systems. 1.2 Transducers and Sensors:- Position sensors: Limit switch, Photoelectric switches, Proximity sensors, Incremental and absolute encoders and relays. Displacement sensors: Potentiometer sensors, LVDT, Capacitive displacement sensors, Hall effect sensor. Velocity sensors: Tachogenerator, Temperature sensors. 1.3 Signal Conditioning Signal conditioning process, Operational amplifier (inverting amplifier, non-inverting amplifier, Summing, Integrating amplifier, Differentiating amplifier, Logarithmic amplifier), Protection, Filtering, Analog to Digital Converter (ADC), Digital to Analog Converter (DAC), Demultiplexing, Multiplexing.	08 Hrs.
Unit 2	**Digital Circuits, Microprocessor and Microcontroller** 2.1 Digital logic, Number systems, Logic gates, Boolean algebra, Application of logic gates, Sequential logic 2.2 Microprocessor: Organization of a microprocessor system, Architecture & pin diagram of 8085 processor	07 Hrs

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	2.3 Microcontroller: Organization of a microcontroller system, Architecture & pin diagram of 8051 controller, Comparison between microprocessor and microcontroller	
Unit 3	**Programmable Logic Controllers (PLC)** Introduction, Definition, PLC system and components of PLC input output module, PLC advantages and disadvantages. Ladder diagram and PLC programming fundamentals: Basic components and symbols, Fundamentals of ladder diagram, Machine control terminology, Update – Solve ladder – Update, Physical components Vs. program components, Light control example, Internal relays, Disagreement circuit, Majority circuit, Oscillator, Holding (sealed or latches) contacts, Always ON always OFF contacts, Nesting of ladders.	06 Hrs.
Unit 4	**PLC Programming** PLC Input instructions, Outputs, Coils, Indicators, Operational procedures, Contact and coil input output, Programming example, Fail safe circuits, Simple industrial applications. PLC Functions PLC timer functions – Introduction, Timer functions, Industrial applications, Industrial process, Timing applications, PLC control functions – PLC counters and its industrial applications, Introduction to SCADA.	07 Hrs.
Unit 5	**PLC Instructions** Program control instructions (Master control reset, Jump, Subroutine instructions), Data manipulation instructions (Data transfer, data compare instructions), Math instructions (Addition, Subtraction, Multiplication, Division instructions), Fault finding and troubleshooting.	07 Hrs.
Unit 6	**Robotics** Fundamentals of Industrial Robots: Specifications and Characteristics, Criteria for selection, configurations Robotic End Effectors and Sensors: End Effectors- Types, grippers, Various process tools as end effectors, Touch (Tactile) sensors, Proximity and range sensors, Force and torque sensing Robot Teaching: Introduction, Various teaching method	07Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Mechatronics	W. Bolton	Pearson Education	Fourth	2012
02	Mechatronics	Mahalik	Tata Mc- Graw Hill	Eight	2006
03	Microprocessor 8085	Gaokar	Prentice Hall of India	Fifth	2004
04	Programmable Logical Controller	Hackworth	Pearson Education	Second	2009
05	Programmable Logical Controller	Frank D Petruzella	Tata Mc- Graw Hill	Fourth	2011

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Mechatronics and Microprocessor	Ramchandran	Willey India	Third	2009
02	Automated Manufacturing Systems	S. Brain Morris	Tata McGraw Hill	First	2001
03	SCADA	Stuart A. Boyer	ISA Publication	Fourth	2011
04	Programmable Logical Controller	Reis Webb	Prentice Hall of India	Fifth	2011
05	Industrial Robotics, Technology, Programming & Applications	Groover, M.P. Weiss, M. Nagel, R.N. & Odrey, N.G. Ashish Dutta	Tata McGraw Hill	Second Edition	2012

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Course Details:

Class	T.Y. B. Tech, Sem.-VI
Course Code and Course Title	**1MEPE312, I. C. Engines**
Prerequisite/s	1MEPC203, 1MEPC302
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEPE312_1	**Explain** the fundamental of I.C. Engine, fuel Supply, lubrication &cooling System in I.C. engines.
1MEPE312_2	**Describe** the impact of vehicular pollution and ways to control the pollution.
1MEPE312_3	**Illustrate** the combustion mechanism of S.I. and C.I. engines.
1MEPE312_4	**Select** the I.C. Engine and pollution control devices for various applications.
1MEPE312_5	**Evaluate** the performance parameters of I.C. engine

Course Contents:		
Unit 1	**Introduction to I.C. Engines** Introduction, Classification of I. C. Engines, applications, Selection of IC Engine for different applications, Engine specifications. Engine Cycles, Deviation of actual cycles from air standard cycles, Valve timing diagram for high and low speed engine, Port timing diagram.	05 Hrs.
Unit 2	**Fuel systems for S.I. and C.I. Engines** **Fuel Systems for S.I. Engines:** Engine fuel requirements, complete carburetor, Derivation for calculation of A/F ratio, Calculation of main dimensions of carburetors, Effect of altitude on Air fuel ratio. Electronic Petrol injection system (MPFI) – components such as sensors, ECU etc., merits and demerits. **Fuel Systems for C.I. Engines:** Requirements of injection system, Types of injection systems – Individual pump, Common rail and Distributor systems, Unit injector, Types of fuel nozzles- single hole, multi hole, pintle, and pintaux, Formation of Spray, Atomization and penetration. Governing of C.I. engines. Electronic diesel injection system. Calculations of main dimension of fuel injection system.	09 Hrs.
Unit 3	**Combustion in S. I. & C.I. Engines.** **Combustion in S. I. Engines.** Stages of combustion, Ignition lag, Flame propagation, Factors affecting flame speed, Abnormal combustion, Influence of engine design and operating variables on detonation, Fuel rating, Octane number, Fuel additives, HUCR, Requirements of combustion chambers of S.I. Engines and its types, Flame Structure & Speed: Laminar burning speeds, Flame propagation relations.	09 Hrs.

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	Combustion in C.I. Engines Stages of combustion, Delay period, Factors affecting delay period, Abnormal combustion- Diesel knock, Influence of engine design and operating variables on diesel knock, Comparison of abnormal combustion in S.I. and C.I. Engines, Cetane number, Additives. Requirements of combustion chambers for C.I. Engines and its types, Cylinder pressure analysis: Combustion efficiency, Direct-injection engines, Indirect-injection engines.	
Unit 4	**Engine lubrication & Cooling System** **Engine lubrication System** Requirement of lubrication system, Types of lubricants and their properties, SAE rating of lubricants, Types of lubrication systems **Engine Cooling System** Necessity of engine cooling, disadvantages of overcooling, Cooling systems and their comparison: Air cooling, Liquid cooling	05 Hrs.
Unit 5	**Performance Testing of Engines** Performance parameters, I. S. Standard Code10000 (I to XI) to 10004 for testing of engines), Measurement of performance parameters like torque, power, Volumetric Efficiency, Mechanical Efficiency, BSFC, Brake and Indicated Thermal efficiencies. Numerical on Heat Balance Sheet and engine performance, Performance curves. Introduction to Supercharging and Turbo-charging	08 Hrs.
Unit 6	**Engine Emission and Control** S.I. engine emission (HC, CO, NOx) Control methods- Evaporative (ELCD), Thermal, Catalytic converters, C.I. Engines Emission (CO, NOx, Smog, Particulate), Control methods- Chemical, EGR, Standard pollution Norms like EURO, Bharat stage norms, Introduction to alternative fuels for I.C. engines, Introduction to Electric Vehicle. Recent trends in I.C. Engines.	06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Internal Combustion Engines	Mathur and Sharma	Dhanpat Rai Publi. Delhi.	First	1994
02	Internal Combustion Engines	V. Ganesan	Tata McGraw Hill Publications	Fourth	2012
03	Internal Combustion Engines	Domkundwar	Dhanpat Rai and Sons	First	1999
04	Internal Combustion Engines	Ramlingam	SciTech Publi	Second	2008

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Internal Combustion Engines	J. B. Heywood	McGraw Hill Education	First	Reprint 2017
02	Engg. Fundamentals of the I.C. Engines	W.W. Pulkrabek	Pearson education	First	2003
03	Internal Combustion Engines – Applied Thermosciences	Ferguson Allan T. Kirkpatrick	Wiley-Blackwell	Third	2015
04	Introduction to Internal Combustion Engines	Richard Stone	Palgrave Macmillan	Third	1999
05	Internal Combustion Engine Handbook: Basics, Components, Systems, and Perspectives	Richard Van Basshuysen, Fred Schäfer	SAE International	First	2016

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Course Details:

Class	T.Y. B. Tech, Sem.-VI
Course Code and Course Title	**1MEPE313, Machine Tool Design**
Prerequisite/s	1MEPC206, 1MEPC210, 1MEPC353
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE313_1	**Describe** general design requirements of machine tool system.
1MEPE313_2	**Apply** fundamental laws and principles of machine tool design.
1MEPE313_3	**Determine** Forces, Velocities and Power Requirements during metal cutting
1MEPE313_4	**Design** different elements of machine tool system like design of beds, guide ways, sideways, spindle etc.
1MEPE313_5	**Analyze** machine tool system as per designed constraints.

Course Contents:

Unit 1	**General principle of M/C tool design:** Working and auxiliary motions in machine tools, Parameter defining working motions, Drives required for machine tools, Mechanical and Hydraulic transmissions for m/c tools, General requirement of m/c tool design, Design process of m/c tools, Preparation of layout of m/c tool .	07 Hrs.
Unit 2	**Regulation of Speed and Feeds:** Forces, Velocities and Power Requirements during metal cutting, Speed and Feed Regulation, Gear boxes for speed and feed regulations, Gear box design, gearing diagram, Step less Regulation of Speeds speed and feeds.	08 Hrs
Unit 3	**Design of Machine Tool Structures:** Functions of Machine Tool Structures and their Requirements, Design criteria for m/c tool structures, Materials for structure, Static and dynamic stiffness, Design of machine tool structure, Design of beds, columns, bases and tables, cross rails and arms.	08 Hrs.
Unit 4	**Design of Guide ways:** Functions of Guide ways, Types of Guide ways, Design of guide ways and Sideways, Frictional aspects in the design of guide ways and sideways. Protection of guide ways and sideways	06 Hrs.
Unit 5	**Design of Spindles and Spindle Support:** Functions of Spindles, Material for spindle, Design calculations of spindle, Selection of bearings for spindles.	07Hrs.
Unit 6	**Control systems in machine tools.** Control system for changing speed and feed, Control system for executing, forming and auxiliary motions, Manual control, Automatic control, Numerical control of machine tools, Manual part programming, Computer aided part programming.	06 Hrs.

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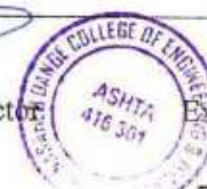
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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Machine Tool Design	S.K, Basu	Oxford and IBH Publishing.	Fourth	2019
02	Elements of Workshop Technology Vol. II	S.K. Hajra Choudhury	Media Promoters and Publishers, Mumbai.	Fifth	2010
03	Principles of Modern Manufacturing	M. P. Groover	Wiley Publication	Fifth	2014
04	Production Engineering,	P.C. Sharma	S. Chand Publication.	Fourth	2012

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Design Principles of Metal-Cutting Machine Tools	F. Koenigsberger	CBS Publishers, New Delhi.	First	2013
02	Machine Tool Design	N. K. Mehta	McGraw Hill Publishing	Third	2012
03	Machine tool design	Sen and Bhattacharya,	CBS Publications	Second	2009
04	Fundamentals of Manufacturing Engineering	D. K. Singh	Tata McGraw Hill education Pvt. Ltd	Nine	2014

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Course Details:

Class	T.Y. B. Tech, Sem.-VI
Course Code and Course Title	**1MEPE314, Foundry and Forming Technology**
Prerequisite/s	1MEES205,1MEPEC253
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEPE314_1	**Explain** the principle and working of casting and forming processes.
1MEPE314_2	**Estimate** pouring time, solidification rate and design gating system for casting process
1MEPE314_3	**Describe** mechanism of metal forming techniques and calculate load required for flat rolling.
1MEPE314_4	**Apply** the basic principles to design of tools for forming operations
1MEPE314_5	**Select** appropriate processing techniques for the given job assignment.

Course Contents:		
Unit 1	**Introduction:** Brief History, Foundry, Comparison of casting technology with other metal processing technologies, merits and limitations, Comparison of casting manufacturing in India with that in other countries, 3-D printing for pattern making.	05 Hrs.
Unit 2	**Casting Practices:** Fundamental of metal casting, Different Types of casting methods. Design of gating system. (Numerical treatment) Melting furnaces-rotary, Pit electric, Tilting and cupola. Metallurgical considerations in casting elements of gating system, and risers and their design.	09 Hrs
Unit 3	**Solidification of Casting:** Crystallization and development of cast structure, Shrinkage of metals, Nucleation, Growth, Dendritic growth, Independent nucleation, Eutectic freezing, Peritectic reactions, The structure of castings, Concept of progressive and directional solidification, Chvorinov's equation, heat flow analysis, Composite casting of polymers. (Numerical Treatment)	08 Hrs
Unit 4	**Fundamentals of Metal Forming:** Classification of forming processes, mechanism of metal forming, temperature of metal working, hot working, cold working, friction and lubricants.	04 Hrs.
Unit 5	**Rolling and Forging Practices** Rolling of metals: Classification, Rolling processes, Defects in rolling. (Numerical Treatment)	08 Hrs.

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	Forging: Classification of forging processes, forging of plate, forging of circular discs, open die and closed-die forging, forging defects, and powder metallurgy forging. (Numerical Treatment)		
Unit 6	**Extrusion and Drawing Practices** Extrusion: Classification, Different extrusion processes. Defects in extrusion. (Numerical Treatment) Wire drawing dies, tube drawing process, analysis of wire, deep drawing and tube drawing (Numerical Treatment). Advanced Metal forming processes: High Energy Rate forming (HERF), Electromagnetic forming, residual stresses, and in-process heat treatment and computer applications in metal forming.		08 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Principles of Metal Casting	Heine Loper & Rosenthal	Tata McGraw Hill	Fifth	2005
02	Foundry Technology	P.Beelay	Tata McGraw Hill	Second	2001
03	Fundamentals of Metal Forming Processes	B.L. Juneja	New Age International Publication	Second	2005
04	Technology of Metal Forming Processes	Sunder Kumar	Eastern Economy Edition	First	2003
05	Manufacturing Technology	P.N.Rao	Tata McGraw Hill	First	2012

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Principle of Foundry Technology	P. L. Jain	Tata McGraw Hill, India	First	2001
02	Workshop Technology vol 1 & vol 2	Hajara Choudhari	Media Publishers & Promoters	Second	2000
03	Foundry Technology	K.P. Sinha & D.B. Goel	Standard Publishers Distributors, India	First	2002
04	Mechanical Metallurgy	G.E. Dieter	Tata McGraw Hill	Third	2017
05	Forging Practice	G. Kamenshchikov	Peace Publication	First	1964
06	Metal Forming Practice: Processes - Machines - Tools	Heinz Tschätsch	Springer	Sixth	2007

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Course Details:

Class	T.Y. B. Tech, Semester-VI
Course Code and Course Title	1MEPC356, Refrigeration and Air Conditioning Laboratory
Prerequisite/s	1MEPC203
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE / ESE	25/25

Course Outcomes (COs)	
Upon successful completion of this course, the student will be able to,	
1MEPC356_1	**Identify** the components used in refrigeration & air conditioning systems.
1MEPC356_2	**Determine** the performance of various refrigeration & air conditioning systems
1MEPC356_3	**Use** the refrigeration tools and equipments efficiently.
1MEPC356_4	**Compare** various refrigeration/ Air conditioning products available in market.
1MEPC356_5	**Prepare** a report on refrigeration and air conditioning applications in industry.

Course Contents:

1. Demonstration of refrigeration and air conditioning equipments, safety devices and their working.
2. Demonstration of domestic refrigerator, water cooler.
3. Determine the COP of refrigeration system.
4. Evaluate the performance of heat pump test rig.
5. Evaluate the performance of ice plant test rig.
6. Determine the efficiency and COP of vortex tube test rig.
7. Demonstration and hands-on practice of tools used in refrigeration & air conditioning system.
8. Evaluate the performance of cascade refrigeration system.
9. Determine the performance of air conditioning test rig.
10. Visit to actual sites related to refrigeration or air conditioning system.
11. Market survey of various refrigeration & air conditioning systems.

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Refrigeration and Air Conditioning.	C. P. Arora	Mc- Graw Hill Education (India) Pvt. Ltd.	Third	2008
02	Refrigeration and Air Conditioning	Arora Domkundwar	Dhanpat Rai & Co Ltd	Seventh	2006
03	Refrigeration and Air Conditioning	R.S.Khurmi	S Chand & Comapny Ltd	Fifth	2011
04	Refrigeration and Air Conditioning	S.N.Sapali	PHI Learning Private Limited	Second	2014

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Basic Refrigeration and Air Conditioning	P.N. Ananthnarayan	Mc- Graw Hill Education (India) Pvt. Ltd.	Fourth	2013
02	Air Conditioning Engineering	W. P. Jones	Spon Press	Fifth	2001
03	Air Conditioning Principles and Systems- An Energy Approach	Edward D Pita	John Wiley & Sons Inc	Second	1993
04	Handbook Of Air Conditioning and Refrigeration	Shan K. Wang	McGraw-Hill Education	Second	2000
05	Principles of Refrigeration	Roy J. Dossat	Pearson Education India	Fourth	2002

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Course Details:

Class	TY BTech, Sem.-VI
Course Code and Course Title	**0MEPC357, Noise and Vibration Laboratory**
Prerequisite/s	1MEBS106,1MEPC208, 1MEPC255
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE/ ESE	25/25

Course Outcomes:

Upon successful completion of this course, the student will be able to,

1MEPC357_1	**Explain** fundamentals of noise, vibration and measuring instruments,
1MEPC357_2	**Determine** natural frequency of mechanical vibrating system/element,
1MEPC357_3	**Illustrate** and Carry out measurement of various vibration parameters,
1MEPC357_4	**Analyze** vibratory response of mechanical system/element,
1MEPC357_5	**Use** FFT analyzer to capture different vibration parameters.

Course Contents:
1. Determine damping effect on a system under forced vibration with viscous damping.
2. Experiment on free vibration of a coupled pendulum to determine natural frequency.
3. Experiment on free vibration of a double pendulum to determine natural frequency.
4. Determine natural frequency of torsional vibration of two rotor without damping.
5. Determine natural frequency of torsional vibration of three rotor without damping.
6. Measurement of vibration parameters using vibration measuring instruments.
7. Measurement of vibration parameter by FFT analyzer.
8. Condition monitoring and fault diagnose in a rotating system using vibration measuring technique.
9. Determination of natural frequency by Impact hammer test using FFT analyzer.
10. Measurement of noise by using noise measuring instruments.
   Take any 8 experiments from above

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Mechanical Vibrations	Rao S.S.,	Wiley Publishing Co	Fourth	1990
02	Mechanical Vibration	Dr. V. P. Singh	S. Chand and Sons, New Delhi.	Fifth	2007
03	Mechanical Vibration	G. K. Grover	Nemchand and Brothers Roorkee	Second	1972
04	Mechanical Vibration	A. G.	PHI	First	2006

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	and Noise Engineering	Ambekar			
05	Engineering Vibration	Inmann Daniel J	Pearson	Fourth	2001
06	Mechanical Vibration	Austin Church	Wiely Eastern	Second	1963
07	Mechanical Vibrations	J.P. Den Hartog	McGrawhill Book Company Inc.	First	1956
08	Fundamentals of Acoustics	Kinsler Lawrence E. & Frey Austin R.	Wiley Eastern Ltd.	Second	1987.

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Theory of Machines	Thomas Bevan	CBS Publishers, New Delhi.	Third	reprint 2005
02	Theory of Machines and Mechanism	Shigley	Oxford International	Third	2009
03	Theory of Machines and Mechanism	G.S. Rao and R.V. Dukipatti	New Age Int. Publications Ltd. Delhi.	Second	1992
04	Mechanical Vibrations	SingiresuS.Rao	Pearson Education	Sixth	2004
05	Noise and Vibration Control	Leo L. Bernack	Tata Mc- Graw Hill	Second	1956

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Course Details:

Class	T.Y.B. Tech, Sem.-VI
Course Code and Course Title	**1MEPC358, Mechatronics and Robotics Lab**
Prerequisite/s	1MEES156
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE/ ESE	25/25

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPC358_1	Explain the basics of sensors, signal conditioners, digital circuits and PLC
1MEPC358_2	Apply the ladder programming method to simple operations like sequencing..
1MEPC358_3	Validate characteristics of different sensors.
1MEPC358_4	Simulate the ladder logic for industrial applications using PLC and RS Logix software.
1MEPC358_5	Apply the knowledge gained to build simple mechatronics systems.

Course Contents:

- Trials on Sensors: Proximity Sensor, RTD, Encoders, Load Cell
- PLC programming for implementation of logic function.
- PLC Programming for Hold on, Always On Always Off, and sequencing operations.
- PLC programming on industrial applications based on timers.
- PLC programming on industrial applications based on counters.
- PLC programming for controlling pneumatic circuits.
- Fabrication of Simple Mechatronics working project by a group of 3 students using hardware & suitable s/w
- Industrial visit to study Mechatronics system application & submission of visit report.
- Programming of Industrial Robot
  Introduction to Arduino and simple programs

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Mechatronics	Mahalik,	TATA McGraw Hill	1st	2003
02	Introduction to Mechatronics	Appu Kuttam	Oxford publications	1st	2007
03	Fundamentals of Digital circuits	A. Anand kumar	PHI Learning pvt.ltd	2nd	2010
04	Mechatronics	Tilak Thakur	Oxford publications	1st	2016
05	Mechatronics	K.P.Ramchandran	Wiley India Pvt. Ltd.	2nd	2012
06	Microprocessor 8085	Ramesh Gaokar	Penram International Publishing	5th	2012

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Mechatronics	W. Bolton,	Pearson education	4th	2008
02	Programmable logic controller	Hackworth	Pearson publication	1st	2006
03	Programmable logic controller	John Webb	PHI Learning pvt.ltd	5th	2010
04	Programmable logic controller	Frank Petruzella	McGraw Hill publication	4th	2016

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Course Details:

Class	T.Y. B. Tech, Sem.-VI
Course Code and Course Title	**1MEPE359, I. C. Engines Lab**
Prerequisite/s	1MEPC203, 1MEPC302
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE/ ESE	25/00

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE359_1	Identify the different components of internal combustion engine.
1MEPE359_2	Interpret the experimental results of I. C. Engine performance testing.
1MEPE359_3	Use modern technique to analyze the performance parameters of I. C. Engine.
1MEPE359_4	Compare the performance characteristics of different I.C. Engines available in market
1MEPE359_5	Prepare report for industrial visit to engine manufacturing or maintenance center.

Course Content:
01   Demonstrate constructional details of I.C. engines
02   Demonstration of Engine systems: Air, exhaust, Cooling, Lubrication.
03   Demonstration of ignition systems, Starting systems.
04   Demonstration of Carburetor and Petrol injection system.
05   Demonstration of fuel injection system of diesel engine.
06   Conduct trial on slow speed diesel engine to calculate heat balance sheet.
07   Conduct trial on high-speed petrol engine to calculate performance parameter.
08   Conduct Morse test on four stroke petrol engines.
09   Conduct trial on computer-controlled engine.
10   Visit to engine manufacturing or maintenance center.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Internal Combustion Engines	Mathur and Sharma	Dhanpat Rai Publi. Delhi.	First	1994
02	Internal Combustion Engines	V. Ganesan	Tata McGraw Hill Publications	Fourth	2012
03	Internal Combustion Engines	Domkundwar	Dhanpat Rai and Sons	First	1999
04	Internal Combustion Engines	Ramlingam	SciTech Publi	Second	2008

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Internal Combustion Engines	J. B. Heywood	McGraw Hill Education	First	Reprint 2017
02	Engg. Fundamentals of the I.C. Engines	W.W. Pulkrabek	Pearson education	First	2003
03	Internal Combustion Engines – Applied Thermosciences	Ferguson Allan T. Kirkpatrick	Wiley-Blackwell	Third	2015
04	Introduction to Internal Combustion Engines	Richard Stone	Palgrave Macmillan	Third	1999
05	Internal Combustion Engine Handbook: Basics, Components.	Richard Van Basshuysen, Fred Schäfer	SAE International	First	2016

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Course Details:

Class	T.Y.B. Tech, Sem.-VI
Course Code and Course Title	**1MEPE360, Machine Tool Design Lab**
Prerequisite/s	1MEPC206, 1MEPC210, 1MEPC353
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE/ ESE	25/00

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE360_1	**Describe** general design requirements of machine tool system
1MEPE360_2	**Apply** fundamental laws and principles of machine tool design
1MEPE360_3	**Determine** Forces, Velocities and Power Requirements of machine tools like bed of lathe machine, drilling machine etc
1MEPE360_4	**Design** different elements of machine tool system like lathe beds, column and radial arm of radial drilling machine etc
1MEPE360_5	**Analyze** machine tool system as per designed constraints

Course Contents:

1. Case Study 1: - Design of bed of lathe machine

2. Case Study 2: - Design and drawing of Column and radial arm of radial machine

3. Case Study 3: - Design and drawing speed gear box of any machine tools.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Design Principles of Metal-Cutting Machine Tools	F. Koenigsberger	CBS Publishers, New Delhi.	First	1964
02	Production Engineering,	P.C. Sharma	S. Chand Publication.	Fourth	2012
03	Principles of Modern Manufacturing	Grover,	Wiley Publication	Fifth	2014
04	Machine Tool Design	S.K, Basu	Oxford and IBH Publishing.	Fourth	2019

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Machine Tool Design	N. K. Mehta	McGraw Hill Publishing	Third	2012
03	Machine tool design	Sen and Bhattacharya	CBS Publications	Second	2009
03	Fundamentals of Manufacturing Engineering	D. K. Singh	Tata McGraw Hill education pvt. Ltd	Nine	2014
04	Elements of workshop technology Vol-II	S. K. Hajra Choudhari	Media promoters and publishers, Mumbai	Fifth	2010

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Course Details:

Class	T. Y. B. Tech. Semester-VI
Course Code and Course Title	**1MEPR362, Mini Project**
Prerequisite/s	All Courses
Teaching Scheme: Practical	02
Credits	01
Evaluation Scheme: ISE	25

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEPR362_1	**Identify** the real life institutional, societal, industrial problems/issues for sustainable development.
1MEPR362_2	**Design**, development and testing of components, systems and or processes using modern tools/ techniques and available resources using contemporary knowledge.
1MEPR362_3	**Analyze** the results obtained from analytical and or numerical and or experimental methods.
1MEPR362_4	**Function** effectively as an individual or as a team for understanding of the engineering and management principles and apply these to manage the projects by maintaining professional and ethical values.
1MEPR362_5	**Communicate** effectively on complex engineering activities, write appropriate project report and make effective presentations.
1MEPR362_6	**Engage** in life-long learning in the broadest context of technological change.

COs correlated with Psychomotor and Affective domains will be assessed at the end of semester through various rubrics based on student's performance throughout the semester.

Course Contents:

- Project work can be a design project / experimental project and or computer simulation project on mechanical engineering or any of the topics related with mechanical engineering stream.
- Project work may consist of fabrication and experimental work or exhaustive analysis of system in the context of 2-3 factors identified while formulating problem by them or supported by industry.
- Project work consists of two reviews based on work. In the first review, progress of the project work done is to be assessed and in second review, the complete assessment (quality, quantum and authenticity) of the thesis is to be evaluated.
- Each group has to present the work carried out and analysis results obtained in final project evaluation.
- Students have to prepare final project report under the guidance of the project guide. Project report should consist of assembly and details drawing of product/setup/prototype

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prepared by using CAD software. It should also include bill of material, all geometrical dimensions, limit, fit and tolerances.

- Along with the Mini Project, students should attend hands on training/internship/ certification courses in their area of interest.
- One copy of the report is expected to be submitted to project guide and one copy should remain with project group.

Project work submitted by students shall include;

1. *Work Diary*: Work Diary maintained by group and countersigned by the guide weekly. The contents of work diary shall reflect the efforts taken by project group for

     a. Searching suitable project work

     b. Brief report preferably on journals/ research or conference papers/ books or literature surveyed to select and bring up the project.

     c. Day to day activities carried out related to project work for entire semester.

2. *Synopsis*: The group should submit the synopsis in following prescribed format.

     a. Title of Project

     b. Names of Students

     c. Name of Guide

     d. Relevance

     e. Present Theory and Practices

     f. Proposed work

     g. Expenditure

     h. References

The synopsis should consist of minimum **eight** review papers. The synopsis shall be signed by each student in the group, approved by the guide and endorsed by the Head of the Department.

3. *Presentation & report*: The group has to make a presentation in front of the faculty members and review panel member at the time of Review's.

Project-I Report Format:

Project report should be of 25 to 30 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point Font
7. Line Spacing: 1.5 Lines
8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
9. Headings: Times New Roman, 14 Point , Bold Face

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10. References: References should have the following format

For Papers: Authors, "Title of Paper", " Journal/Conference Details", Year

For Books: Authors, "Title of Book", Publisher, Edition

Important Notes:

- Along with Mini Project students are informed to do Hands on Training/Internship/ / Certification Courses.
- Project group should continue maintaining a work diary for project and should write (a) Book referred (b) Company visited (c) Person contacted (d) Paper referred (e) Creative thinking.
- Students should prefer to attend hands on training/internship in reputed/well known industries or certification courses floated or organized by reputed institutions as per guidelines given by department.
- Number of students in one batch will be as per guidelines given by department.

Assessment Tools: Project Synopsis Assessment Rubric, Project Assessment Rubric

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Annasaheb Dange College of Engineering and Technology, Ashta
An Autonomous Institute

Curriculum Structure

B. Tech.
MECHANICAL ENGINEERING

SEMESTER VII- VIII

w.e.f. 2022-23

Department of Mechanical Engineering

Teaching and Evaluation Scheme
B. Tech: Semester-VII

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks)		Practical (Marks)	
		L	T	P	Credits	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
1OE***	Open Elective-III	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPC401	Vehicle Engineering	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPC402	Finite Element Analysis	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPE***	Professional Elective-III	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPE***	Professional Elective-IV	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50	20	--	--
1MEPC451	Finite Element Analysis Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	POE	25	10
1MEPE***	Professional Elective-III Laboratory	--	--	2	1	ISE	--	--	25	10
						ESE	--	OE	25	10
1MEPR455	Project	--	--	10	5	ISE	--	--	50	20
						ESE	--	OE	50	20
Total		15	--	14	22	Total	350		200	

Total Contact Hours/Week: 29 hrs

Course Category	HS	BS	ES	PC	PE	OE	PR
Credits	00	00	00	07	07	03	05
Cumulative Sum	07	20	24	79	14	09	06

1MEPE*** Professional Elective-III	1MEPE*** Professional Elective-IV
1MEPE403- CFD 1MEPE404- Condition Monitoring 1MEPE405- Non-Destructive Testing	1MEPE406- Energy Management 1MEPE407- Reliability Engineering 1MEPE408- Industrial Engineering

1MEPE*** Professional Elective-III Laboratory	1OE*** Open Elective-III
1MEPE452- CFD 1MEPE453- Condition Monitoring 1MEPE454- Non-Destructive Testing	1MEOE401- Total Quality Management 1MEOE402- Reliability Engineering 1MEOE403 - Renewable Energy Engineering

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ME- ST- 01|03

Open Elective-III (Semester-VII)		
Courses Code	**Course Name**	**Department**
1AEOE421	Air Traffic Control and Airport Design	Aeronautical Engineering
1AEOE422	Aircraft General Engineering Maintenance	
1AEOE423	Design of Fixed Wing Unmanned Aerial Vehicles	
1AUOE401	Vehicle Maintenance and Safety	Automobile Engineering
1AUOE402	Vehicle Aerodynamics	
1CVOE401	Structural Auditing	Civil Engineering
1CVOE402	Disaster Management	
1CSOE401	Introduction to Image Processing and Computer Vision	Computer Science and Engineering
1CSOE402	Introduction to Machine Learning	
1EEOE401	Electric Vehicles	Electrical Engineering
1EEOE402	Wind and Solar Energy Systems	
0FTOE411	Process Optimization	Food Technology
0FTOE412	Cold Storage and Supply Chain Management	
1MEOE401	Total Quality Management	Mechanical Engineering
1MEOE402	Reliability Engineering	
1MEOE403	Renewable Energy Engineering	

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ME-ST-02|03

Teaching and Evaluation Scheme

B. Tech : Semester-VIII

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks)		Practical (Marks)	
		L	T	P	Credits	Scheme	Max.	Min. for Passing	Max.	Min. for Passing
1MEHS409	Project and Finance Management	3	--	--	3	MSE	50	40	--	--
						ESE	50	20	--	--
1MEMC411	Constitution of India	2	--	--	--	ISE	Audit		--	--
1MEPR459	Internship/ Project	--	--	12	6	ISE	--	--	100	40
						ESE	--	POE	100	40
Total		5	0	12	9	Total	100		200	
Total Contact Hours/Week: 17 hrs										

Course Category	HS	BS	ES	PC	PE	OE	PR
Credits	03	00	00	00	00	00	06
Cumulative Sum	10	20	24	79	14	09	12
Credits (AICTE)	12	25	24	48	18	18	15

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ME-ST-03/03

Course Details:

Class	B. Tech, Sem.-VII
Course Code and Course Title	1MEOE401, Total Quality Management
Prerequisite/s	--
Teaching Scheme: Lecture / Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims:

01	To explain the concept of Total Quality and role of Quality Assurance.
02	To clarify Planning and Controlling techniques for Quality.
03	To elucidate benefits of Taguchi's Quality philosophy.
04	To make aware of the current trends in TQM.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEOE401_1	Explain the techniques and philosophy of Total Quality Management (TQM).
1MEOE401_2	Make use of statistical process control techniques to control the quality of the process.
1MEOE401_3	Identify the system reliability using different tests and find the loss functions.
1MEOE401_4	Organize different customers, feedback, organizational structures, internal departments, their role and responsibilities in TQM.
1MEOE401_5	Select an appropriate quality certification like ISO series of standards with its importance.

Course Contents:

Unit 1	**Quality Assurance System:** Concept of total quality, role and objectives of quality assurance, quality assurance cycle, process approach to quality assurance (input-process-output), information feedback, Significance of feedback and field complaints analysis in quality assurance, significance of internal customer approach in defect prevention program for quality assurance.	06 Hrs.
Unit 2	**Planning Techniques for Quality** Planning for Quality: The dimensions of Quality (quality of Design, conformance, performance and service) Specifications of quality dimensions, quality planning activities for new products, Advanced Product Quality Planning (APQP, Vendor rating). **Controlling Techniques for Quality:** SPC, Problem solving QC tools, Process capability analysis, Six sigma- concept, need, implementation, DPMO, Gradation.	07 Hrs.
Unit 3	**Robust and Reliable product approach for Quality:** Product and System reliability, Basic concepts, Prediction and evaluation of parallel, series and combined system reliability, Reliability tests (life testing, burn-in test, accelerated life testing) FMEA and FTA Introduction to design of experiments.	07 Hrs.

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Unit 4	**Principles and Approaches to TQM:** Basic Concepts: Concept and definition of TQM, TQM and traditional management approach, Principles, Models (TQM pyramid – Okland, Integrated model-shoal), building blocks of TQM-Zaire, the house of TQM-Kano), Characteristics and benefits of TQM. Approaches to TQM: Deming's approach, Juran's triology, Crosby and quality improvement, Ishikawa's CWQC, Feignbaum's theory of TQC, Schnberger's action agenda for manufacturing excellence.	**07Hrs.**
Unit 5	**Essentials of TQM:** **Customer focus-** Customer perception of quality, Customer satisfaction, Kano's model of satisfaction, Customer retention. **TQM leadership** - role and commitment and accountability of leadership, Quality policy and objectives, Organizational structure for TQM, Role of HR in TQM, Training for TQM, Developing quality culture. **Tools and Techniques for TQM** 5-S campaign, TEI, Quality circles, QFD, FMEA and FTA, Poka-yoke, Kaizen.	**08 Hrs.**
Unit 6	**Current trends in TQM** **TQM in Service Sector:** Definition and meaning of service, Problems in defining service quality, Attributes of service quality, SERVQUAL model, Implementing TQM in service industries, Measurement system for service quality. **Quality Management Systems:** ISO 9001:2008 Series of Standards Structure of ISO 9001:2008 series standards, Clauses, Contents, Interpretation and Implementation, Audit Sector specific Standards: AS 9100, ISO/TS 16949, TL 9000, Quality awards: national and international quality awards, criteria and case studies.	**07 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Total Quality Management	Dale H. Bester filed	Pearson Education Asia	Third	2012
02	Industrial Engineering and Production Management	Martand Telsang	S. Chand & Company Ltd., New Delhi	Second	2006
03	Total Quality Management	Dr. Poornima Charantimath	Pearson Education Asia	Second	2012
04	Handbook of Total Quality Management	Dr. R.P. Mohanti, R.R. Lakhe	Jaico Publishing House	Second	2007

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Total Quality Control	Feigenban	McGraw Hill Book Company, New York	--	2007
02	Practical Reliability Engineering"	Patrick D.T. Connor,	Wiley India P. Ltd.	Fourth	2009
03	Introduction To Work Study	International Labour Office	International Labour Office,1969	Second	2008
04	Handbook of Total Quality Management"	Dr. R.P. Mohanti, R.R. Lakhe	Jaico Publishing House	Second	2007

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B·Tech – ME-03/48

Course Details:

Class	B. Tech, Sem.-VII
Course Code and Title	**1MEOE402, Reliability Engineering**
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives:

01	To introduce principles of reliability in engineering design.
02	To develop understanding of concepts of failures, maintainability and availability of the intended products/systems and services.
03	To develop an ability to apply various reliability techniques to solve problems related to mechanical engineering.
04	To develop an ability to analyze system reliability.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEOE402_1	**Explain** the basics concepts of reliability, maintainability and availability.
1MEOE402_2	**Apply** fundamentals of reliability to estimate various reliability measures.
1MEOE402_3	**Calculate** system reliability using basic reliability models.
1MEOE402_4	**Estimate** maintainability and availability characteristics.
1MEOE402_5	**Analyze** reliability of a given system/configuration using various reliability techniques.

Course Contents:

Unit 1	**Introduction:** Brief history, concepts, terms and definitions, applications, the life cycle of a system, concept of failure, typical engineering failures and their causes, theory of probability and reliability, rules of probability, random variables, discrete and continuous probability distributions, reliability data collection.	07 Hrs.
Unit 2	**Reliability Measures:** Reliability function–$R(t)$, cumulative distribution function (CDF)–$F(t)$, probability density function (PDF) – $f(t)$, hazard rate function–$\lambda(t)$, Mean time to failure (MTTF) and Mean time between failures (MTBF), median time to failure (t_{med}), mode (t_{mode}), variance (σ^2) and standard deviation (σ), typical forms of hazard rate function, bathtub curve and conditional reliability.	07 Hrs
Unit 3	**Basic Reliability Models:** Constant failure rate (CFR) model, failure modes, renewal and Poisson process, two parameter exponential distribution, redundancy with CFR model, time-dependent failure models, Weibull distributions, burn-in screening for Weibull, redundancy, three parameter Weibull, calculation of $R(t)$, $F(t)$, $f(t)$, $\lambda(t)$, MTTF, t_{med}, t_{mode}, σ^2 and σ.	07 Hrs.

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Unit 4	**Reliability Evaluation of Systems:** Reliability block diagram, series configuration, parallel configuration, mixed configurations, redundant systems, high level versus low level redundancy, k-out-of-n redundancy, complex configurations, network reduction and decomposition methods.	06 Hrs.
Unit 5	**Maintainability and Availability:** Concept of maintainability, measures of maintainability, mean time to repair (MTTR), analysis of downtime, repair time distributions, stochastic point processes, maintenance concept and procedures, availability concepts and definitions, important availability measures.	07 Hrs.
Unit 6	**Design for Reliability and Maintainability:** Reliability design process and design methods, failure modes, effects and criticality analysis (FMECA), fault tree and success tree methods, symbols used. **Reliability Testing:** Product testing, reliability life testing, burn-in testing, acceptance testing, accelerated life testing and reliability growth testing.	08 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	An Introduction to Reliability and Maintainability Engineering	Charles E. Ebling	Waveland Press	Third	2019
02	Reliability Engineering	L. S. Srinath	East West Press, New Delhi	Fourth	2005
03	Engineering Reliability – New Techniques and Applications	B. S. Dhillon, Chanan Singh	John Wiley and Sons	First	1981
04	Engineering Maintainability	B. S. Dhillon,	Prentice Hall of India	--	1999

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Practical Reliability Engineering	Patrick D.T. O'Conner, David Newton, Richard Bromley	John Wiley and Sons.	First	2002
02	Reliability Engineering: Theory and Practice	Alessandro Birolini	Springer	First	2010
03	Reliability Engineering: Probabilistic Models and Maintenance Methods	Joel A. Nachlas	Taylor and Francis	--	2005
04	Case studies in Reliability and Maintenance	W. R. Blischke, D.N.P. Murthy	John Wiley and Sons	Second	2003

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Course Details:

Class	B. Tech, Sem.-VII
Course Code and Title	1MEOE403 Renewable Energy Engineering
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims :	
01	To describe the energy scenario and the need for energy conservation.
02	To identify the opportunities of renewable energy sources.
03	To develop the interest in energy load curves, assessment procedures.
04	To explore the status of energy generation, and storage technologies.

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEOE403_1	Describe need & working principles of different energy sources.
1MEOE403_2	Evaluate various parameters of energy resources.
1MEOE403_3	Analyze various renewable energy sources utilized in power plants.
1MEOE403_4	Apply energy management principles to enhance energy related business.
1MEOE403_5	Distinguish the performance of various power plants on the basis of availability and economics.

Course contents		Hours
Unit 1	**Solar Energy** Introduction to Renewable Energy sources , Solar potential, Solar radiation spectrum, Solar radiation geometry (Numerical on angle of incidence only), Solar radiation data, ,Solar Collectors (Flat plate, evacuated tube, Cylindrical parabolic, Concentrating paraboloid),Graphical representation of efficiency of various Collectors , Testing of Solar flat plate collectors – BIS code , Thermal Energy storage (Introduction and types) Principle and operation of fuel cells	06 Hrs.
Unit 2	**Hydro power plant:** Site selection, components of hydro power plant, classification, auxiliaries used, combined hydro and steam power plants, underground hydro plants, calculation of hydropower, cost of hydro power, hydro power potential in India.	07 Hrs.
Unit 3	**Wind Energy Conversion** Wind parameters and wind data, Power from wind, Site selection, Wind energy conversion systems and their classification, Construction and working of typical wind mill, Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield,	06 Hrs.
Unit 4	**Ocean Energy** Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economic. Introduction to OTEC and Hybrid systems Power scenario in India and world. Power generation in Private sector, Power distribution, Power grid corporation of India, (Case study on commercial benefits, payback period for renewable energy utilization at industrial site.)	09 Hrs.

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Unit 5	**Load Curves** NTPC, NHPC and their role in Power development in India, Load Curves and Load duration curves (Numerical treatments), Performance and operational characteristics of power plants, Peak load, Intermediate load and Base load plants and their characteristics, Economic division of between Base load plant and peak load plants, Tariff methods (Numerical Treatments).	**09 Hrs.**
Unit 6	**Energy Management** Energy Marketing: Selling and marketing in India, Creating supply chain in India, Successfully working with business and virtual teams in India, Navigating the financial, legal and accounting environment, Human Resources issues, India's business culture in energy sector	**05 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Solar Energy	Dr. S.P.Sukhatme	Tata McGraw Hill.	Third	2008
2	Non Conventional Energy Sources	G.D.Rai	Khanna Publishers	Fifth	2011
3	Power Plant Engineering	Domkundwar & Arora	Dhanpatrai and Sons	Fifth	2005
4	Power Plant Engineering	R K Rajput	Laxmi publication	Fourth	2008

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Energy Technology	S. Rao, Dr. B.B.Parulekar	Khanna Publishers	Third	Reprint 2012
2	Solar energy fundamentals& its Application	Rokosh das Begamudre	Tata McGraw Hill.	First	2000
3	Solar energy-Fundamental& its Application	Prof. H.P.Garg	Tata McGraw Hill.	First	2000
4	Renewable energy Sources & their environmental impact	S.A Abbasai	Prentice hall publication	First	2000
5	Energy Resources	MVR Koteshwara	B.S,Publication	First	2004
6	Fundamentals of renewable energy system	D.Mukherjee S.Chakrabarti	New age international	First	2004
7	Renewable energy Technology	C.Palaniappan	Narosa publication	First	2001

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B·Tcch - ME· 07/48

Course Details:

Class	B.Tech, Sem-VII
Course Code and Title	**1MEPC401, Vehicle Engineering**
Prerequisite/s	1MEPC202,1MEPC210
Teaching Scheme: Lecture/Tutorial	03/00
Credit	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims to :	
01	Describe body parts and its advanced materials, Chassis types, constructional details.
02	Explain the concept of gear boxes like Sliding mesh, constant mesh, Synchromesh.
03	Describe the Steering system layout, Automotive steering mechanism.
04	Develop an ability to compute Power required for vehicle propulsion, Selection of gear ratio.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
1MEPC401_1	**Explain** components of automobile, modern trends, techniques used in industries.
1MEPC401_2	**Identify** various types of automobile layouts as per drive given to wheels, automobile bodies and materials used for the same.
1MEPC401_3	**Demonstrate** various electrical systems like lighting, starting charging and its construction and working principle.
1MEPC401_4	**Resolve** the problems related with various systems for the automobile.
1MEPC401_5	**Analyse** techniques used in brake system, steering system.

Course Contents:		**Hours**
Unit 1	**Introduction** Automobile history and development, Classification, vehicle layouts- engine location and drive arrangement, safety regulations, specifications of vehicles, Type of vehicle bodies, body parts and its advanced materials, Chassis types, constructional details, Types of Frames, sub frames, frameless vehicles, details of chassis material, Vehicle life development cycle overview.	07Hrs.
Unit 2	**Transmission System** Clutch – Function and requirements, Classification, Construction and working of Single-plate, Fluid flywheel. Gear Box – Necessity, classification, construction of manual gear boxes like, Synchromesh, Epicyclic gear train, automatic transmission, Torque convertor, Electronic transmission control, overdrive. Propeller shaft, Differential , final drive and axels,	07Hrs

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Unit 3	**Control systems** Steering System: Steering system layout, Automotive steering mechanisms, Types of steering gear boxes, Condition for true rolling, Steering geometry- Camber, Caster, King pin inclination, Included angle, Toe-in and Toe-out, Wheel alignment, Slip angle, Under steer & over steer, Types and working of power steering. Braking System: Function of automotive brake system, Types of braking mechanism internal expanding & Disc brake, Mechanical, Hydraulic& Air brake system, Servo and power brakes, Anti lock and antiskid braking, Calculation of braking force required, stopping distance and dynamic weight transfer.(Numerical)		07Hrs.
Unit 4	**Suspension System** Functions, Sprung and unsprung mass, Types of suspension linkages, types of spring - leaf, coil, air springs, telescopic shock absorber, hydro gas suspension, rubber suspension, interconnected suspension, self-leveling suspension (active suspension) Advances in suspension system, Air suspension Wheels and Tyres: Wheel construction, alloy wheel, Types, tyre construction, tread design, specification, factors affecting tyre performance, tyre wear and its causes, wheel balancing.		06Hrs.
Unit 5	**Electrical and Electronic Systems** Automotive batteries - lead acid batteries, Advances in batteries ,battery charging system, alternators, principle and operation of cutout and regulators, starter motor, Bendix drive, solenoid drive, magneto coil and solid stage ignition systems, lighting and electrical accessories, automobile air conditioning, panel board instruments. Electronic controlled management systems (ECM), Automobile wiring.		08Hrs.
Unit 6	**Introduction to electric vehicle** Introduction to electric vehicle, hybrid vehicle. Transmission in electric vehicle: Battery management system, electric motors and converters. Sensors used in automobile ,42 volt battery technology		07Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Automobile Engineering	G. B. S. Narang	Khanna Publication	Ninth	2010
02	Automobile Mechanics	N. K. Giri	Khanna Publication	Second	2011
03	Automobile Electrical Equipment	P. S. Kohali	Technical education series	Fourteenth	2016
04	Motor Vehicle	Newton &Steeds	Butterworth-Heinemann	Twelfth	1998
05	Automobile Engineering(Vol-I)	Dr.Kirpal Singh	Standard Publisher Distributer	Twelfth	2009

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Motor Vehicle	P.Ketts	Springer	Eighth	2011
02	Automobile Engineering	Ramalingam	SCITECHpublication	First	2009
03	Fundamentals of Automobile Engineering	Ramalingam	SCITECHpublication	Sixth	2011
04	Automotive Engines Theory & Servicing	J D Harderman	Mitchell Pierson Education	First	2006
05	Electric and Hybrid-Electric Vehicles	Ronald K. Jurgen	SAE International	First	2010

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B·Tech - ME-10/48

Course Details:

Class	BE-Part-I-VII Semester
Course Code & Course Title	**1MEPC402, Finite Element Analysis**
Prerequisite/s	1MEBS102
Teaching Scheme: Lecture / Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims to :	
01	Impart the knowledge of Pre-processing, solving, post processing steps.
02	Acquire the procedure of FEM to solve any problem.
03	Acquire the knowledge in field problem.
04	Impart knowledge in higher order element.

Course Outcomes (COs) After successful completion of this course student will able to:	
1MEPC402_1	**Illustrate** the fundamental concepts, equations of equilibrium, Stress-strain relations and the principle of potential energy and approximations of differential equations.
1MEPC402_2	**Develop** finite element formulations by considering the 1D problem, just as Shape function, element stiffness and boundary conditions.
1MEPC402_3	**Apply** the finite element formulations for two dimensional plane stress and plane strain problems using constant strain triangle.
1MEPC402_4	**Compute** displacement, stress and strain for two dimensional elements
1MEPC402_5	**Analyze** the steady state heat transfer using Galerkins approach.

Course Contents:

Unit 1	**Fundamental Concepts** Introduction, Past, present and future of FEA, stresses and Equilibrium, boundary conditions, strain-displacement relations, stress-strain relations, Temperature effects, Potential energy and equilibrium; the Rayleigh-Ritz method, Galerkins method, Saint-Venant'sprinciple, Von-Misesstress, Gauss elimination method	7 Hrs.
Unit 2	**One Dimensional Problem** Introduction, Finite element modelling(element division, numbering scheme), coordinates and shape functions, the potential energy approach(element stiffness matrix, force terms), Galerkin approach (element stiffness matrix, force terms),Assembly of the global stiffness matrix and load vector, properties of K, the finite element equations; treatment of boundary conditions(types of boundary conditions), elimination approach, penalty approach (Theoretical concept only), multipoint constraints, Quadratic shape functions.	6 Hrs.

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Unit 3	**Two-Dimensional Problems using Constant Strain Triangles** Introduction, finite element modelling, Constant Strain Triangle (CST), Iso-parametric representation, potential-energy approach, element stiffness, force terms, Galerkin approach, stress calculations, problem modelling and boundary conditions	6 Hrs.
Unit 4	**Axisymmetric solids subjected to axisymmetric loading & Analysis of Trusses** Introduction, axisymmetric formulation, finite element modelling, triangular element, potential energy approach, body force term, rotating flywheel, pressure vessel, Galerkin approach, stress calculations. Trusses:-Plane trusses, Local and Global coordinate systems, formulas for calculating L and M, element stiffness matrix, Stress Calculations, Assembly of global stiffness matrix.	8 Hrs.
Unit 5	**Scalar Field Problems** Introduction, steady state heat transfer, One dimensional heat conduction, One dimensional heat transfer in thin fins, Two dimensional steady state heat conduction, two dimensional fins.	6 Hrs.
Unit 6	**Computer Implementation of the Finite Element Method:** **Pre-processing:** Model definition – nodal coordinates element connectivity, material and element type and property definitions, type of analysis (static/modal), loading and boundary conditions. Meshing techniques- free and mapped meshing, Quality checks – aspect ratio, warp angle, skew, distortion, stretch, included angle, taper **Processing:** Element level calculations, Equation assembly, Equation solver (sparse solvers, factorization, numerical/computational issues) **Post Processing:** Strain and stress recovery (integration and nodal points), interpretation of results (results validation and data interpretation) and design modification	7 Hrs.

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Introduction to Finite Elements in Engineering	Chandrapatala, Belgundu	PHI	Third	2012
2	Finite Element Methods for Engineers	U.S. Dixit	Cengage	Fourth	2011
3	An Introduction to Finite Element Method	J. N. Reddy	McGraw Hill	Second	1993
4	Finite Element Analysis – Theory and Practice	M.J.Fagan	Longman Scientific & Tech.	---	---
5	Textbook of Finite Elements Analysis	P. Sheshu	Prentice-Hall of India Private Limited	---	---

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B.Tech-ME-12/48

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	An Introduction to Finite Element Analysis	Barna Szabo, Ivo Babuska	---	---	---
2	Finite Element Methods for Engineers	S.S.Rao	--	--	---
3	Finite Element Analysis Theory and Application With ANSYS	Saeed Moaveni	Prentice Hall	Third	----
4	Finite Element Simulations With ANSYS Workbench 14 Perfect Paperback – Import, 11 Jun 2012	Huei-Huang Lee	Schroff Development Corp	First	2012
5	Ansys Workbench Tutorial Release 14: Structure & Thermal Analysis	Kent L. Lawrence	Schroff Development	Second	2012
6	Finite Element Analysis Using Ansys 11.0 Paperback	Srinivas Paleti	PHI	First	2010

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B.Tech- ME - 13/48

Course Details:

Class	B. Tech, Sem.-VII
Course Code and Title	**1MEPE403, Computational Fluid Dynamics**
Prerequisite/s	1MEPC209, 1MEPC301, 1MEPC302
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims:	
01	To introduce the different prediction methods and applications of CFD.
02	To explain the exact solution for simple N.S equations.
03	To describe the different numerical techniques used in CFD.
04	To develop skills in the analysis of fluid systems for lifelong learning

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE403_1	**Explain** the methodology of grids generation and discretization.
1MEPE403_2	**Solve** the governing equations for fluid flow.
1MEPE403_3	**Apply** various discretization methods to fluid flow problems.
1MEPE403_4	**Interpret** the suitable turbulence models to engineering fluid flow problems.
1MEPE403_5	**Analyze** the effect of solution algorithm for pressure velocity coupling in steady flow.

Course Contents:		Hours
Unit 1	**Introduction to Computational Fluid Dynamics & Principles of Conservation** Introduction to Computational Fluid Dynamics, CFD Applications, Numerical vs. Analytical vs. Experimental, Modeling vs. Experimentation, typical problems, Summary Equations for Viscous Flow (the Navier-Stokes Equations) Equations for Inviscid Flow (the Euler Equations) Forms of the Governing Equations Particularly Suited for CFD, Working of Commercial CFD Software, Solution methodology-pre-processing, Solver, Post processing	08 Hrs.
Unit 2	**Basics of discretization & Grid generation** Basic concepts of discretization, Discretization techniques - Finite difference, Finite volume and Finite element method, Comparison of discretization methods, Transformation of non-uniform grids to uniform grids, General transformation of the equations, Form of the governing equations suitable for CFD, Compressed grids, Boundary fitted co-ordinate systems, Elliptic grid generation, Adaptive grids, Modern developments in grid generation.	07 Hrs.

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Unit 3	**Finite Difference Method** Finite Difference Formulations: Introductory remarks, Taylor Series Expansions, Finite difference equations, Central Forward, Backward Numerical error, Explicit, Implicit, Semi-implicit (Crank- Nicholson method). Applications of direct, Iterative, Thomas algorithm, Gauss- Jacobi, Gauss-Seidal method. Alternate directional implicit, Applications. 1-D examples, 2-D examples.	06 Hrs.
Unit 4	**Finite Volume Method** **i. For Diffusion** Introduction, FVM for 1D steady state Diffusion, FVM for 2 D Diffusion **ii. For Convection Diffusion** Introduction, Steady 1-D Convection and Diffusion, Central Differencing, Upwind Differencing, Hybrid Differencing, Power Law Scheme, QUICK scheme.	07 Hrs.
Unit 5	**Introduction to solution algorithms for pressure velocity coupling in steady flows & turbulence and multiphase modeling (Introductory treatment)** Introduction, staggered grid, introduction to SIMPLE, SIMLEC, SIMPLER, PISO algorithms, Modeling of multiphase problems, Level set methods, VOF method. Coupled LS+VOF	07 Hrs.
Unit 6	**Introduction to Turbulence and its modeling:** Introduction to turbulence, Transition from laminar to turbulent flow; Effect of turbulence on time averaged Navier -Stokes equations; Characteristics of simple turbulent flows; Introduction to Turbulent Models like Mixing length Model, k-epsilon model, Reynolds stress equation models, Algebraic stress equation models; Some recent Advances, introduction to LES, DNS.	07 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Computational Fluid Dynamics	Gautam Biswas	Narosa Publishing House, New Delhi	Third	2013
02	Fundamentals of Incompressible Fluid Flow	Babu V	Anne Books Pvt Ltd. New Delhi, India	First	2010
03	Introduction to Fluid Dynamics	Batchelor G. K.	Cambridge University Press. New Delhi, India	Second	1999
04	Fluid Dynamics	Raisinghania M.D.	S Chand & Company, New Delhi	Fifth	2003

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Computational Fluid Mechanics the Basics with applications	Anderson J. D. Jr.	McGraw Hill Education Pvt. Ltd.	Sixth	2014
02	An introduction to computational fluid dynamics; the finite volume method	H. K. Versteeg and W. Malalasekera	Pearson Publication	Second	2009
03	Numerical heal transfer fluid flow	Suhas V. Patankar	Taylor & Francis	First	2014
04	Computational fluid dynamics	T. J. Chung	Cambridge University Press.	Third	2014
05	Computational Fluid Dynamics: A Practical Approach	Jiyuan Tu, Guan Heng Yeoh, Chaoqun Liu,	Butterworth – Heinemann	Second	2008

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B.Tech-ME- 16/48

Course Details:

Class	B. Tech, Sem.-VII
Course Code and Title	1MEPE404, Condition Monitoring
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE- I/MSE/ISE -II/ESE	10/30/10/50

Course Objectives:	
01	To Provide the students types of condition monitoring methods and maintenance methods,
02	To provide the students the knowledge of fault diagnosis and analysis of machines,
03	To provide the students the knowledge of machine fault rectification,
04	To provide the students the knowledge of In-situ balancing and shaft alignment,
05	To prepare the students to succeed as maintenance Engineer in industry/technical profession,

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE404_1	Understand the types monitoring methods and maintenance methods.
1MEPE404_2	Analyze machine vibrations to diagnose mechanical faults in rotating machines.
1MEPE404_3	Analyze the mechanical faults in the machines and systems.
1MEPE404_4	Apply the knowledge of condition monitoring for preventive maintenance of machines.
1MEPE404_5	Evaluate the balancing conditions and carry out site balancing.

Course Contents:		Hours
Unit 1	**Introduction** Introduction to maintenance of Machines, Types of maintenance. Concept of preventive maintenance Introduction to condition monitoring. Different monitoring techniques- Vibration monitoring, oil debris analysis, Temperature monitoring, ferography. spectroscopy, magnetic plug.	06 Hrs.
Unit 2	**Vibration Condition Monitoring Part-I** Introduction of Condition monitoring of machines by using machine vibration. Vibration severity criteria. Mechanical faults in machines-critical speed of the shafts, resonance, unbalance, misalignment, faulty gears and bearings, looseness. Electrical unbalance, Vibration problem related to the foundation. Vibration characteristics of mechanical faults.	07 Hrs.

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Unit 3	**Vibration Condition Monitoring Part-II** Vibration condition monitoring procedure-Selection of vibration measuring parameters, Overall vibration measurement, monitoring data sheet, Trend analysis , Spectrum, Time wave form and phase analysis for fault diagnosis. Bearing condition monitoring, spike energy and crest factor of bearings, fault diagnosis of bearings.	07 Hrs.	
Unit 4	**Miscellaneous Monitoring Techniques** Temperature monitoring, Thermal image and its analysis, Oil debris analysis , Steps in oil debris analysis and fault diagnosis, Ferometry ,wear analysis , magnetic plugs , Spectroscopy and its applications ,Noise monitoring and analysis.	07 Hrs.	
Unit 5	**Balancing of rotors** Types of unbalance, Instrumentation required for dynamic balancing, Single plane balancing by vector method, Single plane and two plane balancing using FFT analyzer, selection of trial weight, Splitting of balance weight, Balancing grades.	07 Hrs.	
Unit 6	**Misalignment and Bearing Problems** Alignment of machinery shafts: Alignment using dial gauge and filler gauge, Laser alignment technique, concept of soft foot. Alignments of shafts of machines subjected to thermal distortions Rectification of antifriction bearing faults viz bearing looseness and misalignment Natural frequency test (NFT) of machines.	06 Hrs.	

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Machinery condition monitoring-Principles and practice	Amiya Ranjan Mohenty	CRC press Tylor and Francis group	First	---
02	Condition Monitoring of Industrial machinery	Ramesh kumar G.R	LAMBERT Academic Publishing	First	---
03	Condition Monitoring with vibration signals	Ashoke Nandi, Hosameldin Ahamad	John Wiley and Sons l	First	2020

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Condition Monitoring and Diagnostic Engineering Management	Proceeding of Comaden90	Chapman and Hall	First	---
02	Advances in Condition Monitoring of Machinery in Non stationary operation	Proceeding of Third international conference	Springer	First	2013
03	Machinery Vibration Analysis-Diagnostics, Condition Evaluation and correction Volume-II	Ronald L. Eshleman .	Vibration Institute	First	2002

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B·Tech-ME- 19/48

Course Details:

Class	B. Tech, Sem.-VII
Course Code and Course Title	**1MEPE405, Non-Destructive Testing**
Prerequisite/s	1MEES205
Teaching Scheme: Lecture/Tutorial	3/0
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims:

01	To make aware about nondestructive testing techniques.
02	To explain the significance of longitudinal and shear wave in UT for crack detection.
03	To provide the knowledge of magnetization & demagnetization, skin effect in magnetic particle inspection.
04	To develop the fundamental knowledge about suitable radiation process for specific engineering components.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE405_1	**Explain** the different inspection techniques under radiography test.
1MEPE405_2	**Select** the appropriate testing techniques as per raw material and manufacturing process.
1MEPE405_3	**Apply** the ultrasonic wave theory for flaw determination using angle probes and calibration block.
1MEPE405_4	**Analyze** the surface and subsurface discontinuities by magnetic particle inspection dye penetrant test.
1MEPE405_5	**Compute** the parameters of eddy current testing technique.

Course Contents:

		Hours
Unit 1	**Fundamentals of NDT :** The comparison and difference between DT & NDT, Importance and scope of NDT, Methods, problems and difficulties of NDT, Selection of NDT process.	**04 Hrs.**
Unit 2	**Ultrasonic testing:** Principle, wave propagation, types of waves, frequency, velocity, wavelength, reflection, divergence, attenuation, mode conversion in ultrasonic, UT testing methods, contact testing and immersion testing, normal beam and straight beam testing, angle beam testing, dual crystal probe testing, resonance testing, through transmission testing, pulse echo testing, instruments used in UT, accessories such as transducers, testing of materials such as products like plates and round bars, weld joints, castings, forgings UT of non metals, defects in different products.	**08 Hrs.**

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Unit 3	**Radiography testing:** Basic principle, Electromagnetic radiation sources: X-ray source, production of X-rays, high energy, X-ray source, gamma ray source, radiography, Standards, advantages and limitations, panoramic exposure, real time radiography, radiography image processing, latest films used in industrial radiography, quality of a good radiograph, film processing interpretation, evaluation of test results, Inspection techniques like SWSI, DWSI, DWDI.	08 Hrs.
Unit 4	**Eddy current testing:** Principle of ECT, physical aspects of ECT like conductivity, permeability, resistivity, inductance, inductive reactance, impedance etc, field factor and lift of effect edge effect, end effect, impedance plane diagram in brief, Depth of penetration of ECT: relation between frequency and depth of penetration in ECT, Equipments and accessories, various application of ECT such as conductivity measurement, hardness measurement, defect detection, coating thickness measurement, coating of materials.	08 Hrs.
Unit 5	**Magnetic particle testing:** Principles of MPI, basic physics of magnetism, permeability, flux density, cohesive force, magnetizing force, resistivity, residual magnetism etc., methods of magnetization, magnetization techniques such as head shot technique, cold shot technique, central conductor testing, magnetization using products using yokes, direct method magnetism, indirect method of magnetization. Continuous testing of MPI, residual technique of MPI, system sensitivity, checking devices in MPI, interpretation of MPI, indications, advantage and limitation of MPI.	08 Hrs.
Unit 6	**Dye penetrant testing:** Principles of DPT, qualification, of penetrant testing consumable, properties required in a good penetrant and development which are used as consumable in dye penetrant testing, types of penetrant, types developers, use of various types of penetrant and developers for various application, DPT technique, test procedure, interpretation and evaluation of penetrant test indication such as relevant indications, non relevant indications, false indication, safety precaution required in penetration testing.	06 Hrs.

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Basics of Non-Destructive Testing	Lari, Kumar	S.K. Kataria & Sons	Fourth	2013
02	Non-Destructive Testing Techniques	Ravi Prakash	New Age International Private Limited	Fourth	2010
03	Non-destructive Evaluation - A tool in Design, Manufacturing and Service	D.E. Bray and R. K. Stanley	CRC Press,	Eight	1996
04	Non-Destructive Testing	Ramchandran S.	AIR WALK Publications (India)	First	2017

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Non-destructive testing	Krant Krammer	McGraw Hill Education	Fifth	2012
02	Practical NDT	Baldev Raj	Narosa Book Distributors	Fourth	2010
03	Ultrasonic Testing of Materials	Josef Kraut Kramer, Herbert Kraut Kramer	Springer-Verlag	Fourth	1990
4	Non-Destructive Test and Evaluation of Materials	J Prasad, C. G. Krishnadas Nair	McGraw Hill Education	Second	2011

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B·Tech -ME - 22/48

Course Details:

Class	B. Tech, Sem.-VII
Course Code and Title	**1MEPE406, Energy Management**
Prerequisite/s	1MEPC302, 1MEPC209, 1MEPC203
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims :

01	To describe the energy scenario and the need for energy conservation.
02	To acquaint with the monitoring/targeting aspects of energy.
03	To develop the interest in energy auditing technologies/ procedures.
04	To prepare the students to select waste heat recovery techniques and cogeneration.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE406_1	**Explain** the various measures for energy conservation and financial implications for various thermal utilities.
1MEPE406_2	**Examining** the performance of thermal systems using energy management principles and energy audit.
1MEPE406_3	**Compute** the various techniques of waste heat recovery and cogeneration.
1MEPE406_4	**Analyze** the methods of energy conservation for air conditioning, heat recovery and thermal energy storage systems.
1MEPE406_5	**Evaluate** energy projects on the basis of economic and financial criteria.

Course Contents:

Unit 1	**Energy Scenario** Primary and Secondary Energy, Conventional and non-conventional energy, Energy Security, Energy conservation and its importance, Energy conservation Act, Thermal Energy basics, Need of Energy Audit and management, Global warming	**06 Hrs.**
Unit 2	**Energy Audit** Energy Audit- its definition and methodology, Energy Audit instruments, Benchmarking for energy performance, Energy Action Planning, Duties and responsibilities of Energy Manager: Energy financial management, Project Management, Energy monitoring and targeting, pinch technology, Detailed Energy Audit methodology, Standard guide for conducting Energy Audit, Case study on preparation of Energy Audit Phase II considering a case study	**08 Hrs**
Unit 3	**Instruments for Energy Auditing** Instrument characteristics- sensitivity, readability, accuracy, precision, and hysteresis, Error and Calibration, Measurement of flow, velocity, pressure, temperature, speed, power and humidity. Analysis of stack, water quality, power and fuel quality.	**07 Hrs.**

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Unit 4	**Thermal Utilities: Operation and Energy Conservation** Detailed analysis of methods and energy conservation of i) Boilers ii) Furnaces iii) Refrigeration Systems iv) Thermal storage	06 Hrs.
Unit 5	**Waste Heat Recovery** Availability and reversibility, First and Second law Efficiencies, Classification, Advantages and Applications, Commercially Viable Heat Recovery Devices, Saving Potential, Case Studies. **Cogeneration:** Introduction, Principles of Thermodynamics Combined Cycles, Topping, Bottoming, Organic Rankine Cycles, Advantages of Cogeneration Technology	08 Hrs.
Unit 6	**Economic Analysis** Investment- Need, Appraisal and Criteria, Financial Analysis Techniques- Break Even Analysis- Simple Payback Period, Return on Investment, Net Present Value, Internal Rate of Return, Cash Flows, DSCR, Financing Options, ESCO concept.	07Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Energy Management Principles	Smith & Parmenter	Elsevier	Second	2015
02	Energy Auditing and Conservation	Yacov Y. Haimes, Marguerite A. H Ruffner	Taylor & Francis Inc	First	1980
03	Energy Management	P R Trivedi, B R Julka	Commonwealth Publishers	First	1997
04	Industrial Energy Management and Utilization	Larry C. Witte, Philip S. Schmidt, David R. Brown	Springer	First	1988

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Handbook of Energy Efficiency	---	TERI- The energy and resources institute	---	---
02	Guide book for National Certification Examination for Energy Managers and Energy Auditiors	---	(could be downloaded from www.energymanagertraining.com	---	---
03	Handbook of Energy Engineeing	Albert Tremann & Paul Mehta	The Fiarmout Press Inc	---	---
04	Industrial Energy Management and utilization	G. L. Witte, Phillips S, Scbmidt and David R. Brown	Industrial Energy Management	First	1988
05	Energy Management Principles, Applications, Benefits & Saving	Carig, B. Saith	Pergamon Press, New York	First	2013

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Course Details:

Class	B. Tech, Sem.-VII
Course Code and Title	**1MEPE407, Reliability Engineering**
Prerequisite/s	1MEPC303
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives:

01	To introduce principles of reliability in engineering design.
02	To develop understanding of concepts of failures, maintainability and availability of the intended products/systems and services.
03	To develop an ability to apply various reliability techniques to solve problems related to mechanical engineering.
04	To develop an ability to analyze system reliability.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE407_1	**Explain** the basics concepts of reliability, maintainability and availability.
1MEPE407_2	**Apply** fundamentals of reliability to estimate various reliability measures.
1MEPE407_3	**Calculate** system reliability using basic reliability models.
1MEPE407_4	**Estimate** maintainability and availability characteristics.
1MEPE407_5	**Analyze** reliability of a given system/configuration using various reliability techniques.

Course Contents:

Unit 1	**Introduction:** Brief history, concepts, terms and definitions, applications, the life cycle of a system, concept of failure, typical engineering failures and their causes, theory of probability and reliability, rules of probability, random variables, discrete and continuous probability distributions, reliability data collection.	07 Hrs.
Unit 2	**Reliability Measures:** Reliability function–$R(t)$, cumulative distribution function (CDF)–$F(t)$, probability density function (PDF) – $f(t)$, hazard rate function–$\lambda(t)$, Mean time to failure (MTTF) and Mean time between failures (MTBF), median time to failure (t_{med}), mode (t_{mode}), variance (σ^2) and standard deviation (σ), typical forms of hazard rate function, bathtub curve and conditional reliability.	07 Hrs
Unit 3	**Basic Reliability Models:** Constant failure rate (CFR) model, failure modes, renewal and Poisson process, two parameter exponential distribution, redundancy with CFR model, time-dependent failure models, Weibull, Rayleigh, Normal and Lognormal distributions, burn-in screening for Weibull, redundancy, three parameter Weibull, calculation of $R(t)$, $F(t)$, $f(t)$, $\lambda(t)$, MTTF, t_{med}, t_{mode}, σ^2 and σ for above distributions.	07 Hrs.

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Unit 4	**Reliability Evaluation of Systems:** Reliability block diagram, series configuration, parallel configuration, mixed configurations, redundant systems, high level versus low level redundancy, k-out-of-n redundancy, complex configurations, network reduction and decomposition methods, cut and tie set approach for reliability evaluation.	**06 Hrs.**
Unit 5	**Maintainability and Availability:** Concept of maintainability, measures of maintainability, mean time to repair (MTTR), analysis of downtime, repair time distributions, stochastic point processes, maintenance concept and procedures, availability concepts and definitions, important availability measures.	**07 Hrs.**
Unit 6	**Design for Reliability and Maintainability:** Reliability design process and design methods, reliability allocation, failure modes, effects and criticality analysis (FMECA), fault tree and success tree methods, symbols used, maintainability design process, quantifiable measures of maintainability, repair versus replacement. **Reliability Testing:** Product testing, reliability life testing, burn-in testing, acceptance testing, accelerated life testing and reliability growth testing.	**08 Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	An Introduction to Reliability and Maintainability Engineering	Charles E. Ebling	Waveland Press	Third	2019
02	Reliability Engineering	L. S. Srinath	East West Press, New Delhi	Fourth	2005
03	Engineering Reliability – New Techniques and Applications	B. S. Dhillon, Chanan Singh	John Wiley and Sons	First	1981
04	Engineering Maintainability	B. S. Dhillon,	Prentice Hall of India	--	1999

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Practical Reliability Engineering	Patrick D.T. O'Conner, David Newton, Richard Bromley	John Wiley and Sons.	First	2002
02	Reliability Engineering: Theory and Practice	Alessandro Birolini	Springer	First	2010
03	Reliability Engineering: Probabilistic Models and Maintenance Methods	Joel A. Nachlas	Taylor and Francis	--	2005
04	Case studies in Reliability and Maintenance	W. R. Blischke, D.N.P. Murthy	John Wiley and Sons	Second	2003

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Course Details:

Class	B. Tech, Sem.-VII
Course Code and Course Title	**1MEPE408, Industrial Engineering**
Prerequisite/s	--
Teaching Scheme: Lecture / Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims:

01	To introduce the various tools and techniques of industrial engineering.
02	To develop managerial skills relevant to the industry.
03	To make students familiar with various lean manufacturing techniques.
04	To train students to apply industrial engineering techniques to real/ practical problems.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE408_1	**Explain** different techniques used to improve the productivity and production.
1MEPE408_2	**Estimate** the process time using different work measurement techniques.
1MEPE408_3	**Identify** best sequence and schedule of various jobs and machines.
1MEPE408_4	**Apply** different inventory control and project management techniques.
1MEPE408_5	**Analyze** the plant location and design appropriate type of layout with suitable material handling system.

Course Contents:		Hours
Unit 1	**Industrial Engineering and Productivity** Scope, Role of industrial engineer, Tools and techniques of I.E. Productivity- concept, objective, factors affecting productivity, tools & techniques to improve productivity, value analysis & value Engineering.	07 Hrs.
Unit 2	**Lean Manufacturing** JIT, SMED, 5S, Kaizen, Six-sigma, Kanban, Management Information System, Total productive maintenance, Poka-Yoke.	07 Hrs.
Unit 3	**Method Study** Objectives of method study, various recording techniques, Therbligs, micro-motion study, MEMO motion study, principles of motion economy. **Work Measurement** Definitions, objectives, activity and elements, performance rating, rating methods, allowances, work sampling, PMTS, workplace ergonomics. (Numerical)	07 Hrs.
Unit 4	**Capacity and Aggregate planning, Scheduling** Introduction, measures of capacity, capacity strategies, overcapacity & under capacity factors. Aggregate planning, Aggregate planning strategies. Sequencing problems, n jobs 2 machines, n jobs 3 machines, scheduling, forward & backward scheduling. (Numerical)	07 Hrs.

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Unit 5	**Inventory Control and Network Techniques** Inventory valuation by LIFO and FIFO, ABC analysis, MRP, MRP-II, ERP, Network Techniques: CPM and PERT, Construction, Time cost tradeoff (Numerical.)	08 Hrs.
Unit 6	**Facility Planning** Plant site selection, factors influencing selection, optimum decision on choice of site & analysis, principle & objective of plant layout, types of plant layout, MHS.	06 Hrs.

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Operations Management: Theory and Practice	B. Mahadevan	Pearson Education India	Third	2015
02	Industrial Engineering and Production Management	Martand Telsang	S. Chand & Company Ltd., New Delhi	Second	2006
03	Global Management Solutions Demystified	Dinesh Seth, Subhash Rastogi	Cengage learning publications.	Second	2009
04	Industrial Engineering Handbook	H.B. Maynard and Others	Tata McGraw Hill Publication	Fourth	2009

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Hand Book of Industrial Engineering	Gavrial Salvendy	John Wiley and Sons, New York,	---	2007
02	Industrial Engineering	M. I. Khan	New age international(P) Ltd, New Delhi	Second	2004
03	Introduction To Work Study	International Labour Office	International Labour Office,1969	Third	2008
04	Operations research	D.S.Hira and Gupta	Chand & Co. New Delhi.	Seventh	2015

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Course Details

Class	B. Tech, Sem.-VII
Course Code and Course Title	1MEPC451, Finite Element Analysis Laboratory
Prerequisite/s	-
Teaching Scheme: Practical	02/00
Credits	01
Evaluation Scheme: ISE / ESE	25/25

Course Outcomes (COs)

Upon successful completion of this course, the student will be able to:

1MEPC451_1	Illustrate structural analysis process for mechanical components using Finite Element Software (ANSYS),
1MEPC451_2	Use computer programming C++ software to analyze mechanical components,
1MEPC451_3	Solve static structural, steady state thermal analysis 1D, 2D problems by using ANSYS software,
1MEPC451_4	Analyze 3D components with stress concentration geometry using ANSYS Workbench.
1MEPC451_5	Evaluate buckling analysis of column using ANSYS.

Course Contents:

The term work consists of following experiments:

1. Introduction to Finite Element Software (ANSYS)
2. Finite Element Approach and Computer Program using C++ for Stepped bar.
3. Static structural analysis of Truss /Beam using ANSYS. (APDL)
4. Steady state analysis of 1D or 2D Fin using ANSYS.
5. Static structural analysis of 3D component using ANSYS Workbench. (Mesh Convergence using Parameters Set).
6. Static structural analysis of 3D component with Stress concentration geometry using ANSYS Workbench. (Define Path to find results)
7. Buckling Analysis of Column using ANSYS.

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Introduction to Finite Elements in Engineering	Chandrapatala, Belgundu	PHI	Third	2012
02	Finite Element Methods for Engineers	U.S. Dixit	Cengage	Fourth	2011
03	An Introduction to Finite Element Method	J. N. Reddy	McGraw Hill	Second	2010
04	Finite Element Analysis – Theory and Practice	M. J. Fagan	Longman Scientific & Tech.	Second	2007

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	An Introduction to Finite Element Analysis	Barna Szabo, Ivo Babuska	....	.....	.....
2	Finite Element Methods for Engineers	S.S.Rao	.....	.....	.....
3	Finite Element Analysis Theory and Application With ANSYS	Saeed Moaveni	Prentice Hall	Third	.....
4	Finite Element Simulations With ANSYS Workbench 14 Perfect Paperback – Import, 11 Jun 2012	Huei-Huang Lee	Schroff Development Corp	First	2012
5	Ansys Workbench Tutorial Release 14: Structure & Thermal Analysis	Kent L. Lawrence	Schroff Development	Second	2012
6	Finite Element Analysis Using Ansys 11.0 Paperback	Srinivas Paleti	PHI	First	2010

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Course Details:

Class	B. Tech, Sem.-VII
Course Code and Course Title	**1MEPE452, Computational Fluid Dynamics Laboratory**
Prerequisite/s	1MEPC209, 1MEPC301, 1MEPC302
Teaching Scheme: Practical/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE / ESE	25/25

Course Objectives: The course aims:	
01	To introduce basics of Computational fluid dynamics.
02	To explain the use of various tools for fluid flow and heat transfer simulation.
03	To describe the fluid flow system with reference to experimental results.
04	To develop the interest for the application of CFD techniques for lifelong learning.

Course Outcomes (COs)	
Upon successful completion of this course, the student will be able to:	
1MEPE452_1	**Understand** the various applications of CFD tool.
1MEPE452_2	**Create** the fluid model by using design modular
1MEPE452_3	**Develop** an effective mesh to fluid model.
1MEPE452_4	**Solve** the governing equations iteratively by applying the suitable boundary condition.
1MEPE452_5	**Interpret** the flow pattern (fluid flow and heat transfer) and results obtained.

Course Contents:

The term work consists of following experiments:

1. Development of geometry with design modular.
2. Generation of Mesh with Ansys Mesher.
3. Fluid flow and heat transfer analysis in Mixing Tee.
4. Fluid Flow and heat transfer analysis in Mixing Tee for Discrete phase model.
5. Heat and fluid flow analysis in Multi-species flow.
6. External fluid flow simulation over an airfoil.
7. Heat dissipation simulation from electronic cooling with natural convection and radiation.
8. Fluid simulation in vertical wind turbine.
9. Fluid flow simulation in Multiphase unsteady environment.
10. Simulation of transient flow model.

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Computational fluid dynamics	Gautam Biswas	Narosa Publishing House, New Delhi	Third	2013
02	Fundamentals of incompressible fluid flow	Babu V	Anne Books Pvt Ltd. New Delhi, India	First	2010
03	Introduction to fluid dynamics	Batchelor G. K.	Cambridge University Press. New Delhi, India	Second	1999
04	Fluid Dynamics	Raisinghania M.D.	S Chand & Company, New Delhi	Fifth	2003

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Computational Fluid Mechanics the Basics with applications	Anderson J. D. Jr.	McGraw Hill Education Pvt. Ltd.	Sixth	2014
02	An introduction to computational fluid dynamics; the finite volume method	H. K. Versteeg and W. Malalasekera	Pearson Publication	Second	2009
03	Numerical heal transfer fluid flow	Suhas V. Patankar	Taylor & Francis	First	2014
04	Computational fluid dynamics	T. J. Chung	Cambridge University Press.	Third	2014
05	Computational Fluid Dynamics: A Practical Approach	JiyuanTu, Guan HengYeoh, Chaoqun Liu,	Butterworth – Heinemann	Second	2008

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B.Tech-ME-33/48

Course Details:

Class	B. Tech, Sem.-VII
Course Code and Title	**1MEPE453, Condition Monitoring Laboratory**
Prerequisite/s	--
Teaching Scheme: Lecture/Practical	02/00
Credits	01
Evaluation Scheme: ISE-I/MSE/ISE -II/ESE	25/25

Course Objectives:	
01	To Provide the students a sound knowledge vibration condition monitoring procedure.
02	To provide the students a hands-on practice of vibration analysis and fault diagnosis of machines.
03	To provide the students a hands-on practice of machine fault rectification.
04	To provide the hands-on practice of In-situ balancing of rotating machines.
05	To prepare the students to succeed as maintenance Engineer in industry/technical profession.

Course Outcomes (COs):	
Upon successful completion of this course, the student will be able to:	
1MEPE453_1	**Select** the proper type of condition monitoring method to be apply for maintenance of a machines.
1MEPE453_2	**Analyze** machine vibrations to diagnose mechanical faults in rotating machines.
1MEPE453_3	**Demonstrate** an ability to rectify the mechanical faults in the machines and systems.
1MEPE453_4	**Apply** the knowledge of condition monitoring for preventive maintenance of machines.
1MEPE453_5	**Evaluate** the balancing conditions and carry out site balancing.

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Course Contents:

1. Measurement of Overall vibrations on Rotating Machine to Judge the condition of machine
2. Frequency spectrum Analysis of rotating Machine for fault diagnosis
3. Single plane balancing of rotor using FFT analyzer
4. Two plane balancing of rotor using FFT analyzer
5. Condition monitoring of bearing and analysis
6. Alignment of shafts by using dial gauge, filler gauge
7. Alignment of shafts by laser technique
8. Evaluation of natural frequency by impact hammer
9. Octave band analysis of machinery noise
10. Case study on bearing faults

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Machinery condition monitoring-Principles and practice	Amiya Ranjan Mohenty	CRC press Tylor and Francis group	First	2014
02	Condition Monitoring of Industrial machinery	Ramesh Kumar G.R	LAMBERT Academic Publishing	First	---
03	Condition Monitoring with vibration signals	Ashoke Nandi , Hosameldin Ahamad	John Wiley and Sons I	First	2020

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Condition Monitoring and Diagnostic Engineering Management	Proceeding of Comaden 90	Chapman and Hall	First	1990
02	Advances in Condition Monitoring of Machinery in Non stationary operation	Proceeding of Third international conference	Springer	First	2013
03	Machinery Vibration Analysis-Diagnostics, Condition Evaluation and correction Volume-II	Ronald L. Eshleman .	Vibration Institute	First	2002

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B.Tech- ME - 35/48

Course Details:

Class	B. Tech, Sem.-VII
Course Code and Course Title	**1MEPE454, Non Destructive Testing** Laboratory
Prerequisite/s	1MEES252
Teaching Scheme: Practical	02/00
Credits	01
Evaluation Scheme: ISE / ESE	25/25

Course Objectives: The course aims:

01	To make aware about non-destructive testing methods.
02	To acquaint students for conducting visual inspection.
03	To conduct defect detection using magnetic particle inspection and dye penetrant test.
04	To develop the skills for conducting the ultrasonic testing of given component.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPE454_1	Identify use of suitable non-destructive method for particular application.
1MEPE454_2	Inspect surface flaws of the components using visual and liquid penetrant testing.
1MEPE454_3	Use magnetic particle inspection method for identification of surface and subsurface defect.
1MEPE454_4	Apply Ultrasonic testing method for welding joint and shaft inspection.
1MEPE454_5	Analyze the metal structure using microscopic examination process.

Course Contents:
1. Microscopic examination of metals.
2. Illustration of the surface defects using the Visual Testing.
3. Examination of the surface defects using the Liquid Penetrant Testing.
4. Determination of Surface and Subsurface Defects using the Magnetic Particle Inspection.
5. Basic Calibration of the Ultrasonic Testing Machine using Angle beam probes.
6. Calibration of Normal Beam probe and thickness measurement with UT.
7. Calculation of different parameters for welding defect analysis.
8. Determination of the defects in the Welded Joints using the angle probe.
9. Determination of the defects in the shafts using the normal probe.
10. Industrial Visit.

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Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Basics of Non-Destructive Testing	Lari, Kumar	S.K. Kataria & Sons	Fourth	2013
02	Non-Destructive Testing Techniques	Ravi Prakash	New Age International Private Limited	Fifth	2010
03	Welding Technology	O. P. Khanna	Dhanpat Rai Publications	Sixth	2011
04	Welding	David J Hoffman	Pearson Education	Second	2017

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Non destructive testing	Krant Krammer	McGraw Hill Education	Fifth	2012
02	Practical NDT	Baldev Raj	Narosa Book Distributors	Sixth	2009
03	Ultrasonic Testing of Materials	Josef Krautkramer, Herbert Krautkramer	Springer-Verlag	Fourth	1999
04	Non-Destructive Test and Evaluation of Materials	J Prasad, C. G. Krishnadas Nair	McGraw Hill Education	Second	2011

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B.Tech-ME-37/48

Course Details:

Class	B. Tech. Sem,-VII
Course Code and Course Title	1MEPR455, Project Phase-I
Prerequisite/s	All Courses
Teaching Scheme: Practical	10
Credits	05
Evaluation Scheme: ISE / ESE	50/50

Course Objectives: The course aims:	
01	To offer students a glimpse into real world problems and challenges that need a technology based solutions.
02	To develop the proficiency in the students for the problem formulation.
03	To prepare the students for effective completion of the project with the observations, discussions, decision making process & use of software's.
04	To develop the team building, communication and management skills of the students.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEPR455_1	Identify the real life practical problem relevant to the industry, societal, health & environmental issues for sustainable development.
1MEPR455_2	Formulate a practical problem in real life to explore for its possible solution after suitable review of literature.
1MEPR455_3	Analyze the feasibility of different mechanisms/techniques/process.
1MEPR455_4	Analyze the problem and give suitable cost-effective optimal solution on the basis of engineering knowledge.
1MEPR455_5	Design of components, system or process that meet the specified needs by using advance tools/ techniques/ resources.

Course contents:

- Project-I work can be a design project / experimental project and or computer simulation project on mechanical engineering or any of the topics related with mechanical engineering stream.
- Project-I can be consists of problem identification, literature review, formulation of problem, design of components/system/ process, modern tools used in the project.
- Submission of synopsis of selected project work. Synopsis report should highlight scope, objectives, methodology, approach and tools to be used like software, other expected results and outcomes along with timeframe.
- One copy of the synopsis report should be expected to submit to project guide and one copy should remain with project group.
- Project -I work is to be extended for Project -II at B. Tech. (Mech.) Semester-VIII with same group working under guidance of same project guide assigned for Project-I.

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Project work submitted by students shall include;

- The report of the work completed in the form of project work diary, Project-I report and other relevant documents shall be submitted for the term work. The term work shall be assessed by the project guide and the assessment shall be based on a presentation of the work completed and submission of report.

  - ➢ **Work Diary:** Work Diary maintained by group & countersigned by guide weekly. The contents of work diary shall reflect the efforts taken by project group for
    - Searching suitable project work
    - Brief report preferably on journals/ research or conference papers/ books or literature surveyed to select and bring up the project.
    - Day to day activities carried out related to project work for entire semester.

  - ➢ **Synopsis report:** The group should submit the synopsis in following prescribed format.
    - Title of Project
    - Names of Students
    - Name of Guide
    - Relevance
    - Literature review
    - Proposed work
    - Methodology
    - Expected outcomes
    - Plan of proposed work
    - Detailed Budget Estimate
    - References

  *Synopsis should consist of minimum **eight** review papers and shall be signed by the each student in the group, approved by the guide and endorsed by the Head of the Department.*

  - ➢ **Project-I report:** Project-I report should be of 25 to 30 pages (typed on A4 size sheets). For standardization of the project-I reports the following format should be strictly followed.
    - Page Size: Trimmed A4
    - Top Margin: 1.00 Inch
    - Bottom Margin: 1.32 Inches
    - Left Margin: 1.5 Inches
    - Right Margin: 1.0 Inch
    - Para Text: Times New Roman 12 Point . Font
    - Line Spacing: 1.5 Lines
    - Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
    - Headings: Times New Roman, 14 Point , Bold Face
    - References: References should have the following format

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- For Papers: *Authors, "Title of Paper", Publisher Details, Volume, Year, Page no*
- For Books: *Authors, "Title of Book", Publisher, Edition, page nos.*

➢ ***Presentation of work completed:*** The student has to make a presentation in front of the faculty members and review panel member at the time of review's and submit presentation soft copy to project guide.

- Project work consists of two presentation reviews based on work i.e. first review: Synopsis is to be assessed and second review: project work progress assessment is to be evaluated.

Important Notes:

- Project group should continue maintaining a work diary for project and should write (a) Book referred (b) Company visited (c) Person contacted (d) Paper referred (e) Creative thinking.
- Work diary along with Project -I report shall be assessed at the time of ESE examination

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B·Tech-ME - 40/48

Course Details:

Class	B. Tech, Sem.-VIII
Course Code and Title	**1MEHS409, Project and Finance Management**
Prerequisite/s	1MEHS213,
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I/MSE/ISE II/ESE	00/50/00/50

Course Objectives: The course aims:	
01	To elaborate fundamental principles of management and business.
02	To discuss principles, polices of material and financial management.
03	To acquire knowledge about purchasing cycle, purchase policies & procedures to evaluate the purchase performance.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEHS409_1	**Explain** the functions of management in organizations.
1MEHS409_2	**Categorize** different responsibilities, principles and polices of financial management and material management.
1MEHS409_3	**Make use of** purchasing cycle, purchase policies & procedures to evaluate the purchase performance.
1MEHS409_4	**Classify** financial sources for business management.
1MEHS409_5	**Prepare** project management plan for the given problem.

Course Contents:

Unit 1	**Business Environment** Environmental factors influencing business, external environment, General environment, Task environment, business ethics and social responsibility of business, Effect of Globalization.	08 Hrs
Unit 2	**Functions of Management** - Definition of Management, Management environment. Planning – Need, Objectives, Strategy, Policies, Procedures, steps in Planning, Organizing – Process of Organizing importance and principle of organizing, Departmentation, Organizational relationship, Authority, Responsibility, Delegation, Span of control. Staffing – Nature, Purpose, Scope, Human resource management, Policies, Recruitment procedure training and development, Appraisal methods. Controlling – Process, requirement for control Management	07 Hrs.
Unit 3	**Materials Management-** Definition, Scope, functions, Materials requirements planning, purchasing objectives, 5-R Principles of Purchasing, Functions of Purchase department, Purchasing cycle, Purchase policy & procedure, Evaluation of Purchase Performance. Vendor selection, vendor rating, Make or buy decisions, Inventory Control - ABC Analysis, EOQ, and Inventory cost relationships.	06 Hrs.

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Unit 4	**Fundamentals of Manufacturing and Engineering**: The Effects of Manufacturing on Nation. The Elements of Manufacturing Competitiveness. The Impact of Engineering on Manufacturing, Design for Productivity, Design to Cost, Design with Technology, Design for Quality.	**07 Hrs.**
Unit 5	**Financial Management**: Types of Capital, Source of finance, Capital building, Institutions of Industrial finance, cash flow, balance sheet. **Wage Administration**: Definition of Salary, different wage schemes, Advantages and disadvantages, Incentive, need, types, its merits and demerits.	**07 Hrs.**
Unit 6	**Principles of Project Management**: Time and Schedule Management, Project Duration Diagnostics, Schedule Compression Techniques, Resource Analysis and Management, Techniques for Project Forecasting, Project Risk Analysis, Project Economic Analysis.	**07Hrs.**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Industrial Organization and business management	M.T. Telsang	S. Chand & Co.	Fifth	2011
02	Industrial Engineering and Production Management	M.T. Telsang	S. Chand & Co.	Twelve	2013
03	Industrial Management & Operation Research	Nandkumar Huukkeri	Electrotech publication	Second	2010
04	Management	James A.F. Stoner, R. Edward Freeman	Prentice Hall of India New Delhi	Seventh	2010

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Industrial Engineering and Management	O.P. Khanna	S. Dhanpatrai and Company	Seventh	2011
02	Management Information Systems	G.B. Davis, M.H. Olson	Mc Graw Hill	First	1985
03	Managerial Economics	V.Mote, S. Paul, G. Gupta	Tata McGraw Hill	Third	2003
04	Business Economics	Pareek Saroj	Sunrise Publishers	Second	2004

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B.Tech- ME - 42/48

Course Details:

Class	B. Tech, Sem.-VIII
Course Code and Course Title	1MEMC411, Constitution of India
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	02/00
Credits	--
Evaluation Scheme: ISE	Audit

Course Objectives (COs):-
The course aims to,

1	To acquaint the students with legacies of constitutional development in India.
2	To make students aware of the theoretical and functional aspects of the Indian Parliamentary System.
3	To channelize students' thinking towards basic understanding of Government of the Union and Government of the States.
4	To channelize students' thinking towards basic understanding of the Judiciary. Regulation to Information acts.

Course Outcomes (COs):
Upon successful completion of this course, the student will be able to:

1MEMC411_1	**Explore** the basic features and modalities about Indian constitution.
1MEMC411_2	**Differentiate** the functioning of Indian parliamentary system at the center and state level.
1MEMC411_3	**Describe** different aspects of Indian Legal System and its related bodies.
1MEMC411_4	**Discuss** different laws and regulations related to engineering practices.
1MEMC411_5	**Correlate** role of engineers with different organizations and governance models.

Course Contents:

Unit 1	**Constitution:-** Structure and Principles Meaning of the constitution law and constitutionalism, Historical Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947, Enforcement of the Constitution Meaning and importance of Constitution Making of Indian Constitution – Sources Salient features of Indian Constitution. Preamble.	04 Hrs
Unit 2	**Fundamental Rights and Directive Principles:-** **Fundamental Rights:** Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies.	04 Hrs

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	Fundamental Duties: Directive Principles-Definition, State to secure a social order for the promotion of welfare of the people, Certain principles of policy to be followed by the State, Equal justice and free legal aid, Right to work, to education and to public assistance in certain cases ,Provision for just and humane conditions of work and maternity Living wage, etc., for workers, Participation of workers in management of industries etc.	
Unit 3	**Union Executive and State Executive** Powers of Indian Parliament Functions of Rajyasabha, Functions of Loksabha, Powers and Functions of the President, Powers and Functions of the Prime Minister, Lokpal, Lokayukta. State Executives-Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature.	**06 Hrs**
Unit 4	**The Judiciary:** Features of judicial system in India Supreme Court –Establishment and constitution of Supreme Court Salaries, etc., of Judges Appointment of acting Chief Justice Appointment of ad hoc judges Attendance of retired Judges at sittings of the Supreme Court Supreme Court to be a court of record Seat of Supreme Court Original jurisdiction of the Supreme Court ,High Court – Structure and jurisdiction, Attorney general of India.	**06 Hrs**
Unit 5	**Regulation to Information:** Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act The Limited Liability Partnership Act, 2008. Companies Act 2013.The Central Goods and Services Tax Act, 2017	**04 Hrs**
Unit 6	**Business Organizations and E-Governance** Sole Traders, Partnerships Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and Proceedings, Auditor, Winding up. E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in a few states creating hurdles in Industrial development.	**04 Hrs**

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	The Constitution of India	Dr. B. R. Ambedkar	Law literature Publications	---	2020
02	Introduction to the Constitution of India	Durga Das Basu	Gurgaon; LexisNexis	23rd	2018
03	Governance in India	M. Laxmikanth	Mc Graw Hill Publications Delhi	3rd	2021
04	The Constitution of India	P.M. Bakshi	LexisNexis	---	2019

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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Introduction to the Constitution of India	Durga Das Basu	Gurgaon; LexisNexis	23rd	2018
02	The Constitutional Law of India,	. J.N. Pandey	Allahabad; Central Law Agency	55th	2018
03	. Constitution of India (Full Text)	India.gov.in	National Portal of India	---	---
04	India's Constitution	M.V.Pylee	S. Chand Publications New Delhi	16th	2017

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Course Details:

Class	B. Tech. Sem,-VIII
Course Code and Course Title	1MEPR459, Project Phase-II
Prerequisite/s	All Courses
Teaching Scheme: Practical	12
Credits	06
Evaluation Scheme: ISE / ESE	100/100

Course Objectives: The course aims:

01	To offer students a glimpse into real world problems and challenges that need a technology based solutions.
02	To develop the proficiency in the students for the problem formulation.
03	To prepare the students for effective completion of the project with the observations, discussions, decision making process & use of software's for evaluating better solution.
04	To build confidence in handling and finding feasible solution of a real time industrial problem by providing Internship to students.

Course Outcomes (COs):

Upon successful completion of this course, the student will be able to:

1MEPR459_1	**Design** of components or system or process that fulfills the specified need with suitable consideration for the industry, public health, safety and with societal & environmental considerations.
1MEPR459_2	**Innovate and implement** ideas to working model or program for the conceptualize idea by using advance tools/ techniques/ resources.
1MEPR459_3	**Estimate** financial management of project by applying the engineering .& management principles.
1MEPR459_4	**Develop** components or system or process with realistic constraints using manufacturing resources.
1MEPR459_5	**Synthesize** the outcome of the problem and validate findings on the basis of experimentation.

Course Contents:

Project Phase-II:

- Project-II is a continuation of project-I started in the Semester VII and the final submission of the report will be at the end of the Semester VIII.
- Project-II work can be consist of design of components/equipment/ idea, fabrication/manufacturing and or exhaustive analysis in the context of 2-3 factors identified while formulating problem, experimental work and testing, report preparation. Students should attempt solution to the problem by experimental/simulation methods. The solution to be validated with proper justification.

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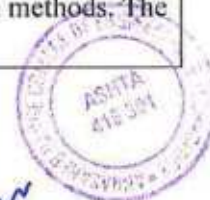
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- Students have to prepare final project report under the guidance of the project guide. Project report should consist of assembly and details drawing of product/setup/prototype prepared by using CAD software. It should also include bill of material, all geometrical dimensions, limit, fit and tolerances. One copy of the report should be expected to submit to Project guide and one copy should remain with project group.

Internship:

- In Internship, each student should undergo minimum 8 week to maximum 16 week training in the industry or organization. Each student should identify a problem from selected industry and try to find out a feasible solution of the same and document its report. The instructions or guidelines for carrying out internship will be provided by department.

Project work submitted by students shall include;

- The report of the work completed in the form of project work diary, final project report and other relevant documents shall be submitted for the term work. The term work shall be assessed by the project guide and the assessment shall be based on a presentation of the work completed and submission of final report.

  ➤ *Work Diary*: Work Diary should be maintained by group and countersigned by the guide weekly. The contents of work diary shall reflect the efforts taken by project group for
    - Summary of literature review. (Attach list of journal or conference papers)
    - Brief report of feasibility studies carried to implement the conclusion.
    - Rough Sketches/ Design Calculations/ Testing reports/ Experimentation results.

  ➤ *Final project report*: Project report should be of minimum 50 to 60 pages (typed on A4 size sheets). For standardization of the project report the following format should be strictly followed.
    - Page Size: Trimmed A4
    - Top Margin: 1.00 Inch
    - Bottom Margin: 1.32 Inches
    - Left Margin: 1.5 Inches
    - Right Margin: 1.0 Inch
    - Para Text: Times New Roman 12 Point . Font
    - Line Spacing: 1.5 Lines
    - Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman
    - Headings: Times New Roman, 14 Point , Bold Face
    - References: References should have the following format
    - For Papers: *Authors, "Title of Paper", Publisher Details, Volume, Year, Page no.*
    - For Books: *Authors, "Title of Book", Publisher, Edition, page nos.*

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> *Presentations of work completed*: The students has to make a presentation on project work & Internship progress in front of the faculty members and review panel members at the time of review's & submit the presentation soft copy to project guide.
>
> - Project work consists of two presentation reviews based on work i.e. first review: progress of the project work done is to be assessed and second review: complete assessment (quality, quantum and authenticity) of the thesis is to be evaluated.

Important Notes:

- Project group should continue maintaining a diary for project and should write (a) Books referred (b) Company visited (c) Person contacted (d) Computer work done (e) Paper referred (f) Creative thinking.
- The Work diary along with Project Report shall be assessed at the time of ESE examination
- Students should publish project work by preparing manuscript in peer reviewed journals/Conferences or actively participate in competitions based on the work.

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B.Tech-ME-48/48

Annasaheb Dange College of Engineering and Technology, Ashta
(An Autonomous Institute)

Structure and Curriculum

F.Y. B. Tech.
(Common to All Branches)

Academic Year 2017-2018

Teaching and Evaluation Scheme
B. Tech: Semester I (Physics Group)

| Course Code | Course | Teaching Scheme | | | | Evaluation Scheme | | | | |
| | | L | T | P | Credits | Scheme | Theory (Marks) | | Practical (Marks) | |
							Max	Min. for Passing	Max	Min. for Passing
0BSBS 101	Applied Physics	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSBS 102	Applied Mathematics I	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 103	Basic Electrical Engineering	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 104	Basic Civil Engineering	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 105	Engineering Graphics	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSHS 106	Professional Communication	2	--	--	2	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSBS 107	Applied Mathematics I Tutorial	--	1	--	1	ISE	--	--	25	10
0BSES 151	Workshop Practice I	--	--	2	1	ISE	--	--	50	20
0BSBS 152	Applied Physics Laboratory	--	--	2	1	ISE	--	--	25	10
0BSES 153	Basic Electrical Engineering Laboratory	--	--	2	1	ISE	--	--	25	10
0BSES 154	Basic Civil Engineering Laboratory	--	--	2	1	ISE	--	--	25	10
0BSES 155	Engineering Graphics Laboratory	--	--	2	1	ISE	--	--	25	10
0BSHS 156	Professional Communication Laboratory	--	--	2	1	ISE	--	--	25	10
Total		17	1	12	24		600		200	
Total Contact Hours/Week: 30 hrs										

Course Category	HS	BS	ES	PC	PE	OE	MC	AC
Credits	3	8	13					
Cumulative Sum	3	8	13					

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nDCET

Teaching and Evaluation Scheme
B. Tech: Semester I (Chemistry Group)

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks)		Practical (Marks)	
		L	T	P	Cre dits	Scheme	Max	Min. for Passing	Max	Min. for Passing
0BSBS 108	Applied Chemistry	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSBS 102	Applied Mathematics I	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 109	Basic Electronic Engineering	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 110	Engineering Mechanics	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 111	Basic Mechanical Engineering	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 112	Computer Programming	2	--	--	2	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSBS 107	Applied Mathematics I Tutorial	--	1	--	1	ISE	--	--	25	10
0BSES 157	Basic Electronic Engineering Laboratory	--	--	2	1	ISE	--	--	50	20
0BSBS 158	Applied Chemistry Laboratory	--	--	2	1	ISE	--	--	25	10
0BSES 159	Engineering Mechanics Laboratory	--	--	2	1	ISE	--	--	25	10
0BSES 160	Basic Mechanical Engineering Laboratory	--	--	2	1	ISE	--	--	25	10
0BSES 161	Computer Programming Laboratory	--	--	4	2	ISE	--	--	50	20
	Total	17	1	12	24		600		200	
	Total Contact Hours/Week: 30 hrs									

Course Category	HS	BS	ES	PC	PE	OE	MC	AC
Credits	0	8	16					
Cumulative Sum	0	8	16					

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Teaching and Evaluation Scheme
B. Tech: Semester II (Physics Group)

Course Code	Course	Teaching Scheme				Evaluation Scheme				
		L	T	P	Cre dits	Scheme	Theory (Marks)		Practical (Marks)	
							Max	Min. for Passing	Max	Min. for Passing
OBSBS 101	Applied Physics	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
OBSBS 113	Applied Mathematics II	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
OBSES 103	Basic Electrical Engineering	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
OBSES 104	Basic Civil Engineering	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
OBSES 105	Engineering Graphics	3	--	--	3	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
OBSHS 106	Professional Communication	2	--	--	2	ISE I	10	40	--	--
						MSE	30		--	--
						ISE II	10		--	--
						ESE	50		--	--
OBSBS 114	Applied Mathematics II Tutorial	--	1		1	ISE	--	--	25	10
OBSES 151	Workshop Practice I	--	--	2	1	ISE	--	--	50	20
OBSBS 152	Applied Physics Laboratory	--	--	2	1	ISE	--	--	25	10
OBSES 153	Basic Electrical Engineering Laboratory	--	--	2	1	ISE	--	--	25	10
OBSES 154	Basic Civil Engineering Laboratory	--	--	2	1	ISE	--	--	25	10
OBSES 155	Engineering Graphics Laboratory	--	--	2	1	ISE	--	--	25	10
OBSHS 156	Professional Communication Laboratory	--	--	2	1	ISE	--	--	25	10
	Total	17	1	12	24		600		200	
	Total Contact Hours/Week: 30 hrs									

Course Category	HS	BS	ES	PC	PE	OE	MC	AC
Credits	3	8	13					
Cumulative Sum	3	16	29					

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Teaching and Evaluation Scheme
B. Tech: Semester II (Chemistry Group)

Course Code	Course	Teaching Scheme				Evaluation Scheme				
							Theory (Marks)		Practical (Marks)	
		L	T	P	Credits	Scheme	Max	Min. for Passing	Max	Min. for Passing
0BSBS 108	Applied Chemistry	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSBS 113	Applied Mathematics II	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 109	Basic Electronic Engineering	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 110	Engineering Mechanics	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 111	Basic Mechanical Engineering	3	--	--	3	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSES 112	Computer Programming	2	--	--	2	ISE I	10		--	--
						MSE	30	40	--	--
						ISE II	10		--	--
						ESE	50		--	--
0BSBS 114	Applied Mathematics II Tutorial	--	1	--	1	ISE	--	--	25	10
0BSES 157	Basic Electronic Engineering Laboratory	--	--	2	1	ISE	--	--	50	20
0BSBS 158	Applied Chemistry Laboratory	--	--	2	1	ISE	--	--	25	10
0BSES 159	Engineering Mechanics Laboratory	--	--	2	1	ISE	--	--	25	10
0BSES 160	Basic Mechanical Engineering Laboratory	--	--	2	1	ISE	--	--	25	10
0BSES 161	Computer Programming Laboratory	--	--	4	2	ISE	--	--	50	20
	Total	17	1	12	24		600		200	
	Total Contact Hours/Week: 30 hrs									

Course Category	HS	BS	ES	PC	PE	OE	MC	AC
Credits	0	8	16					
Cumulative Sum	3	16	29					

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Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSBS101 Applied Physics
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10 / 30 / 10 / 50

Course Objectives: The course aims to

01	Explain basic concepts of Physics in optics and sound waves.
02	Make students aware of the importance of physics in today's developing world and growing society.
03	Provide knowledge and problem solving skills in the classroom learning environment.

Course Outcomes (COs): After successful completion of this course, the student will be able to:

0BSBS101_1	Describe different concepts related to diffraction, polarization, ultrasonic's, acoustics, laser and optical fibre. (2nd cognitive level)
0BSBS101_2	Explain various phenomenon and properties in nuclear energy, crystallography and nano physics. (2nd cognitive level)
0BSBS101_3	Derive formulae related to optics, acoustic and crystallography. (2nd cognitive level)
0BSBS101_4	Calculate energy released in nuclear reactions like fission and fusion. (3rd cognitive level)
0BSBS101_5	Solve relevant problems in optics, acoustic and crystallography. (3rd cognitive level)

Course Contents:		Hrs.
Unit 1	**Diffraction and Polarization :** **I) Diffraction:** Introduction, Propagation of electromagnetic waves, Plane diffraction grating:- construction, theory, determination of wavelength, resolving power, Numerical. **II) Polarization:** Introduction, Concept of Polarization, Brewster's Law, Malus law, Huygen's theory of double refraction (positive and negative crystals, ordinary and extraordinary rays), Optical activity, Laurent's half shade Polarimeter, Numerical.	07
Unit 2	**Ultrasonic and Architectural acoustics:** **I) Ultrasonic waves:** Introduction, Production of ultrasonic waves (magnetostriction method), Detection, Properties, Determination of wavelength and velocity and applications of ultrasonic waves, Numerical. **II) Architectural Acoustics:** Introduction, Basic requirement for the acoustically good halls, Reverberation, Reverberation time, Absorption coefficient, Sabine's formula (no derivation), Factors affecting architectural acoustics and their remedies, Numerical.	07
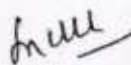
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Unit 3	**Laser and Fibre Optics :** **I) Laser**: Introduction, Basic concepts of Laser:- Absorption, spontaneous emission, stimulated emission, pumping, population inversion. Characteristics of laser, Solid State laser, Applications of laser, Holography (construction and reconstruction). **II) Optical fibre**: Introduction, Basic principle (total internal reflection), Structure of optical fibre, Propagation of light through cladded fibre, Acceptance angle and acceptance cone (no derivation), Numerical aperture (no derivation), Classification of optical fibre, Advantages and disadvantages of optical fibre, Applications of optical fibres, Numerical.	07
Unit 4	**Nuclear Energy:** **I) Fission:** Introduction, Discovery, Energy released by 1 Kg. of $_{92}U^{235}$, Chain reaction, Explosive chain reaction and critical size, Nuclear reactor (essentials and their classification) Numerical. **II) Fusion:** Introduction, Stellar thermonuclear reactions (P-P chain and C-N cycle), Conditions for fusion reaction, Fusion power reactor, Distinguish between fission and fusion.	07.
Unit 5	**Solid State Physics :** **Crystallography:**Introduction, Unit cell, Bravais lattices, Properties of unit cell (number of atoms per unit cell, coordination number, atomic radius, packing fraction), Calculation of lattice constant, Symmetry elements in cube, Miller indices:- Procedure, Features and Sketches for different planes, X-ray diffraction (Laue method), Bragg's law, X-ray diffractometer, Numerical.	07
Unit 6	**Nano Physics :** Introduction, Concept of nanotechnology, Production techniques:- Top-down (eg. Ball milling) and Bottom-up (eg. Sol-gel process), Tools – Scanning Electron Microscope (SEM) and Atomic Force Microscope (AFM), Applications of nano-materials, Carbon Nano Tube (CNT):- Structure, two types, properties and applications.	07
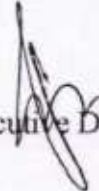
Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Engineering Physics	P. K. Palanisamy	Sci Tech pub. (P) Ltd.	2nd	2009
2	Engineering Physics	G Vijayakumari	Vikas Pub. House (P) Ltd	3rd	2009
3	A Text Book of Engineering Physics	M.N.Avadhanulu& P. G. Kshirsagar	S. Chand Publication.	12th	2006
4	Introduction to Nano science and Nanotechnology:	K.K. Chattopadhyay and A.N. Banerjee,	PHI Learning	3rd	2009
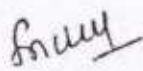
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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
1	Engineering Physics	R. K. Gaur & Gupta S. L	Dhanapat Rai Publication	8th	2008
2	Engineering Physics	Resnick Halliday, Krane,	John Wiley & Sons Pub.	8th	2008
3	Introduction to Solid State Physics	Charles Kittle,	Wiley India Pvt. Ltd	7th	2008
4	Solid State Physics:	S. O. Pillai	New Age International Ltd.	6th	2007
5	Materials Science and Engineering –	V. Raghvan,	PHI Learning.	5th	2006
6	Engineering Physics:	D.K. Bhattacharya and A.Bhaskaran,	Oxford University Press	6th	(2010)

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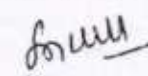
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Course Details:

Class	F.Y. B. Tech Sem.-l & II
Course Code and Course Title	0BSBS152 **Applied Physics Laboratory**
Prerequisite/s	--
Teaching Scheme: Practical/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE /ESE	25/00

Laboratory Objectives :The students carrying out experiments are expected to,	
1	Determine band gap energy, lattice constant and refractive index of water.
2	Calculate various properties of light and laser such as wavelength, divergence, intensity and specific rotation.
3	Perform experimental task and obtain final results as per instructions by faculty.
4	Obtain and interpret experimental results individually.
5	Complete desired task and respond to the instructions by faculty.

Laboratory Outcomes :The students will be able to	
0BSBS152_1	Calculate band gap energy, lattice constants of crystal and refractive index of water. (2nd cognitive level)
0BSBS152_2	Apply various optical formulae to determine wavelength, Divergence, Intensity and Specific rotation of light. (3rd cognitive level)
0BSBS152_3	Follow written or verbal instructions to carry out experimental task in Applied Physics Laboratory. (1st Psychomotor Domain)
0BSBS152_4	Perform the experimental task individually in laboratory and interpret the results. (2nd Psychomotor Domain)
0BSBS152_5	Respond willingly to question asked by faculty. (2nd Affective Domain)

LIST OF EXPERIMENTS

Expt. No	Title of the Experiment
1	Plane Diffraction Grating
2	R.P. of Grating
3	R.P. of telescope
4	Laurent's Half Shade Polarimeter
5	Kund's tube for determination of velocity of sound
6	Divergence of The LASER Beam
7	Wavelength of LASER
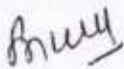
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8	Inverse Square Law
9	Band Gap of Semiconductor
10	Seven Crystal System
11	Symmetry Element of Cube
12	Angle of deviation of prism
13	Double Refraction
14	R.I. of water using microscope

Minimum Eight experiments should be performed from the list.
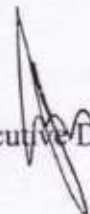
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Course Details:

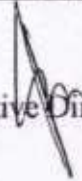| Class	F.Y. B. Tech Sem.-I
Course Code and Course Title	0BSBS102 Applied Mathematics I
Prerequisite	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI/ MSE/ISEII/ESE	10/30/10/50
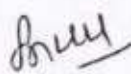
Course Objectives: The course aims	
01	To develop mathematical logical thinking power of students.
02	To produce graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in the solution of problems in the area of engineering.
03	To teach mathematical methodologies to provide students with skills in linear algebra, complex numbers and infinite series which would enable them to devise engineering solution for given situations they may encounter in their profession.
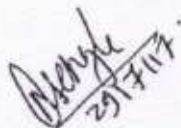
Course Outcomes : After successful completion of this course, the students will be able to:	
0BSBS102_1	Reduce matrices to normal and echelon form and apply the concept of rank of a matrix to solve system of linear equations. (3rd Cognitive level)
0BSBS102_2	Utilize the knowledge of vector space, subspace and examine the dependence and independence of vectors. (3rd Cognitive level)
0BSBS102_3	Identify Eigen values and make use of it for finding Eigen vectors and use Cayley-Hamilton theorem to find higher power of matrix. (3rd Cognitive level)
0BSBS102_4	Solve problems involving complex numbers making use of different forms and properties of complex numbers, hyperbolic functions. (3rd Cognitive level)
0BSBS102_5	Apply Taylor theorem to find the expansion of functions and identify the indeterminate forms. (3rd Cognitive level)
0BSBS102_6	Identify the convergence of infinite series. (3rd Cognitive level)

Course Contents:		Hrs.
Unit1	**Matrices and Solution of Linear System Equations:** Rank of Matrix: Definition, Normal form, Echelon form, Consistency of linear system of Equations.	06
Unit2	**Vector Spaces:** Vector spaces, subspaces, orthogonal vectors, linear dependence and independence of vectors, basis, dimension, four fundamental subspaces, linear transformation.	07

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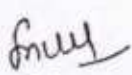
Unit3	**Eigen Values and Eigen Vectors:** Eigen values, Properties of Eigen values, Eigen vectors, Properties of Eigen vectors, quadratic forms, Cayley-Hamilton Theorem, Inverse and Higher powers of matrix using Cayley-Hamilton's theorem.	08
Unit4	**Complex Numbers:** De Moivre's Theorem, Roots of complex numbers, Expansion of $\sin n\theta$ and $\cos n\theta$ in powers of $\sin\theta$ and/or $\cos\theta$, Circular functions of a complex variable–definitions, Hyperbolic Functions, Relation between Circular &Hyperbolic functions, Inverse Hyperbolic Functions, Separation into real and imaginary parts.	08
Unit5	**Expansion of Functions (One Variable) and Indeterminate Forms:** Maclaurin's theorem , Taylor's theorem , Standard expansions, Expansion of function in power series by using Standard series method, Indeterminate forms and L' Hospital's rule.	06
Unit6	**Infinite Series:** Introduction of sequence and series, comparison test, Integral test, D'Alemberts Ratio test, Raabe's test, Logarithmic test, Cauchy's Root test.	07

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Higher Engineering Mathematics	Dr. B. S Grewal	Khanna Publishers	40th	2010
02	Advanced Engineering Mathematics	N. P. Bali, Manish Goyal	Infinity science press	7th	2010
03	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley Publishers	9th	2013
04	Advanced Engineering Mathematics	H. K. Das	S. Chand	19th	2010
05	Linear Algebra and Its Applications	Gilbert Strang	Thomson Publication (USA)	4th	2006
06	Linear Algebra	Seymour Lipschutz, Marc Lars Lipson	McGraw-Hill	4th	2009

Note: - Refer the following books for respective unit.

1. Higher Engineering Mathematics by Dr. B. S. Grewal for Unit no.- 1, 3, 4, 5 & 6
2. Linear Algebra and Its Applications by Gilbert Strang or Linear Algebra by Seymour Lipschutz, Marc Lars Lipson for Unit No. – 2

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Course Details:

Class	F.Y. B. Tech Sem.-I
Course Code and Course Title	0BSBS107 Applied Mathematics-I Tutorial
Prerequisite	---
Teaching Scheme: Practical/Tutorial	00/01
Credits	01
Evaluation Scheme: ISE/ESE	25/00
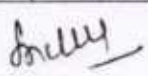
Laboratory Objectives: The course aims	
01	To develop mathematical logical thinking power of students.
02	To produce graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in the solution of problems in the area of engineering.
03	To teach mathematical methodologies to provide students with skills in liner algebra, complex numbers and infinite series which would enable them to devise engineering solution for given situations they may encounter in their profession.
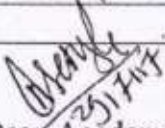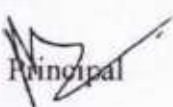
Course Outcomes :After successful completion of this course, the students will be able to:	
0BSBS107_1	Reduce matrices to normal and echelon form and apply the concept of rank of a matrix to solve system of linear equations. (3rd Cognitive level)
0BSBS107_2	Utilize the knowledge of vector space, subspace and examine the dependence and independence of vectors. (3rd Cognitive level)
0BSBS107_3	Identify Eigen values and make use of it for finding Eigen vectors and use Cayley-Hamilton theorem to find higher power of matrix. (3rd Cognitive level)
0BSBS107_4	Solve problems involving complex numbers making use of different forms and properties of complex numbers, hyperbolic functions. (3rd Cognitive level)
0BSBS107_5	Apply Taylor theorem to find the expansion of functions and identify the indeterminate forms. (3rd Cognitive level)
0BSBS107_6	Identify the convergence of infinite series. (3rd Cognitive level)

List of Tutorials	
Sr. No.	**Title of Tutorials**
1	Matrices and Solution of Linear System of Equations
2	Vector spaces
3	Eigen Values and Eigen Vectors–I
4	Eigen Values and Eigen Vectors -II
5	Complex Numbers
6	Hyperbolic Functions
7	Expansion of Functions (One Variable) and Indeterminate Forms
8	Infinite Series

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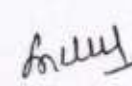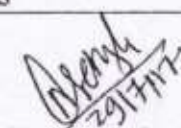
Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES103 **Basic Electrical Engineering**
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50
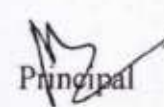
Course Educational Objectives(CEOs): The course aims to:	
01	To explore the students with the field of Electrical Engineering
02	To frame and solve problems on electric and magnetic circuits
03	To introduce concepts in single phase and three phase AC circuits
04	To explain the prerequisites of electrical machines and correlations of electric and magnetic circuits.
05	To describe the construction, working and characteristic of electrical Machines viz. transformer, DC Motor and single phase AC Motor

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0BSES103_1	Define various terms related to electric & magnetic circuits. (1st Cognitive Level)
0BSES103_2	State the significance of power factor improvement in single phase AC system. (1st Cognitive Level)
0BSES103_3	Express the relations of line and phase quantities in balanced star and delta connected three phase system. (2nd Cognitive Level)
0BSES103_4	Explain working principle, construction & applications of transformer, DC Motor, single phase AC motor & universal motor (2nd Cognitive Level)
0BSES103_5	Apply conceptual understanding to solve numerical related to DC circuits, energy conversions, magnetic circuits, single phase AC circuits, transformer. (3rd Cognitive Level)

Course Contents		Hrs.
Unit 1	**DC Circuits** Definitions: EMF, Current, Work, Power, Energy, Ohm's Law, Temperature Coefficient of Resistance, Voltage & Current Source, Kirchhoff's Law, Analysis of DC Circuit using KCL & KVL, Conversion between Electrical, Mechanical & Thermal quantities	8

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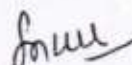
Unit 2	**AC Circuits** A. **Single Phase A.C Circuit:** Faraday's law of Electromagnetic Induction, Generation of Sinusoidal voltage, RMS value, Average value, Form Factor, Peak factor, phasor representation of AC quantities R, L, C, R-L, R-C, R-L-C series circuit, R-L & R-L-C parallel circuit, Power, Power factor, power factor improvement by shunt capacitor. B. **Three Phase A.C Circuit:** Generation of three phase A.C voltage, Balanced three phase system, Relation between line and phase quantities.	10
Unit 3	**Magnetic Circuit:** Concept of Magnetic Circuit and Definition, Comparison between Electric and Magnetic Circuit, Series magnetic circuit, Magnetization (B-H curve), Magnetic Leakage and Fringing	5
Unit 4	**Single Phase Transformer:** Working principle, construction, Types, EMF equation, Transformer ratio, operation of transformer on no load and on load, losses, efficiency and voltage regulation, Transformer testing.	9
Unit 5	**DC Motor** Working principle, construction, Back EMF, Necessity of starters, Types of Starters, characteristics (T-N), equation of torque, speed control methods, application.	5
Unit 6	**Single Phase AC Motor** Operating principle, Construction, Double field revolving theory, Types: Split phase I.M, Shaded pole I.M, **Universal Motor:** Construction, operating principle, application.	5
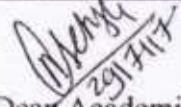
Text Books:

Sr. No	Title	Author	Publisher
01	Fundamentals of Electrical Technology	V. K. Mehta	S. Chand Publications, New Delhi
02	A Textbook of Electrical Technology	B L Theraja & A K Theraja	S. Chand Publications, New Delhi

Reference Books:

Sr. No	Title	Author	Publisher
1	Electrical Engineering Concepts and Applications	PV Prasad & S. Shivanaraju	CENGAGE Learning
2	Fundamentals of Electrical Engineering	Bharati Dwivedi, Anurag Tripathi	Wiley
3	Electrical Engineering Fundamental	Vincent Del Toro	Pearson Publication
4	Basic Electrical Engineering	I.J. Nagrath, D. P. Kothari	Tata McGraw Hill
5	Fundamentals of Electrical Engineering	Ashfaq Husain	Dhanpat Rai & co.
6	Basic Electrical & Electronics Engineering	S. K. Bhattarachya	Pearson Publication

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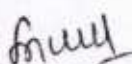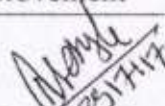
Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES153 Basic Electrical Engineering Laboratory
Prerequisite/s	--
Teaching Scheme: Practical /Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Laboratory Education Objectives (LEOs): Course aims to

01	To explain safety precautions in electrical engineering practices
02	To familiarize with electrical components and equipment & their testing
03	To outline working of different electrical measuring equipment
04	To perform hands on experiments with electrical appliances
05	To relate mathematical treatments (Laws and Theorems) with real world case studies

Laboratory Outcomes (LOs): Upon completion of this course students will be able to

0BSES153_1	Identify electrical components & equipment.	(1st Cognitive Level)
0BSES153_2	Practice safety precautions required for electrical engineering practices.	(2nd Cognitive Level)
0BSES153_3	Perform the measurement of different electrical parameters with appropriate measuring instruments.	(3rd Cognitive Level)
0BSES153_4	Perform different tests and evaluate performance parameters of Transformer.	(3rd Cognitive Level)
0BSES153_5	Correlate the observations and results of experiment with different laws and theorem.	(3rd Cognitive Level)

Expt. No	Title of Experiment
1	Study of laboratory tools, symbols, measuring instruments, Energy meter
2	Electrical Safety Precaution and Earthing
3	Wiring Circuits and Single line diagram
4	Lamps and illumination Schemes
5	Kirchhoff's Voltage and Kirchhoff's Current Law
6	RTD PT-100 with Wheatstone bridge for temperature measurement
7	RLC series Circuit
8	Power Factor improvement

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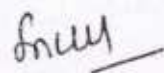
9	B-H curve for magnetic material
10	Transformer Testing
11	Three Phase power measurement
12	Electrical Appliances
13	Study of solar PV system for home lighting

Any ten experiments should be performed from above listed table.

Self-learning content for students:

Study of different Renewable Energy Sources and its environmental impact, Single line diagram of power system, construction and working of Fuse, MCB, different types of Batteries, Electricity Bill.

Note: The assessment of above listed self-learning content will be based on oral exam of each student.

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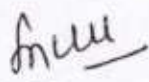
Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES104, **Basic Civil Engineering**
Prerequisite	--
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives The course aims	
1	To understand the scope of civil engineering and suitability of materials for construction.
2	To apply surveying, leveling techniques with the help of various instruments.
3	To discuss principles of planning with building byelaws and Property transaction.
4	To understand various building components.
5	To understand fundamentals of Transportation, Environmental and Irrigation Engineering

Course Outcomes (COs): Upon successful completion of this course, the student will be able to:	
0BSES104_1	Describe scope of civil engineering and suitability of materials for construction (2nd Cognitive Level)
0BSES104_2	Apply the knowledge of surveying techniques. (3rd Cognitive Level)
0BSES104_3	Discuss the principles of planning with building bye laws and property transaction. (2nd Cognitive Level)
0BSES104_4	Explain various building components. (2nd Cognitive Level)
0BSES104_5	Discuss fundamentals of Transportation, Environmental and Irrigation Engineering. (2nd Cognitive Level)

Course Contents:		Hrs.
Unit 1	**Introduction to Civil Engineering and Building Materials** Introduction, branches of civil engineering, application of civil engineering in other allied fields, Role of civil engineer in various construction activities. Use and properties of the following materials: Bricks, Steel, Aluminum, Cement, Aggregate, Plastic. Concrete - Ingredient, grades of concrete. Introduction to Plain and Reinforced Cement Concrete, Pre stressed, Precast, Post tensioned and Ready Mix Concrete.	09
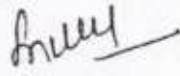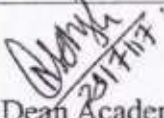
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Unit 2	**Surveying** Principles of surveying, Classification of surveys, Chain Surveying Introduction to metric chain and tapes, correction in tape, ranging. Measurement of horizontal angle: Meridian, bearing and its types, system of bearing, Types of compass, Calculation of included angles, correction for local attraction.	07
Unit 3	**Leveling and Advanced surveying instrument** Terms used in leveling, leveling instruments, methods of reduction of levels, types of leveling. Contours: Characteristics of contours use of contour maps. Measurement of area by Planimeter: Mechanical and Digital. Introduction to EDM and Total station.	07
Unit 4	**Building Planning and Property Transaction** Principles of planning. Building bye laws - building line, Height of building, Open space requirements, FSI. Introduction to Property Transaction: Documents, flow chart.	05
Unit 5	**Building Components** Introduction to types of structures - load bearing and framed structures, types of loads **Sub-structure** Elements of sub structure and their functions, types of soil and rocks, concept of bearing capacity, types of foundations i.e. shallow and deep and their suitability. **Super-structure** Elements of super-structures and their functions	07
Unit 6	**Introduction to Transportation, Environmental and Irrigation Engineering** Components of rigid and flexible pavement, Cross section of road in cutting and filling, components of railway track (Broad Gauge), Components of water supply scheme (flow diagram), Green building concept and rating system. Introduction to Gravity and Earthen Dam.	07

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Basic Civil Engineering	G. K. Hiraskar	Dhanpatrai Publications	First	2008
02	Surveying	N. Basak	Tata Mac Graw Hill., Publications	First	2008
03	Basic Civil Engineering	S. S. Bhavikatti	New Age International Publications	Second	2003
04	Surveying Vol. I, II, II	B. C. Punmia	Laxmi Publications	Second	2001
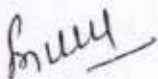
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Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Civil Engineering Handbook	P.N.Khanna	Engineer's Publishers	17th	1999
02	The A To Z of Practical Building Construction and its Management	Sandeep Mantri	Satya Prakashan	1st	2010
03	Advanced Surveying: Total Station, GIS and Remote Sensing	Satheesh Gopi, R. Sathikumar, N. Madhu	Pearson Education India;	1st	2006
04	Engineering Surveying	Schofield W.	Taylor and francies	6th	2007
05	Surveying	A.Bannister, S.Raymond, R.Baker	Pearson	7th	2002

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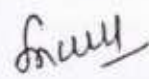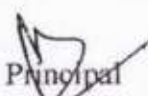
Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES154, **Basic Civil Engineering Laboratory**
Prerequisite	--
Teaching Scheme: Practical /Tutorial	02/00
Credits	01
Evaluation Scheme: ISE	25/00

Laboratory Objectives:- The course aims	
C-I	To locate building outline by using chaining, ranging and offsetting.
C-II	To study working and use of compass.
C-III	To study working and use of dumpy level .
C-IV	To measure area of an irregular shape of figure.
C-V	To understand working of Total Station.
C-VI	To discuss various building components.
C-VII	To understand and apply principles of planning.

Laboratory Outcomes (COs):- Upon completion of this course, students will be able to		
1	Draw building outline by using chaining, ranging and offsetting.	(3rd Cognitive Level)
2	Calculate corrected included angles of traverse by compass.	(3rd Cognitive Level)
3	Calculate reduced levels of different points by leveling.	(3rd Cognitive Level)
4	Compute the area of an irregular shape of figure mechanical and digital Planimeter.	(3rd Cognitive Level)
5	Calculate linear and angular measurement by Total Station.	(3rd Cognitive Level)
6	Identify various building components.	(2nd Cognitive Level)
7	Draw line plan of residential building by applying principles of planning.	(3rd Cognitive Level)
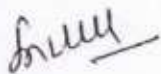
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List of Experiments

Sr. No.	Experiments
1	Plotting the outline of building by chaining, ranging and offsetting.
2	Traversing by Compass.
3	Determination of reduced levels for different points by HI method.
4	Determination of reduced levels by rise and fall method.
5	Measurement of area of irregular figure by mechanical and digital planimeter.
6	Study of total station and Linear measurement.
7	Angular measurement by using total station.
8	Measurement of area by using total station.
9	Visit to construction site and draw various building components.
10	Draw a line plan of residential building by applying principles of planning.
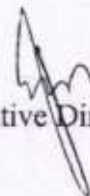
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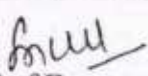
Course Details:
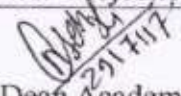
Class	B. Tech, Sem.-I & II
Course Code and Course Title	0BSES105 Engineering Graphics
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50
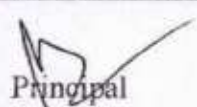
Course Objectives: The course aims

01	To explain the basic knowledge of drawing, drawing tools and methods of projection.
02	To explain the application of drawing in different disciplines of engineering.
03	To develop skills in extracting information from schematic diagrams to produce different drawings
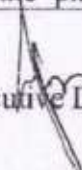
Course Outcomes: Upon successful completion of this course, the student will be able to

0BSES105_1	Explain basic concepts in drawing and its application.	(2nd Cognitive Level)
0BSES105_2	Sketch projection of simple geometries.	(3rd Cognitive Level)
0BSES105_3	Sketch projection of solids.	(3rd Cognitive Level)
0BSES105_4	Prepare sectional views of solids & develop the lateral surfaces of solids.	(3rd Cognitive Level)
0BSES105_5	Sketch the Orthographic projections.	(3rd Cognitive Level)
0BSES105_6	Prepare the Isometric view of simple objects.	(3rd Cognitive Level)

Course Contents:

		Hrs.
Unit 1	**Fundamentals of Engineering Graphics and Engineering Curves** A) **Fundamentals of Engineering Graphics:** Introduction to Drawing instruments and their uses. Different types of lines used in drawing practice, Dimensioning system as per BSI (**Theoretical treatment only**) B) **Engineering curves:** Construction of regular Polygons up to hexagon). Ellipse, Parabola, Hyperbola, Involute, Archimedian spiral and Cycloid only.	06
Unit 2	**Projections of Lines and Planes** A) **Projections of Lines:** Introduction to First angle and third angle methods of projection. Projections of points on regular and auxiliary reference planes. Projections of lines (horizontal, frontal, oblique and Profile lines) on regular and auxiliary reference planes. True length of a line, Point View of a line, angles made by the line with reference planes. Projections of intersecting lines, Parallel lines, perpendicular lines, and skew lines. Grade and Bearing of a line. B) **Projections of Planes:** Projections on regular and on auxiliary reference planes. Types of planes (horizontal, frontal, oblique and Profile planes), Edge view and True shape of a Plane. Angles made by the plane with Principle reference planes. Projections of plane figures inclined to both the planes.	09
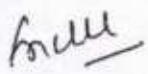
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		(Circle & regular polygon).	
Unit 3	**Projections of Solids**	Projections of Prisms, Pyramids, Cylinder and Cones inclined to both reference planes. **(Excluding Frustum and Sphere)**	06
Unit 4	**Orthographic Projections**	Lines used, selection of views, spacing of views, dimensioning and sections. Drawing required views from given pictorial views (conversion of pictorial views in to orthographic views), including sectional orthographic views.	07
Unit 5	**Isometric Projections**	Introduction to isometric. Isometric scale, Isometric projections and Isometric views /drawings. Circles in isometric view. Isometric views of simple solids and objects.	06
Unit 6	**Sections of Solids and Development of surfaces:**	**A) Sections of solids:** Prisms, Pyramids, Cylinders and Cones in simple positions and inclined to one reference plane and parallel to other. **B) Development of plane and curved surfaces:** Prisms, Pyramids, Cylinders and Cones along with cutting planes.	08

Text Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Engineering Drawing,	N. D. Bhatt	Charotor Publication House, Bombay	53rd	2014
02	Engineering Drawing	Dhananjay A. Jhole	Tata McGraw Hill International	5th	2011

Reference Books

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Engineering Drawing and Graphics	K. Venugopal	New Age Publication	5th	2004
02	Machine Drawing	K. L. Narayana	New Age Publication	3rd	2006
03	Engineering Drawing	N. B. Shaha and B. C. Rana	Pearson Education	2nd	2012
04	Fundamentals of Engineering Drawing	W. J. Luzadder	Prentice Hall of India.	1st	1964

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Course Details:

Class	B. Tech, Sem.-I & II
Course Code and Course Title	0BSES155, **Engineering Graphics Laboratory**
Prerequisite/s	---
Teaching Scheme: Practical/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE / ESE	25/00

Course Objectives: The course aims	
01	To make familiar about effective use of drawing tools and engineering drawing formats.
02	To develop and interpret basic drawing concepts.
03	To develop visualization skills and implement in various types of drawings

After successful completion of this lab work, the student will be able to	
0BSES155-1	Draw the projections the different lines, Planes and Solids in different positions develop the lateral surface of object. (3rd Cognitive Level)
0BSES155-2	Draw orthographic, sectional and isometric views. (3rd Cognitive Level)
0BSES155-3	Use/Handle different engineering drawing instruments accurately & carefully. (2nd Psychomotor Domain, Manipulation.)
0BSES155-4	Produce drawings with accuracy and proficiency. (3rd Psychomotor Domain, Precision)
0BSES155-5	Display a high degree of certainty in drawings and projections of complex components. (3rd Affective Domain, Valuing)

List of Practical's :

Sheet No.	Title of Drawing Sheet
01	Types of Lines and Lettering.
02	Engineering Curves
03	Projections of Straight lines and Projections of Planes (2 Sheets)
04	Projections of Solids
05	Orthographic projections (2 Sheets)
06	Isometric projections
07	Sections of Solids
08	Development of Lateral Surface

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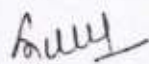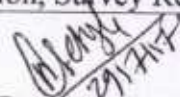
Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSHS106, **Professional Communication**
Prerequisite/s	---
Teaching Scheme: Lecture/Practical	02/00
Credits	02
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims	
01	Illustrate importance and usage of ICT based communication.
02	Explain importance of communication and communicative competence in English.
03	Describe importance of soft skills and nourish students' behavioral skills.
04	Explain professional correspondence and its use in their profession.
05	Illustrate tenses, types of sentences in English and strengthen students' vocabulary.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to	
0BSHS106_1	Recognize ICT based communication and its importance. (1st Cognitive Level)
0BSHS106_2	Illustrate concepts and facets of Oral and written Communication. (2nd Cognitive Level)
0BSHS106_3	Describe need of behavioral skills and professional correspondence in profession. (2nd Cognitive Level)
0BSHS106_4	Write emails, professional letters and reports effectively. (3rd Cognitive Level)
0BSHS106_5	Use knowledge of English grammar properly. (3rd Cognitive Level)

Course Contents:		Hrs.
Unit 1	**Remedial Grammar** Sentence Correction: Subject verb concord, Articles, Prepositions, Common Errors, Vocabulary: One word substitutes, Confused words. Reading a dictionary.	06
Unit 2	**Communication** Introduction, Process, Basic types: Verbal & Non-verbal, Barriers and filters of communication.	04
Unit 3	**Oral & Written Communication** Techniques of Oral Communication, Elocution, Group Discussion Interview. Basics of Written Communication, Paragraph writing, Essay Writing	06
Unit 4	**Professional Correspondence** Importance and techniques of Correspondence, Types of letters: Application Letter and Resume writing, Enquiry letter and its reply. Professional Report writing: Introduction, Survey Report.	05
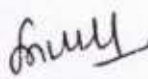
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Unit 5	ICT Based Communication	03
	Introduction, Language laboratory, email, blog, website, PPT, Seminar.	
Unit 6	Behavioral skills	04
	Understanding Self, SWOT Analysis, Johari Window, Developing positive attitude, Stress management, Time management, Professional and personal ethics.	

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Publication
01	Business Communication	Urmila Rai & S.M. Rai	Himalaya Publishing House	3rd	2012
02	Communication Skills	Meenakshi Raman & Sangeeta Sharma	Oxford University Press	3rd	2015
03	Effective Technical Communication	Ashraf Rizvi	Tata McGraw-Hill	5th	2014
04	Business Correspondence & Report-writing	R.C.Sharma & Krishna Mohan	Tata McGraw-Hill	2nd	2010

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Publication
01	Technical Writing &Professional Communication for non-native speakers of English	Thomas N.Huckin & Leslie A.Olsen	Tata McGraw-Hill	1st	2004
02	Better English pronunciation.	J. D. O'Connor,	Universal Book Stall	1st	1997
03	High-school English Grammar and Composition	Wren and Martin	S. Chand and Co., New Delhi	1st	2011
05	The Ace of Soft Skills	Gopal swami Ramesh, Mahadevan	Pearson Publication, Delhi.	2nd	2011

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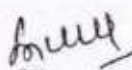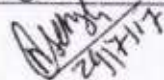
Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSHS156, **Professional Communication Laboratory**
Prerequisite/s	---
Teaching Scheme: Lab/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Course Objectives: The course aims

01	To motivate and guide students to perform better in formal communicative event.
02	To encourage students to write well organized essays, paragraphs and News.
03	To develop students' team spirit for effective participation in team.
04	To make students' familiar with formal situations by using Language Lab Software to understand and perform in their professional life.
05	To improve students' performance in written communication necessary in profession.
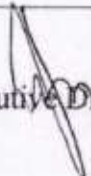
Course Outcomes (COs): Upon successful completion of this course, the student will be able to

0BSHS156_1	Prepare and perform better in formal communicative events. (3rd Psychomotor Skill Level)
0BSHS156_2	Write well organized essays and paragraphs. (3rd Psychomotor Skill Level)
0BSHS156_3	Strengthen their team spirit and perform effectively in a team. (3rd Attitude/ Affective Domain level)
0BSHS156_4	Improve their intonation, vocabulary and communicative performance. (1st Psychomotor Skill Level)
0BSHS156_5	Write relevant professional emails, letters and reports effectively. (3rd Cognitive Level)

Unit 1	**Grammar & Vocabulary**	
	1	Grammar Activities & Dictionary Reading
Unit 2	**Communication**	
	2	Elocution
Unit 3	**Oral & Written Communication**	
	3	Group Discussion
	4	Essay Writing
Unit 4	**Professional Correspondence**	
	5	Application Letter and Resume writing
	6	Professional Report writing
Unit 5	**ICT Based Communication**	
	7	Language Lab Session- I
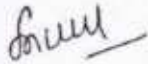
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	8	Language Lab Session- II
	9	E-mail writing
	10	Power Point Presentation
Unit 6	**Behavioral skills**	
	11	Teamwork: Developing positive attitude

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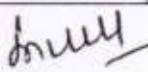
Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES151 **Workshop Practice - I**
Prerequisite/s	-
Teaching Scheme: Lab/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	50/00

Course Objectives: The course aims

01	To explain causes of accident and safety precautions while working in shop.
02	To demonstrate different measuring instruments and their applications.
03	To present different welding joints by using electric arc welding.
04	To demonstrate different tools for fitting operations.
05	To demonstrate different sheet metal working operations and tools.
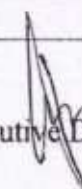
Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BSES151-1	Apply appropriate instruments and handle them carefully and safely to make measurements of the physical quantity. (3rd cognitive level)
0BSES151-2	Make male female joint by carrying out different fitting operations. (3rd cognitive level)
0BSES151-3	Prepare a job with different joining operations by electric arc welding. (3rd cognitive level)
0BSES151-4	Produce a component using different sheet metal operations and tools. (3rd cognitive level)

Course Contents:		Hrs.
Unit No.1	**Safety:** Concept of accidents causes of accidents, safety precautions while working in shop, safety equipments and their use. **Measuring Instruments:** Brief introduction to instruments like – Steel rule, Calipers, Vernier Caliper, Micrometer, Vernier height Gauge etc. Least counts, common errors and care while using them, Use of marking gauge, 'V' block and surface plate.	04
Unit No.2	**Fitting:** Study of various tools like- files, drills, taps, dies. Fitting operations. **Fitting:** One job Male/Female fitting with operations- Marking, cutting, drilling, tapping filing etc	10
Unit No.3	**Welding:** Importance of welding in Engineering, Introduction to different welding tools. **Welding:** One job on Arc welding- Lap / Butt Joint etc. (For individual student)	06
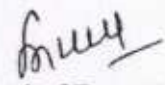
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| Unit No.4 | **Sheet metal working:** Introduction to sheet metal working operations like- cutting, bending, forming, riveting. Introduction of sheet metal tools.
Sheet metal working: One job on sheet metal working involving sheet metal cutting, bending, forming, riveting etc. | 08 |

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Workshop Technology -I & II	S K Hajara Choudhury, A K Hajara Choudhury, Nirjhar Roy	MMP Pvt. Ltd.	14th	2003

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Workshop Technology, Vol-I	S. Raghuvanshi	Dhanpat Rai and Sons	9th	2007
02	Workshop Practice	H.S.Bawa	TMH Publications, New Delhi	2nd	2012

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ADCET

Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSBS108 Applied Chemistry
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Course Objectives: The course aims	
01	To discuss basic concepts of chemistry in engineering.
02	To develop the ability to understand the effect of various impurities on water quality.
03	To outline the characteristics of fuels and alloys in domestic and industrial use.
04	To justify the properties of metal and alloys and effect of corrosion on them.

Course Outcomes :Upon successful completion of this course, the students will be able to:	
0BSBS108_1	Identify water quality parameters and methods for water softening. (2nd Cognitive Level)
0BSBS108_2	Discuss properties and applications of fuels and some alloys. (2nd Cognitive Level)
0BSBS108_3	Summarize different methods to prevent metals from corrosion. (2nd Cognitive Level)
0BSBS108_4	Describe principles of analytical instruments and properties of some advanced materials with their uses. (2nd Cognitive Level)
0BSBS108_5	Calculate total hardness of water and calorific values of fuel. (3rd Cognitive Level)

Course Contents:		Hrs.
Unit 1	**Water Technology:** Introduction, impurities in natural water, Water Testing: Total solids, acidity, alkalinity and chlorides, hardness of water (definition, causes and significance), disadvantages of hard water. Scale and sludge: formation in boilers and removal, Introduction to caustic-embrittlement, boiler corrosion, priming and foaming in boilers. Calculations of total hardness, Treatment of hard water by ion exchange process, Desalination of brackish water by Reverse Osmosis, Disinfection of domestic water by chlorination and ozone.	07
Unit 2	**Instrumental Techniques:** Introduction, advantages and disadvantages of instrumental methods. p^H-metry: Introduction, pH measurement using glass electrode and applications. Spectrometry: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert's law). Principles, instrumentation and applications of single beam spectrophotometer and flame photometry.	07
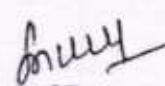
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	Chromatography: Introduction, Principle, instrumentation and applications of gas-liquid chromatography (GLC) and high performance liquid chromatography (HPLC).		
Unit 3	**Metallic materials & Green Chemistry:** Introduction, alloy definition and classification, purposes of making alloys. Ferrous alloys: Plain carbon steels (mild, medium and high). Nonferrous alloys: Copper alloy (Brass), Nickel alloy (Nichrome), Aluminum alloy (Duralumin and Alnico). **Green Chemistry:** Definition, Twelve principles of green chemistry, Research and industrial applications.	07
Unit 4	**Fuels and Batteries:** Introduction, classification, characteristics of good fuels, comparison between solid, liquid and gaseous fuels, types of calorific value (higher and lower), Bomb calorimeter and Boy's calorimeter. Numericals on Bomb and Boy's calorimeter. **Batteries:** Rechargeable alkaline storage batteries, Rechargeable Li- ion batteries (Diagram, charging-discharging reactions, advantages and applications). **Fuel Cells:** Introduction, H_2-O_2 Fuel cell (Construction, working and applications), applications of fuel cells.	07
Unit 5	**Corrosion:** Introduction, causes, classification, atmospheric corrosion (oxidation corrosion), electrochemical corrosion (hydrogen evolution and oxygen absorption mechanism), factors affecting rate of corrosion. Prevention of corrosion by proper design and material selection, hot dipping (galvanizing and tinning), cathodic and anodic protection methods, electroplating.	07
Unit 6	**Advanced Materials:** **Polymers**: Introduction, plastics, thermosoftening and thermosetting plastics, industrially important plastics like phenol formaldehyde, urea formaldehyde. Conducting polymers, biopolymers (preparation, properties and applications). **Nanomaterials:** Introduction, applications of nanomaterials- Catalysis, Electronics and Telecommunication, Medicines, Energy Sciences. **Composites:** Introduction, composition, properties and uses of fiber reinforced plastics (FRP) and glass reinforced plastic (GRP).	07

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	A Text Book of Engineering Chemistry	S. S. Dara	S. Chand & Co. Ltd., New Delhi.	11th	2008
02	A Text book of Engineering Chemistry	ShashiChawala	DhanpatRai Publishing Co. New Delhi.	3rd	2007
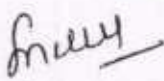
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Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Engineering Chemistry	Jain & Jain	Dhanpat Rai Publishing Co., New Delhi.	15th	2010
02	Industrial Chemistry	B. K. Sharma	Goel publication (P) Ltd.	10th	1999
03	Fundamentals of Engineering Chemistry	S. K. Singh	New Age International (P) Ltd, New Delhi.	1st	2009
04	Instrumental Methods of Chemical Analysis	Chatwal and Anand	Himalaya Publishing House, Mumbai.	5th	2005
05	Engineering Chemistry	Wiley India	Wiley India Pvt. Ltd., New Delhi.	1st	2012

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nDCET

Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSBS158 **Applied Chemistry Laboratory**
Prerequisite/s	---
Teaching Scheme: Practical/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Laboratory Objectives:
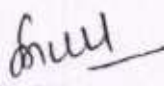
01	To test water quality parameters like hardness, acidity and chloride content.
02	To synthesize polymers and plastics.
03	To understand the mechanism of corrosion of metals in different environments.
04	To know the handling of different analytical Instruments.
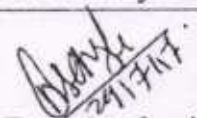
Laboratory Outcomes : Upon successful completion of this course, the student will be able to:

0BSBS158_1	Identify hardness, acidity, alkalinity and chloride content of water and percentage of elements in some alloys. (2nd cognitive level)
0BSBS158_2	Produce various advanced materials and analyze aqueous solutions using instruments. (3rd cognitive level)
0BSBS158_3	Carry out experimental tasks by handling different glassware's. (1st Psychomotor Domain) Imitation
0BSBS158_4	Perform various experiments by following written instructions. (2nd Psychomotor Domain) Manipulation
0BSBS158_5	Express involvement by understanding concepts in applied chemistry. (2nd Affective Domain) Responds to phenomena

List of Experiments:

Sr. No.	Title of Experiments
1	Determination of acidity of water.
2	Determination of alkalinity of water.
3	Determination of chloride content of water by Mohr's method.
4	Determination of total hardness of water by EDTA method.
5	Determination of moisture, volatile and ash content in a given coal sample by proximate analysis.
6	Preparation of urea-formaldehyde resin.
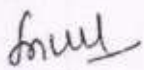
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7	Preparation of phenol-formaldehyde resin.
8	Estimation of zinc in brass solution.
9	Estimation of copper percentage in brass solution.
10	Determination of rate of corrosion of aluminium in acidic and basic medium.
11	Determination of pH of sample solution.
12	Demonstration of photo-colorimeter / spectrophotometer.
13	Demonstration of paper chromatography.

Minimum 8 experiments should be performed from the list out of which two experiments should be on instrumental methods.

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Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES109, **Basic Electronic Engineering**
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISE I / MSE / ISE II / ESE	10/30/10/50

Course Objectives: The course aims to:
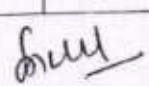
01	Provide an introduction to digital logic design, leading to understand number system, Boolean algebra and its relevance to digital logic design.
02	Illustrate combinational & sequential digital circuits.
03	Provide basic knowledge in solid state electronics including passive and active components.
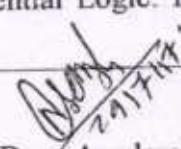
Course Outcomes (COs): Upon successful completion of this course, the student will be able to:

0BSES109_1	Explain fundamental concept of number system and its conversion amongst them. (2nd Cognitive level)
0BSES109_2	Interpret logic functions, circuits, truth tables and Boolean algebra expression. (2nd Cognitive level)
0BSES109_3	Implement Combinational and Sequential circuits using standard gates by applying reduction techniques. (3rd Cognitive level)
0BSES109_4	Explain characteristics and working of basic electronic components like diode, BJT and FET. (2nd Cognitive level)
0BSES109_5	Apply knowledge of electronic components to explain working of electronic circuits such as rectifiers, amplifiers. (2nd Cognitive level)
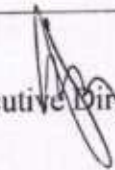
Course Contents:		Hrs.
Unit 1	**Number Systems:** Decimal, Binary, Octal & Hex number system. Inter-conversion of number system, Unsigned and Signed binary numbers (Sign magnitude, 1's complements, 2's complement) binary addition, subtraction, division, multiplication.	06
Unit 2	**Logic Gate and boolean algebra:** Basic gates, derived gates, NAND & NOR as universal gates, Boolean Laws, Theorems, simplification of logic expressions. Algebraic minimization (min-terms, max- terms), K-map reduction with examples.	07
Unit 3	**Combinational & sequential Logic circuits:** Combinational logic: Adders, Subtractors, Decoders, Encoders, Multiplexers, De-multiplexers. Sequential Logic: Introduction to Counters, Shift registers & Flip-flops	08

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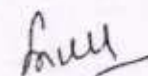
Unit 4	**Introduction to Electronics Components**: Passive Components: Resistors, Capacitors, Inductors (Various Types, Construction, Color coding, Specifications, Mathematical representation.), SMD Technology Active Components: Diode & Applications Construction, Diode biasing, V-I characteristics, Types of Diode (Zener diode, PIN diode, Photo diode, LED- symbol, construction, working, characteristics) Rectifier circuits.	09
Unit 5	**Bipolar Junction Transistor and applications** Construction, V-I Characteristics of transistor (CE configuration), biasing of transistor, saturation, cut off mode and active mode of operations, Leakage current, dc load line, operating point, Need for stabilization, fixed bias, emitter bias, self bias, Stability factors **Applications:** Transistor as a switch, transistor as an amplifier. (RC coupled CE Amplifier).	08
Unit 6	**Field Effect Transistor** FET: Construction, Working Principle, V-I Characteristics MOSFET: P-channel, n- Channel MOSFET Handling Precautions for MOS Devices.	04
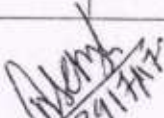
Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Fundamentals of Digital Design	Anand Kumar	PHI	2	2009
02	Electronic Devices and Circuits	R. Boylestad & L. Nashelsky	PHI	11	2012
03	Principle of Electronics	V.K. Mehta	S. Chand	1	2010
04	A Text Book of Applied Electronics	R S Sedha	S. Chand	2	2013
05	Digital Principals & Applications	Albert Malvino, Donald Leach	TMGH Publication	3	1981

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Basic Electronics: Solid State	B. L. Thareja	S. Chand	1	2007
02	Fundamental of Electronics Engineering	R.Prasad	CENGAGE- Learning	3	2012
03	Digital Design	John Wakerly	Prentice Hall India Publication	4	2005

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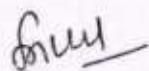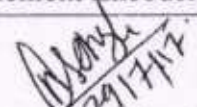
Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES157, **Basic Electronic Engineering Laboratory**
Prerequisite/s	--
Teaching Scheme: Practical/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE / ESE	25/00

Course Objectives:- The Course aims to,

1	Familiarize the students with basic electronics equipments and components
2	Develop the ability to analyze analog and digital electronics circuits

Course Outcomes (COs): After successful completion of this course, the student will be able to,

0BSES157_1	Implement combinational & sequential circuits by applying the knowledge of logic gates. (2nd Cognitive Level)
0BSES157_2	Explain the characteristics of different electronics devices such as diodes, transistors etc. and simple circuits like rectifiers, amplifiers. (2nd Cognitive Level)
0BSES157_3	Use Laboratory equipments for testing and measurement of various electronic components. (3rd Psychomotor Domain) Precision
0BSES157_4	Construct and take measurement of various circuits to compare experimental results in the laboratory with theoretical analysis. (3rd Psychomotor Domain) Precision
0BSES157_5	Interact effectively with the instructor and the teaching assistant(s) during lab hours and discussions in order to further their learning experience and their interest. (3rd Affective Domain) Valuing

List of Experiments:

Expt. No.	Title of Experiment
01	Familiarization with Laboratory Instruments (Oscilloscope, Function Generator, Digital Multimeter, DC Power Supply) and electronics components (R, L, C, Diodes, Transistor, LED, Switches)
02	Implement logic gates and verify its truth table. (OR, AND, NOT, NAND, NOR, EXOR, EXNOR)
03	Implement logic gates using universal gates. (NAND, NOR)
04	Design and implement adders and Subtractors.
05	Design and implement Encoders and Decoders.

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06	Design and implement Multiplexers & De-multiplexers.
07	Verify V-I Characteristics of PN junction diode and Zener diode.
08	Calculate and compare various parameters of Half and Full wave rectifier.
09	Biasing of a transistor.
10	Observe the performance of single stage RC coupled CE amplifier.

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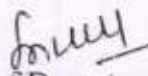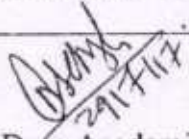
Course Details:

Class	F. Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES110 Engineering Mechanics
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50
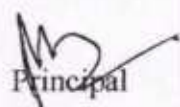
Course Objectives: The Course aims	
01	To understand various force systems and their effects on static and moving bodies
02	To study the concept of equilibrium
03	To analyze a truss
04	To understand the concept of Centroid and Moment of Inertia
05	To understand dynamics of rigid bodies

Course Outcomes: Upon successful completion of this course, the student will be able to:	
0BSES110_1	Apply knowledge of resolution and composition of forces. (3rd Cognitive Level)
0BSES110_2	Apply the concepts of equilibrium to find unknown forces acting on rigid bodies. (3rd Cognitive Level)
0BSES110_3	Calculate forces in members of truss with their nature. (3rd Cognitive Level)
0BSES110_4	Compute Centroid and Moment of Inertia of a given plane lamina.(3rd Cognitive Level)
0BSES110_5	Apply the knowledge of dynamics to analyse rigid bodies (in motion). (3rd Cognitive Level)

Course Contents:		Hrs.
Unit 1	**Introduction to Engineering mechanics:** Basic concepts - Particle,Body, Rigid body, Force, Types of force systems, Law of transmissibility of force, Resolution of a force, Resultant force, Moment of a force, couple, Varignon's theorem.	07
Unit 2	**Equilibrium of forces** Concept of equilibrium, Conditions of equilibrium, Free Body Diagram, Lami's theorem, Law of moments, Introduction to surface friction. **Beams:** Types of Loads, Types of supports, Types of Beams, Analysis of Simple and Compound beams using conditions of equilibrium.	07
Unit 3	**Analysis of Truss** Introduction of roof truss, Types of Trusses, Determinacy of a Truss, Assumptions for analysis of truss, Analysis of truss using method of Joints and method of Sections.	06

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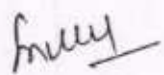
Unit 4	**Centroid and Moment of Inertia** Introduction to Centroid and Center of Gravity, Centroid of plain laminae, Moment of Inertia, Moment of Inertia of Standard shapes from first principle, Parallel and perpendicular axis theorem, Moment of Inertia of plain and composite figures, Radius of Gyration.	07
Unit 5	**Kinematics of Linear and Circular motion** Kinematics of linear motion, Newton's Laws of motion, motion under gravity, Motion under variable acceleration, Kinematics of Circular Motion, Super elevation, banking of roads.	06
Unit 6	**Kinetics of Linear and Circular motion** Kinetics of linear motion, D'Alembert's Principle, Work- Energy Principle, Impulse Momentum Principle, Kinetics of Circular Motion.	09

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Engineering Mechanics	S.Ramamrutham	Dhanpat Rai Publishing Company (P). Ltd	9th	2010
02	Engineering Mechanics	R.S. Khurmi	S.Chand	Revised	2006
03	Engineering Mechanics	R. K. Bansal and Sanjay Bansal	Laxmi Publications Pvt. Ltd.	6th	2013
04	Engineering Mechanics	K. L. Kumar	Tata McGraw Hill Education	4th	2012
05	Engineering Mechanics	S. B. Junnarkar	Charotar Publications	16th	2011
06	Engineering Mechanics	S.S. Bhavikatti	New Age International Pvt. Ltd.	4th	2012
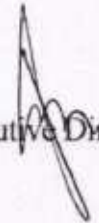
Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Engineering Mechanics	Irving H. Shames	Prentice Hall of India, New Delhi	5th	2011
02	Vector Mechanics for Engineers Vol.-I and II	F. P. Beer and E. R. Johnson	Tata McGraw Hill Education	6th	2011
03	Engineering Mechanics: Statics & Dynamics	Ferdinand Singer	Harper and Row Publications	9th	2009
04	Fundamentals of Engineering Mechanics	S.Rajasekaran	Vikas Publishing House Pvt. Ltd.	3rd	2005
05	Mechanics of Materials	Dr. B. C. Punmia	Laxmi Publications Pvt. Ltd.	Reprint	2010

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Course Details:

Class	B. Tech, Sem.-I / II
Course Code and Course Title	0BSES159 Engineering Mechanics Laboratory
Prerequisite/s	---
Teaching Scheme: Practical/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE /ESE	25/00
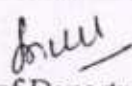
Laboratory Objectives: The course aims to	
01	Study law of polygon of forces using Universal Force Table
02	Study the law of moments using Bell Crank Lever
03	Find support reactions of a simply supported beam using Parallel force apparatus.
04	Verify Lami's Theorem using force table
05	Compare Centroid of a given lamina by experimental and analytical methods
06	Coefficient of friction of different material surfaces.
07	Compute support reactions by graphical method
08	Study rigid bodies in static and dynamic states
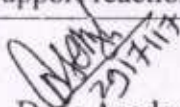
Laboratory Outcomes :Upon successful completion of laboratory work, the student will be able to	
0BSES159_01	Compute resultant, moments of a force system to verify the Laws for forces. (3rd Cognitive level)
0BSES159_02	Calculate and compare support reactions of a simply supported beam by experimental and analytical methods. (3rd Cognitive level)
0BSES159_03	Calculate and compare centroid of lamina by experimental and analytical methods. (3rd Cognitive level)
0BSES159_04	Solve numerical for rigid bodies in static and dynamic states. (3rd Cognitive level)
0BSES159_05	Calculate coefficient friction of different material surfaces. (3rd Cognitive level)
0BSES159_06	Follow the teacher and repeat the experiment performances individually and interpret the results. (3rd Psychomotor domain) Precision.
0BSES159_07	Express involvement and understanding concepts and applications in the laboratory. (3rd Affective domain) Valuing
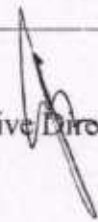
List of Experiments	
Sr. No.	Title of Experiments
1	To verify law of polygon of forces with the help of force table
2	To verify lami's theorem using force table
3	To verify law of moments with the help of Bell crank lever
4	To calculate support reactions of beam

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5	To compute center of gravity of plain lamina	
6	To calculate coefficient of friction of different material surfaces.	
7	To find support reactions of a beam by graphical method	
8	Assignments based on each unit	

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Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES111 **Basic Mechanical Engineering**
Prerequisite/s	--
Teaching Scheme: Lecture/Practical	03/00
Credits	03
Evaluation Scheme: ISE1/ MSE /ISEII/ ESE	10/30/10/50

Course Objectives: The course aims
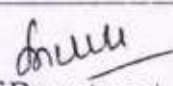
1.	To make students aware Laws of Thermodynamics, Principles of Thermal Machines and Power Transmitting Devices.
2.	To cognize knowledge of engineering materials and manufacturing process.
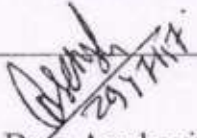
Course Outcomes (COs): Upon successful completion of this course, the student will be able to:
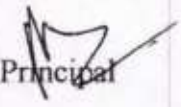
BS111_1	Define different manufacturing processes and properties of material.	(1st Cognitive Level)
BS111_2	Describe power generation processes from different energy sources.	(2nd Cognitive Level)
BS111_3	Explain the basic concept of refrigeration and classify the different refrigerants.	(2nd Cognitive Level)
BS111_4	Explain principles of power transmission devices and its types.	(2nd Cognitive Level)
BS111_5	Calculate the various thermodynamic Properties.	(3rd Cognitive Level)
BS111_6	Determine the efficiency of air standard cycles	(3rd Cognitive Level)
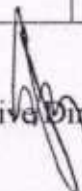
Course Contents:		Hrs.
Unit 1	**Energy Sources & power plant** Renewable and nonrenewable, Solar-flat plate collector, concentric collector– Parabolic and cylindrical, Photovoltaic cell, Wind, Geothermal, Tidal, Hydropower plant, Steam Power plant.	07
Unit 2	**Fundamentals of Thermodynamics** Thermodynamics state, Process, Cycle, Thermodynamic system, Heat &Work, Concept of Internal energy, First Law- Joule's experiment and application of First law to steady flow processes, Limitation of first Law of Thermodynamics, Introduction of Modes of Heat transfer.	07
Unit 3	**Gas laws & I.C. Engine** Ideal Gases – Concept of Constant Pressure, Constant Volume, Constant Temperature, Adiabatic, Polytropic and their representation on p-V and T-s diagrams, Power Cycles -Carnot Cycle, Otto cycle, Joule Cycle. Basic Components of IC Engines and Terminology, Four stroke and Two stroke engines.	07

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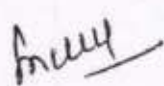
Unit 4	**Introduction to Refrigeration and Air Conditioning**	07
	Carnot Refrigerator, Vapour compression and vapour absorption system, Selection of Refrigerants. Study of household refrigerator, window air conditioner.	
Unit 5	**Mechanical Power Transmission and Energy Conversion Devices**	07
	Belt drives, gears drives, Construction, working and applications of Pumps & Compressors - Centrifugal and Reciprocating and Hydraulic turbines - Pelton, Francis and Kaplan.	
Unit 6	**Engineering Materials and Manufacturing Processes**	07
	Material properties, tensile, compressive and shear strength, ductility, malleability, hardness, toughness, resilience, creep, thermal and electrical conductivity and Stress-Strain curve.	
	Casting process -Sand casting and metal joining processes - Arc welding, Gas welding, soldering and brazing, Metal Removing Process	
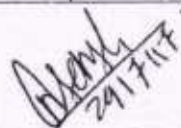
Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Solar Energy	Dr. S. P. Sukathame	Tata Mc- Graw Hill Publication	4	2012
02	Non Conventional Sources of Energy	G. D. Rai	Khanna Publication	5	2012
03	Engineering Thermodynamics	R. K. Rajput	Laxmi Publication, Delhi.	8	2011
04	IC Engines	V. Ganesan	Tata Mc- Graw Hill Publication	4	2013
05	Workshop Technology	HajraChoudhary, Bose	Media Promoters & publishers Pvt. Ltd. (Vol.-I & II).	13	2011
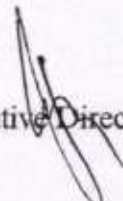
Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Thermodynamics	Yunus A. Cengel and Boles	Tata Mc-Graw Hill Publication	7	2012
02	Manufacturing Technology	P. N. Rao	Tata Mc-Graw Hill Publication	2	1999
03	Theory of machines	S.S. Ratan	Tata-McGraw Hill Publications.	3	2012
04	Thermal engineering	P.L Ballaney	Khanna Publications	22	2000

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Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES160 **Basic Mechanical Engineering Laboratory**
Prerequisite/s	--
Teaching Scheme:Practical /Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00
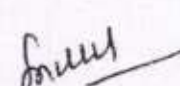
Course Objectives : The course aims to	
1.	Understand the concept of different energy conversion devices.
2.	To impart knowledge of thermal machines and manufacturing processes.

Course Outcomes (COs):-Upon successful completion of this course, the student will be able to:	
BS160_1	Gain knowledge of different conventional and non conventional energy recourses. (2nd Cognitive Level)
BS160_2	Illustrate construction and working of Pump, Compressor and Air conditioner. (2nd Cognitive Level)
BS160_3	Perform experiment of calculation thermal conductivity and COP of Refrigeration system. (3rd Cognitive Level)
BS160_4	Follow the teacher and repeat the experiment performance individually and interpret the results. (3rd Psychomotor Domain)
BS160_5	Express involvement and understanding of concepts and their applications in the laboratory. (3rd Affective Domain)

Course Contents:	
1.	Demonstration of working Solar photovoltaic cell.
2.	Calculate the thermal conductivity of given metal rod
3.	Demonstration of Two stroke and Four stroke Engines with the help of models.
4.	Demonstration of Hydro-Electric Power Plant and Study of Hydraulic turbines.
5.	Visit and Demonstration of steam power plant.
6.	To determine the COP of Vapour Compression Refrigeration system.
7.	Demonstration of Window Air Conditioner
8.	Demonstration of working of Pumps and compressors.
9.	Study and demonstration of electric arc welding process.

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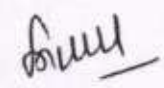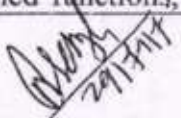
Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES112 Computer Programming
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	02/00
Credits	02
Evaluation Scheme: ISE I /MSE/ ISE II / ESE	10/30/10/50

Course Objectives: The course aims	
01	To understand C programming environment.
02	To develop problem solving skills amongst the students.
03	To write, compile and debug programs in C language.
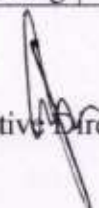
Course Outcomes (COs): Upon successful completion of this course, the student will be able to:		
0BSES112_1	Use structured approach to solve a problem.	(2nd Cognitive Level)
0BSES112_2	Comprehend C programming fundamentals.	(2nd Cognitive Level)
0BSES112_3	Comprehend concepts like array, functions, structures, and pointers and file handling in C Programming language.	(2nd Cognitive Level)
0BSES112_4	Apply C Programming constructs to solve a given problem.	(3rd Cognitive Level)

Course Contents:		Hrs.
Unit 1	**Basics of Programming** The meaning of algorithms, Flowcharts, Pseudo codes, Writing algorithms and drawing flowcharts for simple exercises, Memory concepts, C Program development environment	03
Unit 2	**C Fundamentals** Importance of 'C' Language, History, Structure of 'C' Program, Sample 'C' Program, Constants, variables and data types. Operators and expressions, Managing input / output operations, Control statements-Decision making, Case control& Looping Constructs	06
Unit 3	**Array** The meaning of an array, one dimensional and two dimensional arrays, declaration and initialization of arrays, reading , writing and manipulation of above types of arrays, multidimensional arrays. Strings-Declaring and initialing character array, reading and writing string to/from terminal, arithmetic operations on characters, putting strings together, string handling functions	04
Unit 4	**Functions** Need of user defined functions, elements of User defined functions, defining	04

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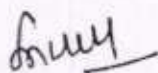
	functions, return values and their types, function calls, function declaration, methods of parameter passing, Scope rule of functions, user defined and library functions	
Unit 5	**Structure & Pointers** Need of Structure, Defining a structure, declaring and accessing structure variables, structure initialization, copying and comparing structure variables, array of structures, structures and functions, Unions. Understanding pointers, accessing the address space of a variable, declaring and initialization pointer variables, accessing a variable through its pointer, pointer expressions, pointers and arrays, pointer and character strings, pointer and structure	06
Unit 6	**File Handling** Defining and opening a file, closing a file, input/output operations on files, error handling during I/O operations, random access files, command line arguments, C preprocessor.	03

Text Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Programming And Problem Solving Using C Language	ISRD Group	McGraw-Hill Publications	-	2012
02	Let Us C	Yashwant Kanetkar	BPB	3rd	2011
03	C How to Program	Harvey M. Deitel, Paul J. Deitel, Abbey Deitel	Pearson	2nd	2009

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	The 'C' Programming Language	D. M. Ritchie	Pearson	2nd	1998
02	C Programming Laboratory: Handbook for Beginners	Sidnal	Wiley India Limited	-	-
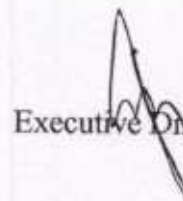
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Course Details:

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES161 Computer Programming Laboratory
Prerequisite/s	-
Teaching Scheme: Practical /Tutorial	04/00
Credits	02
Evaluation Scheme: ISE/ESE	50/00
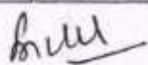
Course Objectives: The Course aims to	
01	Expose programming constructs of C language to the students
02	Develop problem solving skills amongst the students
03	Learn how to write modular and efficient C programs.
04	Implement C programs for various problem statements.

Course Outcomes (COs): Upon successful completion of this course, the student will be able to	
0BSES161_1	Write, compile and debug programs in C language. (2nd Cognitive Level)
0BSES161_2	Make use of different data types in a computer program. (3rd Cognitive Level)
0BSES161_3	Make use of conditional expressions and looping statements to solve problems associated with conditions and repetitions. (3rd Cognitive Level)
0BSES161_4	Construct the C code using a modular approach. (3rd Cognitive Level)
0BSES161_5	Demonstrate C Programs for various problem statements. (3rd Affective Domain)
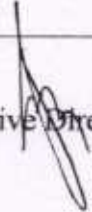
Course Contents:	
1	2-3 Exercises based on construction of flowcharts and algorithms for a given problem statement
2	Program based on data types and operators in C
3	2 Programs based on If, If Else and If Else If Else
4	Program based on Switch
5	2 Program based on Loops (For, While, Do-While)
6	Program based on one dimensional array
7	Program based on Two dimensional array
8	Program based on Character Array, Strings
9	Program based on Functions
10	2 Program based on Recursion
11	Program based on Structure
12	Program based on Array of Structures
13	2 Program based on Pointers
14	Program based on File Handling .

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Course Details:

Class	F.Y. B. Tech Sem.- II
Course Code and Course Title	0BSBS113 **Applied Mathematics II**
Prerequisite	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI/ MSE/ISEII/ESE	10/30/10/50

Course Objectives: The course aims	
01	To develop mathematical logical thinking power of students.
02	To produce graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in the solution of problems in the area of engineering.
03	To teach mathematical methodologies to provide students with skills in differential calculus and integral calculus which would enable them to devise engineering solution for given situations they may encounter in their profession.

Course Outcomes : After successful completion of this course, the students will be able to:	
0BSBS113_1	Identify different types of ordinary differential equations and use analytical methods to solve them. (3rd Cognitive level)
0BSBS113_2	Using partial derivatives solve the problems based on functions of two or more variables. (3rd Cognitive level)
BSBS113_3	Make use of differential equations for finding orthogonal trajectories, to solve simple electrical problems and to calculate maxima and minima of functions of two variables. (3rd Cognitive level)
0BSBS113_4	Apply the concept of Beta function, Gamma function and DUIS rules to solve improper integrals. (3rd Cognitive level)
0BSBS113_5	Identify and sketch the approximate shape of the curve in cartesian and polar form and estimate their length by integration method. (3rd Cognitive level)
0BSBS113_6	Solve multiple integrals and make use of it to find area and mass. (3rd Cognitive level)
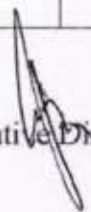
Course Contents:		Hrs.
Unit 1	**Differential Equations of First Order and First Degree** Linear differential equations, Equation reducible to Linear differential equation, Bernoulli's equation, Exact differential equations, Equation reducible to Exact differential equation.	06
Unit 2	**Partial Differentiation** Function of two or more variables, Partial derivatives, Homogeneous functions, Total derivative, Euler's theorem on Change of variables.	07
Unit 3	**Applications of Differential Equations of First Order and First Degree and Partial Differentiation**	08

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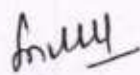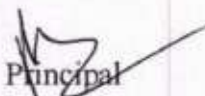
	Applications to Orthogonal trajectories (Cartesian and Polar equations), Applications to Simple Electrical Circuits, Jacobian, Errors and approximation, Maxima and Minima of Functions of two variables.	
Unit 4	**Special Functions** Gamma function, Beta function, relation between Beta and Gamma functions and its properties, Differentiation under integral sign (DUIS).	06
Unit 5	**Curve Tracing** Tracing of Standard curves in Cartesian form, Tracing of Standard curves in Polar form, Rectification of Cartesian curves and Rectification of Polar curves.	07
Unit 6	**Multiple Integration and its applications** Double Integrals, Change of order of integration, Double Integrals in Polar Coordinates, Area enclosed by plane curves, Mass of a plane lamina, Triple integrals.	08

Reference Books:

Sr. No	Title	Author	Publisher	Edition	Year of Edition
01	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers	40th	2010
02	Higher Engineering Mathematics	B. V. Ramana	Tata McGraw Hill	19th	2013
03	Advanced Engineering Mathematics	N. P. Bali, Manish Goyal	Infinity science press	7th	2010
04	Advanced Engineering Mathematics	Erwin nKreyszig	Wiley Publishers	9th	2013
05	Advanced Engineering Mathematics	H. K. Das	S. Chand	19th	2010

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Course Details:

Class	F. Y. B. Tech, Sem.-II
Course Code and Course Title	0BSBS114 Applied Mathematics-II Tutorial
Prerequisite	---
Teaching Scheme: Practical/Tutorial	00/01
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Laboratory Objectives: The course aims	
01	To develop mathematical logical thinking power of students.
02	To produce graduates with mathematical knowledge, computational skills and the ability to deploy these skills effectively in the solution of problems in the area of engineering.
03	To teach mathematical methodologies to provide students with skills in differential calculus and integral calculus which would enable them to devise engineering solution for given situations they may encounter in their profession.

Course Outcomes : After successful completion of this course, the students will be able to:	
0BSBS114_1	Identify different types of ordinary differential equations and use analytical methods to solve them. (3rd Cognitive level)
0BSBS114_2	Using partial derivatives solve the problems based on functions of two or more variables. (3rd Cognitive level)
0BSBS114_3	Make use of differential equations for finding orthogonal trajectories, to solve simple electrical problems and to calculate maxima and minima of functions of two variables. (3rd Cognitive level)
0BSBS114_4	Apply the concept of Beta function, Gamma function and DUIS rules to solve improper integrals. (3rd Cognitive level)
0BSBS114_5	Identify and sketch the approximate shape of the curve in cartesian and polar form and estimate their length by integration method. (3rd Cognitive level)
0BSBS114_6	Solve multiple integrals and make use of it to find area and mass. (3rd Cognitive level)

List of Tutorials	
Sr. No.	Title of Tutorials
1	Differential Equations of First Order and First Degree
2	Partial Differentiation
3	Applications of Differential Equations of First Order and First Degree
4	Applications of Partial Differentiation
5	Special Functions
6	Curve Tracing
7	Multiple Integration
8	Application of Multiple Integration

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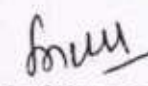
MODE OF CONDUCT EXAMINATION – PHYSICS GROUP

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSBS101 Applied Physics
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50
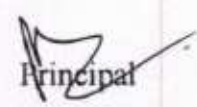
Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Written Exam	Unit I& II	It is of 25 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 Marks& Duration 02 Hours
3.	ISE II	Poster presentation	Unit IV, V	It is of 10 Marks.
4.	ESE	Written Exam	On entire syllabus of Applied Physics(0BSBS101)	The Weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSBS152 Applied Physics Laboratory
Prerequisite/s	---
Teaching Scheme: Laboratory/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of laboratory work and oral.	Minimum 8 experiments out of 14.	ISE shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral examinations uniformly distributed throughout the semester.

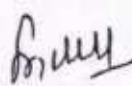Head of Department   Dean Academics   Principal   Executive Director

Class	F.Y. B. Tech Sem.-I
Course Code and Course Title	0BSBS102 Applied Mathematics-I
Prerequisite	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	MCQ	Unit I	It is of 20 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ISE II	Written Exam	Unit IV	It is of 20 Marks.
4.	ESE	Written Exam	On entire syllabus of Applied Mathematics-I (0BSBS102)	The weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I
Course Code and Course Title	0BSBS107, Applied Mathematics-I Tutorial
Prerequisite/s	---
Teaching Scheme: Laboratory/Tutorial	00/01
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of Tutorial and oral.	Eight tutorials covering the entire syllabus.	Arranging the tutorials batch wise ones in a week and maintaining the Continuous Assessment sheet based on his/her performance.

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Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES103 **Basic Electrical Engineering**
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Written Exam	Unit I, II	It is of 25 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ISE II	Assignment & Oral	Unit IV and V	It is of 25 Marks. (Assignment 15 marks + Oral 10 marks)
4.	ESE .	Written Exam	On entire syllabus of Basic Electrical Engineering (0BSES 103)	The weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES153 **Basic Electrical Engineering Laboratory**
Prerequisite/s	---
Teaching Scheme: Laboratory/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of laboratory work and oral.	On any 8 experiments out of which 2 experiments must be on instrumental methods.	ISE shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral examinations uniformly distributed throughout the semester.

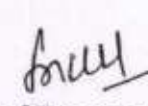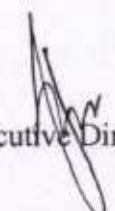Head of Department Dean Academics Principal Executive Director

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES104 **Basic Civil Engineering**
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Written Exam	Unit I& II	It is of 25 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ISE II	Assignment & Oral	Unit IV and V	It is of 25 Marks.
4.	ESE	Written Exam	On entire syllabus of Basic Civil Engineering, 0BSES104	The weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES154 **Basic Civil Engineering Laboratory**
Prerequisite/s	---
Teaching Scheme: Laboratory/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of laboratory work and oral.	Out of 10 experiments 8 experiments are on instrumental methods.	ISE shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral examinations uniformly distributed throughout the semester.

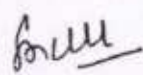Head of Department   Dean Academics   Principal   Executive Director

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES105 Engineering Graphics
Prerequisite/s	---
Teaching Scheme: Lecture/Practical	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Written Exam	Unit I, Unit II	It is of 25 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ISE II	Written Exam	Unit IV	It is of 25 Marks.
4.	ESE	Written Exam	On entire syllabus of Engineering Graphics (0BSES105)	The weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES155 Engineering Graphics Laboratory
Prerequisite/s	---
Teaching Scheme: Lecture/Practical	00/02
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	Assessment of drawing sheet	Continuous assessment of practical work and oral.	On 8 Drawing sheets as mentioned in Lab. Course content.	Assessment shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through Drawing sheets and his/her performance in oral examinations uniformly distributed throughout the semester.

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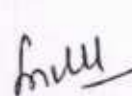
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F.Y. B. Tech (Common to All Branches)

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSHS106 Professional Communication
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	02/00
Credits	02
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Written Exam	Unit I	It is of 25 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ISE II	Written Quiz	Unit IV and V	It is of 25 Marks.
4.	ESE	Written Exam	On entire syllabus of Professional Communication (0BSHS106)	The weightage shall be 35% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSHS156 Professional Communication Laboratory
Prerequisite/s	---
Teaching Scheme: Laboratory /Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of Students' performance	Out of 11 practical (prescribed in the syllabus) 10 will be conducted.	Students' performance in each practical session will be evaluated and average marks out of 25 will be considered.

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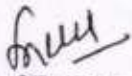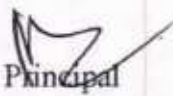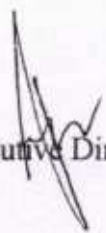
Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES151 Workshop Practice
Prerequisite/s	-
Teaching Scheme: Lecture/Practical	00/02
Credits	01
Evaluation Scheme: ISE/ESE	50/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of laboratory work and oral.	03 Experiments and 01Assignments per unit.	ISE shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral examinations uniformly distributed throughout the semester.

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MODE OF CONDUCT EXAMINATION – CHEMISTRY GROUP
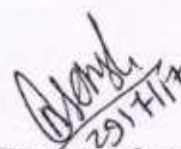
Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSBS108 **Applied chemistry**
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50
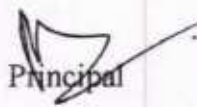
Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Written Exam	Unit I, II	It is of 25 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ISE II	Assignment& Oral	Unit IV and V	It is of 25 Marks.
4.	ESE	Written Exam	On entire syllabus of Applied Chemistry (0BSBS108)	The weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSBS158 **Applied Chemistry Laboratory**
Prerequisite/s	---
Teaching Scheme: Laboratory/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of laboratory work and oral.	On any 8 experiments out of which 2 experiments must be on instrumental methods.	ISE shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral examinations uniformly distributed throughout the semester.

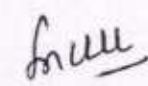Head of Department   Dean Academics   Principal   Executive Director

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES109 **Basic Electronic Engineering**
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Written Exam	Unit I	It is of 25 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ISE II	Written Exam (MCQ)	Unit IV and V	It is of 25 Marks.
4.	ESE	Written Exam	On entire syllabus of Basic Electronic Engineering (0BSES109)	The weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES157 **Basic Electronic Engineering Laboratory**
Prerequisite/s	---
Teaching Scheme: Lab/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of laboratory work and oral.	10 experiments	ISE shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral examinations uniformly distributed throughout the semester.

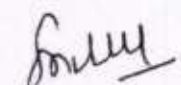Head of Department   Dean Academics   Principal   Executive Director

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES110 **Engineering Mechanics**
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Written Exam	Unit I	It is of 25 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks & 02 Hours Duration
3.	ISE II	Assignment/Multiple Choice Questions	Unit IV	It is of 25 Marks.
4.	ESE	Written Exam	On entire syllabus of Engineering Mechanics (0BSBS110)	30% weightage for the syllabus covered in MSE and 70% weightage for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES159 **Engineering Mechanics Laboratory**
Prerequisite/s	---
Teaching Scheme: Laboratory/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of laboratory work and oral.	7 Experiments and 6 Assignments (1 Assignment Per Unit)	ISE shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral examinations uniformly distributed throughout the semester.

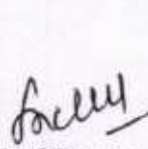Head of Department   Dean Academics   Principal   Executive Director

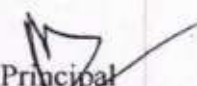| Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES111 Basic Mechanical Engineering
Prerequisite/s	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Written Exam	Unit I, II	It is of 25 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ISE II	Assignment & Oral	Unit IV and V	It is of 25 Marks.
4.	ESE	Written Exam	On entire syllabus of Basic Mechanical Engineering (0BSES111)	The weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES111 Basic Mechanical Engineering Laboratory
Prerequisite/s	---
Teaching Scheme: Laboratory/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of laboratory work and oral.	All 8 Experiments.	ISE shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral examinations uniformly distributed throughout the semester.

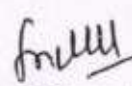Head of Department   Dean Academics   Principal   Executive Director
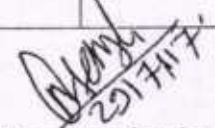
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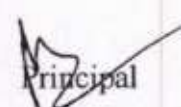| Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES112 Computer Programming
Prerequisite/s	--
Teaching Scheme: Lecture/Tutorial	02/00
Credits	02
Evaluation Scheme: ISE I / MSE / ISE II /	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	Quiz- Multiple Choice Examination	All topics covered till the date of examination	10 marks quiz. It shall be conducted 1-2 weeks prior to MSE Examination
2.	MSE	Written Exam	Unit I, II, III	It is of 50 Marks and 02 hours durations.
3.	ISE II	Seminar	Based on topic allotted to candidate by the faculty advisor.	10 Marks Seminar shall be conducted. Performance shall be evaluated on the basis of following guidelines 1. Content delivery 2. Presentation Skills 3. Question and Answers
4.	ESE	Written Exam	On entire syllabus of 0BSES112-Computer Programming	The syllabus weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus covered after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSES161 Computer Programming Laboratory
Prerequisite/s	---
Teaching Scheme: Laboratory/Tutorial	02/00
Credits	01
Evaluation Scheme: ISE/ESE	50/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of laboratory work and oral.	Laboratory experiments as prescribed by faculty advisor based on the syllabus given for Computer Programming Lab Course- OBSES161	ISE shall be based on turn-by-turn supervision of the students work and the quality of his/her work as prescribed through laboratory journals and his/her performance in oral examinations uniformly distributed throughout the semester.

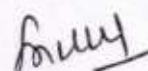Head of Department   Dean Academics   Principal   Executive Director

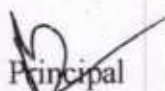| Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSBS113 Applied Mathematics-II
Prerequisite	---
Teaching Scheme: Lecture/Tutorial	03/00
Credits	03
Evaluation Scheme: ISEI /MSE/ISE II/ESE	10/30/10/50

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE I	MCQ	Unit I	It is of 20 Marks.
2.	MSE	Written Exam	Unit I, II, III	It is of 50 marks and 2 hours duration.
3.	ISE II	Written Exam	Unit IV	It is of 20 Marks.
4.	ESE	Written Exam	On entire syllabus of Applied Mathematics-II (0BSBS113)	The weightage shall be 30% for the syllabus covered for MSE and 70% for remaining syllabus after MSE.

Class	F.Y. B. Tech Sem.-I & II
Course Code and Course Title	0BSBS114 Applied Mathematics-II Tutorial
Prerequisite/s	---
Teaching Scheme: Laboratory/Tutorial	00/01
Credits	01
Evaluation Scheme: ISE/ESE	25/00

Sr. No.	Exam Type	Mode	Syllabus	Remarks
1.	ISE	Continuous assessment of Tutorial and oral.	Eight tutorials covering the entire syllabus.	Arranging the tutorials batch wise ones in a week and maintaining the Continuous Assessment sheet based on his/her performance.

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