

**MECHANICAL ENGINEERING
SYLLABUS
B. Tech.
Second Year**



Department of Mechanical Engineering
(B. Tech. ME Programme Accredited by NBA)

**VELAGAPUDI RAMAKRISHNA
SIDDHARTHA ENGINEERING COLLEGE**

(An Autonomous, ISO 9001:2008 Certified Institution)

(Approved by AICTE, Accredited by NAAC with 'A' Grade, Affiliated to JNTUK,
Kakinada)

(Sponsored by Siddhartha Academy of General & Technical Education)

Kanuru, Vijayawada

Andhra Pradesh - 520007, INDIA.

www.vrsiddhartha.ac.in

PROGRAMME OUTCOMES

- a. An ability to apply the knowledge of mathematics, science and engineering fundamentals
- b. An ability to conduct Investigations using design of experiments, analysis and interpretation of data to arrive at valid conclusions
- c. An ability to design mechanical engineering components and processes within economic, environmental, ethical and manufacturability constraints
- d. An ability to function effectively in multidisciplinary teams
- e. An ability to identify, formulate, analyse and solve Mechanical Engineering problems
- f. An ability to understand professional, ethical and social responsibility
- g. An ability to communicate effectively through written reports or oral presentations.
- h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- i. An ability to recognize the need and to engage in independent and life-long learning.
- j. A knowledge of contemporary issues
- k. An ability to use the appropriate techniques and modern engineering tools necessary for engineering practice
- l. An ability to apply the principles of management to manage projects Multidisciplinary environments

Text books and Reference books	2. Pyramid Discussion 3. PNI 4. Seminar Talk and Power Point Presentation
	UNIT III: Professional Communication: 1. Self Affirmation 2. Advanced Composition including Official letters and e-mail 3. Resume Preparation 4. Elements of Non-Verbal Communication
	UNIT IV: Life Skills and Vocabulary for Competitive Examinations: 1. Select Life Skills(50) 2. Select Logics, Isms, Phobias and Manias (25 each) 3. Sentence Completion(50 items) 4. Fundamentals of Syllogisms
	Text Books: 1. Martin Cutts, Oxford Guide to Plain English, 7 th Impression, OUP, 2011 2. Exercises in Spoken English, Prepared by Department of Phonetics and Spoken English, CIEFL, OUP, 21 st Impression, 2003 Reference Books: 1. Stephen R Covey, The 7 Habits of Highly Effective people, II edition, (Pocket Books) Simon & Schuster UK Ltd, 2004 2. Martin Cutts, Oxford Guide to Plain English, 7 th Impression, OUP, 2011 3. Deborah. J. Bennett, Logic made easy: How to know when Language Deceives you, I edition(Reprint), 2005 Eclectic Learning Material offered by the Department
E-resources and other digital material	1. ODII Language Learner's Software, 27-6-2012 Orell Techno Systems 2. Visionet Spears Digital Language Lab software Advance Pro, 28-01-2015 3. www.natcorp.ox.ac.uk , British National Corpus, XML edition 2007.

Velagapudi Ramakrishna
Siddhartha Engineering College: Vijayawada - 7
Scheme of Instruction and Examination – VR14
Department of Mechanical Engineering

Semester III

	Sub. Code	Subject Title	L	T	P	C	CE	SE	T
1	14MA1301	Complex Analysis and Numerical Methods	4	1		4	30	70	100
2	14ME3302	Mechanics of Materials	4	1		4	30	70	100
3	14ME3303	Basic Thermodynamics	3	1		3	30	70	100
4	14HS1304	Environmental Studies	3			3	30	70	100
5	14EC1305	Basics of Electronics Engineering.	2			2	30	70	100
6	14ME3306	Kinematics of Machines	3	1		3	30	70	100
7	14ME3307	Manufacturing Processes	3	1		3	30	70	100
8	14ME3351	Computer Aided Drafting Laboratory			3	2	30	70	100
9	14ME3352	Manufacturing Process Lab			3	2	30	70	100
Total			22	5	6	26	270	630	900

L – Lecture, T – Tutorial, P – Practical, C – Credits, CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

**Velagapudi Ramakrishna
Siddhartha Engineering College: Vijayawada - 7
Scheme of Instruction and Examination – VR14
Department of Mechanical Engineering**

Semester IV

S.No	Sub. Code	Subject Title	L	T	P	C	CE	SE	T
1	14MA1401	Transformations and Probability Distributions	3	1		3	30	70	100
2	14ME3402	Advanced Mechanics of Materials	4	1		4	30	70	100
3	14ME3403	Fluid Mechanics	3	1		3	30	70	100
4	14ME3404	Applied Thermodynamics	4	1		4	30	70	100
5	14EE1405	Basics of Electrical Engineering	2			2	30	70	100
6	14ME3406	Material Science and Metallurgy	3			3	30	70	100
7	14ME3451	Computational Methods Lab			3	2	30	70	100
8	14ME3452	Electrical and Electronics Engineering Lab			3	2	30	70	100
9	14HS1453	Communication Skills Lab			2	2	30	70	100
Total			19	4	8	25	270	630	900

L – Lecture, T – Tutorial, P – Practical, C – Credits, CE - Continuous Evaluation, SE - Semester-end Evaluation, T – Total Marks

14HS 1453 –COMMUNICATION SKILLS LAB

Course Category:	Programme Core	Credits:	2
Course Type:	Lab	Lecture - Tutorial - Practice:	0 - 0 – 2
Prerequisites:	Technical English & Communication Skills -14HS1204	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Be proficient in pronunciation of speech sounds including accentuation.											
	CO2	Enhance the awareness of the elements of listening comprehension.											
	CO3	Develop the abilities of rational argumentation and skills of public speaking.											
	CO4	Be aware of the elements of professional communication											
	CO5	Be exposed to the items of various competitive exams.											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1							H	H	M			L
	CO2		M		H	M	M	H	H	M	H		M
	CO3	H	H	M	H		H	H	M	M	H	L	H
	CO4	M	M	M	H	L	H	H	H	H	H	L	H
	CO5		M	M	M	M	H	H	L	H	H	L	L
Course Content	UNIT I : Elements of Spoken Expression and processes of Listening comprehension: <ol style="list-style-type: none"> 1. Speech Mechanism 2. Articulation of vowels and consonants 3. Patterns of Accentuation 4. Types and processes of Listening comprehension UNIT II: Polemics and Public Speaking: <ol style="list-style-type: none"> 1. Group Discussion 												

	<ol style="list-style-type: none"> 4. Common emitter configuration 5. Implementation of the given Boolean function using logic gates in both SOP and POS form. 6. Verification of combinational circuits(Half adder, full adder, half subtractor, full subtractor). <p>Note: Any 5 experiments must be completed from Electrical lab and 5 experiments from Electronics lab</p>
Text books and Reference books	--
E-resources and other digital material	--

SEMESTER-III

14MA1301: COMPLEX ANALYSIS & NUMERICAL METHODS

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	4 - 1 - 0
Prerequisites:	Algebra of Complex numbers, convergence of infinite series, theory of equations	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:											
CO1		Determine analytic and non analytic functions and understand the concept of complex integration.											
CO2		Analyze Taylor and Laurent series and evaluation of real definite integrals using residue theorem and understand the concept of transformations.											
CO3		Solve Algebraic and transcendental, system of equations and understand the concept of polynomial interpolation.											
CO4		Understand the concept of Numerical differentiation and integration. Solve initial and boundary value problems numerically.											
		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	H					M							
CO2	H					M							
CO3	H	M				H						M	
CO4	H	M				H						M	
Contribution of Course Outcomes towards achievement of Program Outcomes													
Course Content		UNIT I: Complex Analysis: Introduction, continuity, Cauchy-Riemann equations. Analytic functions, Harmonic functions, Orthogonal systems, Complex integration, Cauchy's integral theorem, Cauchy's integral formula											

14ME3452-
ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

Course Category:	Programme Core	Credits:	2
Course Type:	Laboratory	Lecture - Tutorial - Practice:	0 - 0 - 3
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:											
CO1		Conduct and analyze the parameters of electrical network											
CO2		Analyze the performance of DC and AC machines.											
CO3		Conduct and analyze the steady state characteristics of electronic devices.											
CO4		Design of combinational circuits.											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1			H					M					
CO2			H					M					
CO3			H					M					
CO4			H					M					
(L – Low, M- Medium, H – High)													
Course Content		Electrical Lab: <ol style="list-style-type: none"> 1. Verification of KVL and KCL. 2. Parameters of choke coil. 3. Measurement of low and medium resistance. 4. OCC of separately excited DC shunt generator. 5. Load characteristics of DC shunt generator. 6. Brake test on DC shunt motor. 7. Load test on 3-phase induction motor. Electronics Lab: <ol style="list-style-type: none"> 1. V-I characteristics of junction diode. 2. V-I characteristics of zener diode. 3. Characteristics of FET 											

	<p>8. Solution of partial differential equations.</p> <p>9. Solution of some Mechanical Engineering Problems using MATLAB Toolboxes.</p>
Text books and Reference books	<p>1. Matlab programming by Y.Virani Singh & B.B.Chaudhuri. PHI publications(2010).</p> <p>2. Getting started with Mat lab-a quick reference for scientists & engineers by Rudra Pratap. Oxford university press(2009).</p> <p>3. an introduction to programming and numerical methods in Matlab by s.r.Otto, j.p.denier. Springer publications(2007). VR10 DEPARTMENT OF MECHANICAL ENGINEERING, V.R SIDDHARTHA ENGINEERING COLLEGE 99</p> <p>4. Ordinary & partial differential equations routines in Matlab-H.J.Lee & W.E.Schieser. champmans hall /CRC (2004).</p> <p>5. Graphics and GUI'S with Matlab, 3rd edition by Patrick Marchand, O.Thomas Holland. champmans hall /CRC (2004).</p>
E-resources and other digital material	<p>Web References:</p> <p>1. http://www.math.ucsd.edu/~bdriver/21d-s99/matlab-primer.html</p> <p>2. http://www.mathworks.in/academia/student_center/tutorials/launchpad.html</p> <p>3. http://www.cyclismo.org/tutorial/matlab/</p> <p>4. http://www.mathworks.com/matlabcentral/fileexchange?s_cid=wiki_matlab_17</p> <p>Videos:</p> <p>1. http://www.youtube.com/user/matlab?feature=results_main</p> <p>2. http://www.youtube.com/watch?v=DPLBPdux6bs</p>

	<p>UNIT II:</p> <p>Taylor's series, Laurent's series, Zeros and singularities. Residue theorem, calculation of residues, evaluation of real definite integrals (by applying the residue theorem).</p> <p>Standard transformations: Translation - Magnification and Rotation – Inversion and reflection - Bilinear transformation.</p> <p>UNIT III:</p> <p>Numerical Methods: Solution of Algebraic and Transcendental Equations : Introduction, Newton - Raphson method, Solution of simultaneous linear equations – Gauss Elimination Method - Gauss - Seidel iterative method.</p> <p>Interpolation: Introduction, Finite Differences – Forward, Backward, Central Differences, Symbolic Relations, Differences of a polynomial, Newton's formulae for interpolation, Central difference interpolation formulae – Gauss's, Sterling's, Bessel's formulae Interpolation with unequal intervals – Lagrange's and Newton's Interpolation formulae.</p> <p>UNIT – IV</p> <p>Numerical Differentiation And Integration : Finding first and second order differentials using Newton's formulae. Trapezoidal rule and Simpsons 1/3 Rule</p> <p>Numerical Solutions of Differential Equations: Taylor's series method Picard's method. Euler's method, Runge - Kutta method of 4th order, Boundary value problems, Solution of Laplace's and Poisson's equations by iteration.</p>
Text books and Reference books	<p>Text Book:</p> <p>[1] B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition Khanna Publishers, 2012.</p> <p>Reference Books:</p> <p>[1] Krezig, "Advanced Engineering Mathematics", 8th Edition, John Wiley & Sons. 2007,</p> <p>[2] R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishers.</p> <p>[3] N.P.Bali, Manish Goyal, "A Text book of Engineering Mathematics", 1st Edition, Lakshmi Publications (P) Limited, 2011</p> <p>[4] H.K.Das, Er. Rajnish Verma, "Higher Engineering Mathematics", 1st Edition, S.Chand & Co., 2011.</p> <p>[5] S. S. Sastry, "Introductory Methods of Numerical Analysis", PHI , 2005.</p>
E-resources and other digital material	<p>[1] faculty.gvsu.edu/fishbacp/complex/complex.html.</p> <p>[2] nptelvideolectures/iitm.ac.in</p>

14ME3302 - MECHANICS OF MATERIALS

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	4 - 1 - 0
Prerequisites:	14ME1107 Mechanics for Engineers 14ME1205 Advanced Mechanics for Engineers	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Understand stress-strain concepts and analyze axially loaded members											
	CO2	Illustrate SFD & BMD and analyze the structure subjected to bending & torsion.											
	CO3	Determine deflections of statically determinate beams.											
	CO4	Analyse plane stress problems.											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M- Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H		L		M							
	CO2	M		L		H							
	CO3	M		L		H							
	CO4	M		L		H							
Course Content	UNIT - I TENSION, COMPRESSION AND SHEAR : Introduction, Normal Stress and Strain, Stress-Strain Diagrams, Elasticity and Plasticity, Linear Elasticity and Hooke's Law, Poisson's Ratio, Shear Stress and Strain, Allowable Stresses and Allowable Loads. AXIALLY LOADED MEMBERS: Axially loaded Members of uniform cross-section, Volumetric strain, Axially loaded Members of non-uniform cross-section, Impact loading.												

14ME3451 – COMPUTATIONAL METHODS LABORATORY

Course Category:	Programme Core	Credits:	2
Course Type:	Laboratory	Lecture - Tutorial - Practice:	0 - 0 - 3
Prerequisites:	14MA1301 (Complex Analysis and Numerical Methods) 14ME3302 (Mechanics of Materials) 14ME3402 (Advanced Mechanics of Materials)	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Understand basic commands in Mat lab											
	CO2	Perform Matrix Operations											
	CO3	Solve ordinary and partial differential equations											
	CO4	Perform numerical Integration											
	CO5	Develop Line and Surface Plots											
Contribution of Course Outcomes towards achievement of Program Outcomes (L – Low, M- Medium, H – High)		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H											
	CO2	H				M							
	CO3	L				H						H	
	CO4	L				H						H	
	CO5		M									H	
Course Content	List of Exercises: 1. Basics of MATLAB. 2. Mathematical operations on matrices. (Addition, Multiplication, Division) 3. Transpose, determinant and inverse of a matrix. 4. Solutions of simultaneous algebraic equations. 5. Numerical integration. 6. Line and Surface Plots 7. Solution of ordinary differential equations.												

	<p>UNIT II : Phase diagrams: Binary phase diagrams – Phase rule – one component system, two component system, isomorphous, eutectic, eutectoid, peritectic and peritectoid systems, Fe-Fe₃C equilibrium diagram. Heat treatment of steels: TTT diagrams for eutectoid, hypo and hyper eutectoid steels.</p> <p>UNIT III : Heat treatment processes: Annealing, normalizing, hardening, tempering, austempering, martempering, flame Hardening, Induction Hardening & Chemical hardening techniques, hardenability concept and experimental determination. Strengthening mechanisms: Strain hardening, solid solution strengthening, grain refinement, dispersion strengthening.</p> <p>UNIT IV : Powder metallurgy: Powder metallurgy process, preparation of powders, characteristics of metal powders, mixing, compacting, sintering, Applications of Powder Metallurgy.</p> <p>Composite materials: Classification of composites, various methods of component manufacture of composites, particle reinforced materials, fiber reinforced composite materials, and metal matrix composites.</p>
Text books and Reference books	<p>Text Books: [1] Kodgirie .V.D and Kodgirie.S.V, “Material Science and Metallurgy”, Thirty-seventh Edition, Everest House Publication,2015. [2] Raghavan.V, “ Material Science and Metallurgy” ,Fifth Edition, PHI Learning Pvt Limited,2013</p> <p>Reference Books: [1] Avenner , “Introduction to Physical Metallurgy”, Second Edition, Tata McGraw hill Education (India) Pvt Limited,1997. [2] Rajput R. K , “Material Science and Engineering”, Fourth Edition, S.K.kataria& Sons,2009.</p>
E-resources and other digital material	<p>[1] Prof.R.N.Ghosh, IIT Kharagpur, Solidification Binary Alloys, Iron-Carbon Phase Diagram,[English] Web Available: https://www.youtube.com/results?search_query=prof.r.n+ghosh+lectures [2] Prof.S.K.Gupta, IIT Delhi, Phase Diagrams, Crystal imperfections [English] Web Available: https://www.youtube.com/watch?v=x3n9ht-eRfg</p>

	<p>UNIT - II STATICALLY DETERMINATE BEAMS : Types of Beams, Shear Force and Bending Moment, Relationships between Load, Shear Force and Bending Moment, Shear Force and Bending Moment Diagrams.</p> <p>STRESSES IN STATICALLY DETERMINATE BEAMS: Introduction, Normal Strains in Beams, Normal Stresses in Beams, Shear Stresses in Rectangular Beams, Shear Stresses in Webs of Beams with flanges.</p> <p>UNIT – III DEFLECTIONS OF STATICALLY DETERMINATE BEAMS : Introduction, Differential Equations of the Deflection Curve, Deflections by Integration of the Bending Moment Equation integration of the Shear Force and Load equations, Deflections by Moment Area Method and Macaulay’s Method.</p> <p>UNIT – IV TORSION : Introduction, Torsion of Circular Bars, Relationship between Moduli of Elasticity E and G, Transmission of power by circular shafts, Uniform Torsion for Statically determinate Members.</p> <p>UNSYMMETRIC BENDING: Concept of shear centre with an example of channel section. ANALYSIS OF PLANE STRESS : Stresses on inclined Sections, Plane Stress, Principal Stresses and Maximum Shear Stress. Mohr’s Circle for Plane Stress. Hooke’s Law for Plane Stress.</p>
Text book and Reference book:	<p>Text Books: [1] James M. Gere and Barry J. Goodno, “Mechanics of Materials”, Seventh edition, CENGAGE Learning, 2009 [2] R.K.Bansal, “Strength of Materials” Fifth edition, Laxmi Publishers, 2012</p> <p>Reference books: [1] Dr. Sadhu Singh, “Strength of Materials”, Ninth edition, Khanna Publishers, 2007. [2] R.K. Rajput, “Strength of Materials”, First Edition, S.Chand & Company, 2006. [3] S.S.Rattan, “Strength of Materials”, Second Edition, Tata McGraw Hill Education Private Limited, 2012. [4] M.Chakraborti, “Strength of Materials”, Second Edition, S.K.Kataria & Sons,2007.</p>

E-resources and Other digital material:	[1] Prof. M.S. Sivakumar, IIT Madras, Strength of material, [English], Web Available: http://nptel.ac.in/courses/112106141/
	[2] Dr. Satish C Sharma, IIT Roorkee, Strength of material, [English], Web Available: http://nptel.ac.in/courses/112107146/
	[3] Dr. S. P. Harsha, IIT Roorkee, Strength of material, [English], Video Available: http://nptel.ac.in/courses/112107147/

14ME3406: MATERIAL SCIENCE AND METALLURGY

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	4 - 0 - 0
Prerequisites:	(14PH1102/1202) Engineering Physics (14CH1102/14CH1202) Engineering Chemistry	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Understand the Concept of structure and properties of materials.											
	CO2	Understand about Phase Diagrams and TTT Heat treatment of Steels.											
	CO3	Understand Heat treatment processes and Strengthening Mechanisms.											
	CO4	Understand the Principles of Powder Metallurgy and manufacturing Methods of different types of Composites											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H		M									
	CO2	H		M									
	CO3	H		M									
	CO4	H		M									
(L – Low, M- Medium, H – High)													
Course Content	UNIT I : Properties of materials: Physical properties - Mechanical properties – Electrical properties, Magnetic Properties and Chemical properties. Crystallography: Classification of crystals – Bravi's lattices – Miller Indices – Packing factor in cubic systems – coordination number – crystal imperfections – crystal deformation – Slip and Twinning.												

	<p>UNIT – III D.C. Machines: classification of dc machines; Principle of motor and generator; back emf; Torque of a dc machine; Load characteristics of shunt, series motors AC Machines: Classification of ac machines; Production of rotating field; Constructional features – principle of operation; Torque-slip characteristics;</p> <p>UNIT – IV Measuring Instruments: Classification of instruments; Principle of operation of moving-coil and moving-iron instruments; – Dynamometer –type watt meter Utilization: Principles of resistance and induction heating – principles of electrical traction – speed time characteristics</p>
Text books and Reference books	<p>Text Book: [1] I.J.Nagrath and Kothari, “Theory and problems of Basic Electrical Engineering”, Prentice-Hall of India Pvt. Ltd</p> <p>Reference Books: [1] Dr. K. Uma Rao, Dr. A. Jayalakshmi, “Basic Electric Engineering”, Pearson Publications. [2] T.K. Nagasarkar and M.S. Sukhja, “Basic Electric Engineering”, Oxford University Press.</p>
E-resources and other digital material	---

14ME3303 - BASIC THERMODYNAMICS

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	NIL	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	After successful completion of this course, the student will be able to											
CO1	Understand the basic concepts of thermodynamics and differentiate between work and heat forms of energy											
CO2	Apply mass and energy balance equations for open and close thermodynamic systems.											
CO3	Understand the Second law of thermodynamics and the concepts of entropy, energy and irreversibility.											
CO4	Evaluate the properties of pure substances and analyze Rankine's steam power cycle.											
Contribution of Course Outcomes towards achievement of Program Outcomes	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	H		L		M							
CO2	M		H		H							
CO3	M		M		H							
CO4	M		H		H							
(L-Low, M-Medium, H-High)												
Course Content	<p>UNIT I : FUNDAMENTAL CONCEPTS AND DEFINITIONS : Thermodynamic system and control volume, Macroscopic and microscopic points of view, properties and state of a substance, Thermodynamic equilibrium and Quasi-static Process, thermodynamic path, cycle, Zeroth law, concept of temperature, Perfect gases. Equation of a state for perfect gas.</p> <p>WORK AND HEAT: Definition of work, units, work done at the moving boundary of a system, work done in various non-flow processes, definition of heat, units, comparison of heat and work.</p>											

UNIT II :

FIRST LAW FOR NON FLOW SYSTEMS: First law of thermodynamics for a system undergoing a cycle and for a change in state of system, internal energy and enthalpy, constant volume and constant pressure specific heats and their relation to internal energy and enthalpy of ideal gases.

FIRST LAW FOR FLOW SYSTEMS: Control mass and control volume, first law of thermodynamics for a control volume, steady state steady flow energy equation and application to engineering equipment.

UNIT III :

SECOND LAW OF THERMODYNAMICS: Limitations of First law of thermodynamics. Heat engines and Refrigerators. Statements of Second law of Thermodynamics. Carnot cycle and the two propositions regarding the efficiency of Carnot cycle, Thermodynamic temperature scale, processes-reversible and irreversible, factors that render a process irreversible.

ENTROPY: Inequality of Clausius, Entropy change in reversible process, T- ds relations, Maxwell relations, Entropy change of a system during an irreversible process, Principle of increase of entropy, Entropy change of an ideal gas, Concepts of Exergy, and irreversibility.

UNIT IV :

PURE SUBSTANCES: Pure substance, vapor-liquid-solid phase equilibrium in a pure substance, Independent properties of a pure substance, Equations of state for vapor phase of a simple compressible substance, Tables of thermodynamic properties, thermodynamic surfaces.

VAPOUR POWER CYCLES: Rankine cycle, Effect of pressure and temperature on the Rankine cycle, reheat cycle, regenerative cycle, Deviation of actual cycles from ideal cycles.

Text Books and Reference Books**Text Books:**

1. Yunus A. Cengel M. and Michael A. Boles, "Thermodynamics- An Engineering Approach", Seventh edition, McGraw Hill Education (India) Private Limited, 2011.
2. P.K.Nag, "Engineering Thermodynamics" Fifth edition, Tata McGraw Hill Education Private Limited, 2012..

Reference Books:

1. G.J.Van Wylen & Sonntag, "Fundamentals of Classical Thermodynamics", 4th Edition, 1994 Wiley publication 2005.
2. R.K. Rajput, "Thermal Engineering", Eighth Edition, 8th Edition

14EE1405 – BASICS OF ELECTRICAL ENGINEERING

Course Category:	Institutional Core	Credits:	2
Course Type:	Theory	Lecture - Tutorial - Practice:	2 - 0 - 0
Prerequisites:	Engineering Physics 14PH1202	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:											
CO1	Understand the Fundamentals of Electric Circuits											
CO2	Understand the Fundamentals of Electromagnetism											
CO3	Apply the Basic Concepts of Electric Machines											
CO4	Understand the Principles of Measuring Instruments and Electrical Energy Utilization											
Contribution of Course Outcomes towards achievement of Program Outcomes	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	M	M	M									
CO2	M	L	L									
CO3	M	M	M									
CO4	M	M	M									
(L – Low, M- Medium, H – High)												
Course Content	Unit I DC Circuits: Definitions of Work, Power, Energy and Torque; Ohms law; Kirchhoff's Laws; Series-Parallel resistive circuits; Star-delta Transformation; AC circuits: Generation of Sinusoidal Signal ; RMS, Average Values, Form Factor, Peak Factor UNIT –II Magnetic effect of an electric current; cross and dot conventions; concept of m.m.f., flux, flux density, reluctance, permeability and field strength; Self and Mutual inductances; Fleming's left hand rule; Faradays laws of electromagnetic induction, statically and dynamically induced e.m.f.,											

**E-resources
and other
digital
material**

- [1].<http://www.iscid.org/encyclopedia/Tthermodynamics>.
[2].<http://www.transtutors.com/>

**E-resources
and other
Digital
Material**

- 2010, Lakshmi publications 2010.
3. Rathakrishnan, “Fundamentals of Engineering Thermodynamics”,
Second Edition, PHI, 2006
1. nptel.ac.in/courses/112105123/
2. <http://www.learnthermo.com/tutorials.php>
3. <http://home.iitk.ac.in/~suller/lectures.htm>
4. <http://elearning.vtu.ac.in/06ME33.html>

14HS1304 ENVIRONMENTAL STUDIES

Course Category:	Institutional Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial- Practice:	3 - 0 - 0
Prerequisites:	Concern on Conservation and Preservation of Environment	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:											
CO1	Understand the various natural resources, analyze and explore degradation management											
CO2	Understand the Ecosystems and need of Biodiversity											
CO3	Realize and Explore the Problems related to Environmental pollution and its management											
CO4	Apply the Role of Information Technology and analyze social issues, Acts associated with Environment.											
	PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
CO1	L							H				
CO2			H			H		H				
CO3		L		L		H		H				
CO4								H	H	L	L	L
Contribution of Course Outcome s towards achievement of Program Outcomes (L–Low, M–Medium, H – High)												
Course Content	UNIT -I The Multidisciplinary Nature of Environmental Studies Definition, scope and importance Need for public awareness. Natural Resources Renewable and Non-renewable Resources: Natural resources and associated problems. (a) Forest resources: Use and over-exploitation, deforestation. Timber extraction, mining, dams and their effects on forests and tribal											

STEAM TURBINES:

Types of steam turbines, Impulse turbines, pressure and velocity compounding, velocity diagrams, work output, power, blade efficiency and stage efficiency, Reaction turbines, velocity diagrams, degree of reaction, work output, power, blade efficiency and stage efficiency, Governing of turbines, Overall efficiency and reheat factor.

STEAM CONDENSERS:

Jet and Surface condensers, condenser vacuum and vacuum efficiency, Condenser efficiency, Thermodynamic analysis, Air pump.

UNIT – III**RECIPROCATING AIR COMPRESSORS:**

Classification, Operation, Effect of clearance volume, compression ratio, volumetric efficiency, indicated power, Single-stage and Multi-stage compressors, Effect of inter-cooling, optimum intermediate pressure in a two-stage compressor.

ROTARY COMPRESSORS:

Introduction, Types and their applications, principles of working, static and total head values, Centrifugal compressor- velocity vector diagrams, pressure coefficient, pre whirl, Axial flow compressor polytrophic efficiency, Surging, Choking and Stalling, Centrifugal compressor versus axial flow compressor.

UNIT – IV**GAS TURBINES:**

Closed and open Brayton cycle gas turbines, analysis of closed cycle gas turbines compressor and turbine efficiencies, gas turbine cycles with intercooling, reheat and regeneration

JET AND ROCKET PROPULSION:

Basic principles of jet propulsion – specific thrust, propulsive efficiency and overall thermal efficiency of a jet engine; concepts of turbo shaft, turbo prop, turbo fan; principles of rocket propulsion, types of rocket propulsion.

Text books and Reference books**Text Books:**

- [1]. A.K. Rajput, "Thermal Engineering", Eight Edition, Lakshmi Publications, 2014
- [2]. Mahesh M. Rathore "Thermal Engineering" Fourth Edition, Tata-McGraw-Hill, 2010.

Reference Books:

- [1]. V.R. Vasandani and D.S. Kumar, Treatise on Heat Engineering , Fourth Edition, Metropolitan Book Company, 1979.
- [2]. M.D.Burghardt "Engineering Thermodynamics with Applications" Second Edition, Harper and Row Publications, 1982

14ME3404: APPLIED THERMODYNAMICS

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	4 - 1 - 0
Prerequisites:	14ME 3303 Basic Thermodynamics	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Understand the process of steam Generation and applying the principles of thermodynamics in steam nozzles											
	CO2	Understand and analyze the performance of steam Turbines and Steam Condensers											
	CO3	Understand and analyze the performance of reciprocating and rotary compressors											
	CO4	Understand the principles of gas turbines and Jet and Rocket Propulsion											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	M				M							
	CO2	M				H							
	CO3	M				H							
	CO4	M				M							
(L – Low, M- Medium, H – High)													
Course Content	UNIT – I: STEAM BOILERS: Function, classification, working of Cochran boiler and Babcock and Wilcox boiler, Mountings & Accessories. STEAM NOZZLES: Types of nozzles, isentropic flow through nozzles, Effect of friction, Nozzle efficiency, Critical pressure ratio and maximum discharge, calculation of throat and exit areas using Mollier Diagram UNIT - II												

- people.
- (b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
 - (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
 - (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
 - (e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
 - (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.
Equitable use of resources for sustainable lifestyles.

UNIT II

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, characteristic features, structure and function of the following ecosystem:
- (a) Forest ecosystem
 - (b) Grassland ecosystem
 - (c) Desert ecosystem
 - (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and Its Conservation

- Introduction, definition: genetic, species and ecosystem diversity.
Biogeographically classification of India.
Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
Biodiversity at global, National and local levels.
India as a mega-diversity nation.
Hot-spots of biodiversity.
Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.
Endangered and endemic species of India.
Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT III**Environmental Pollution**

Definition

Causes, effects and control measures of

- | | |
|---------------------|-----------------------|
| (a) Air pollution | (b) Water pollution |
| (c) Soil pollution | (d) Marine pollution |
| (e) Noise pollution | (f) Thermal pollution |
| (g) Nuclear hazards | |

Solid waste management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Disaster management: Floods, earthquake, cyclone and landslides.

UNIT IV**Social Issues and the Environment**

From unsustainable to sustainable development.

Urban problems related to energy.

Water conservation, rain water harvesting, watershed management.

Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Wasteland reclamation.

Consumerism and waste products.

Environment Protection Act.

Air (Prevention and Control of Pollution) Act.

Water (Prevention and Control of Pollution) Act.

Wildlife Protection Act.

Forest Conservation Act.

Issues involved in enforcement of environmental legislation.

Public awareness.

Human Population and the Environment

Population growth, variation among nations.

Population explosion—Family Welfare Programme.

Environment and human health.

Human rights.

Value education.

HIV/AIDS.

Women and Child Welfare.

Role of Information Technology in environment and human health.

Field Work/ Case Studies {NOT TO BE INCLUDED IN SEMESTER END EXAMS}

E-resources and other digital material

1. http://nptel.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/fluid_mechanics/ (Prof.S.Dutta and Prof Nirranjan Sahoo)
2. [http://nptel.ac.in/video.php?subjectId=105101082\(Dr. ELDHO T. I., IITBOMBAY\).](http://nptel.ac.in/video.php?subjectId=105101082(Dr. ELDHO T. I., IITBOMBAY).)
3. <http://nptel.ac.in/courses/112105171/> (Prof .S.K.Som IIT Khargpur)
4. <http://www.efluids.com/>
5. <http://www.efm.leeds.ac.uk/CIVE/FluidsLevel1/Unit00/index.html>
6. <http://www.freestudy.co.uk/fluid%20mechanics/>

	<p>of fluid particle, type of fluid flow, Description of flow pattern, Rotation and irrotational flow, velocity potential, stream function, continuity equation in Cartesian coordinates.</p> <p>Fluid dynamics: Introduction, Control volume & control surface, Euler's equation of motion along a stream line, Bernoulli's equation and applications, Pitot tube, Venturimeter, orifice meter</p> <p>UNIT – III Impulse momentum equation: Impulse momentum Principle, Equation and Applications-Force on pipe bend</p> <p>Flow through pipes: Types, Reynolds experiment, Darcy-Wiesbac equation, minor losses, hydraulic gradient, Total energy lines, pipes in series and parallel, transmission of power through a pipe, water hammer flow through a circular pipe, Hagen-Poiseuille law.</p> <p>UNIT – IV Boundary layer theory: Introduction, boundary layer thickness, displacement thickness, momentum thickness, energy thickness, boundary layer growth on a flat plate, separation of boundary layer, Methods of controlling boundary layer.</p> <p>Flow of compressible fluids: Equation of state, Gas laws, Equation of motion, Equation of Continuity and Equation of Energy, Propagation of elastic waves, Mach number, Mach cone, Shock waves, Stagnation point concept of lift and drag.</p>
Text books and Reference books	<p>Text Books:</p> <ol style="list-style-type: none"> 1. R.K.Bansal, "Fluid Mechanics and Hydraulic machines", 9th Edition 2011, Laxmi Publications 2. Frank M. White, "Fluid Mechanics" (In SI Units) 7th Edition, McGraw-Hill Publications 3. P.N. Modi & S.M.Seth, "Hydraulics and fluid mechanics", 17th Edition, 2009, Standard Book House <p>Reference Books:</p> <ol style="list-style-type: none"> 1. D.S.Kumar, "Fluid mechanics and fluid power engineering", 7th Reprint 2011 Laxmi Publications 2. Yunus A. Cengel, John M. Cimbala, "Fluid Mechanics Fundamentals and Applications", 3rd Edition, McGraw Hill Education 3. R.K.Rajput "Fluid Mechanics And Hydraulic Machines", 4th Edition, S Chand 4. K.L.Kumar, "Fluid Mechanics", 8th Reprint 2012, S.Chand publications

	<p>Visit to a local area to document environmental assets—river/forest/grassland/hill/ mountain.</p> <p>Visit to a local polluted site—Urban/Rural/Industrial/Agricultural.</p> <p>Study of common plants, insects, birds.</p> <p>Study of simple ecosystems—pond, river, hill slopes, etc.</p>
Text books and Reference books	<p>Text Book:</p> <ol style="list-style-type: none"> 1. Text book for ENVIRONMENTAL STUDIES for under graduate courses of all branches of higher education – Erach Bharucha -- For University Grants Commission. First edition 2004. <p>Reference Book:</p> <ol style="list-style-type: none"> 1 Anjaneyulu Y. Introduction to Environmental sciences, B S Publications PVT Ltd, Hyderabad 2004
E-resources and other digital material	<p>collegesat.du.ac.in/UG/Envirnromental%20Studies_ebook.pdf</p>

14EC1305: BASICS OF ELECTRONICS ENGINEERING

Course Category:	Programme Core	Credits:	2
Course Type:	Theory	Lecture - Tutorial - Practice:	2 - 0 - 0
Prerequisites:	-	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Gain knowledge about the fundamentals of electronic components, devices, transducers											
	CO2	Understand and apply principles of digital electronics											
	CO3	Get familiarity about basic communication systems											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L											
	CO2	M											
	CO3	L											
(L – Low, M- Medium, H – High)													
Course Content	UNIT I ELECTRONIC COMPONENTS Passive components – resistors, capacitors & inductors (properties, common types, I-V relationship and uses). SEMICONDUCTOR DEVICES Semiconductor Devices - Overview of Semiconductors - basic principle, operation and characteristics of PN diode, zener diode, BJT, JFET, optoelectronic devices (LDR, photodiode, phototransistor, solar cell, photocouplers) UNIT II TRANSDUCERS Transducers - Instrumentation – general aspects, classification of transducers, basic requirements of transducers, passive transducers - strain gauge, thermistor, Hall-Effect transducer, LVDT, and active transducers – piezoelectric and thermocouple.												

14ME3403 -FLUID MECHANICS

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14ME1107,14ME1205	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Understand the Basic concepts of fluid mechanics and analyze hydrodynamic forces in submerged bodies											
	CO2	Understand the various types of fluid flows and analyze stream function, velocity potential.											
	CO3	Analyze fluid flow problems with the application of the continuity, momentum and energy equations											
	CO4	Understand the concepts of laminar & turbulent boundary layer theories and basic concepts of compressible flow											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H				M							
	CO2	M				H							
	CO3	M				H							
	CO4	H				M							
(L – Low, M- Medium, H – High)													
Course Content	UNIT – I Introduction: Definition of fluid, properties of fluid – density, specific weight, specific gravity, viscosity, compressibility, surface tension, capillarity, Classification of fluids, vapor pressure. Fluid statics: Pressure, variation of pressure in fluid, pressure head, Pascal's law, measurement of pressure- simple and differential manometers, Total pressure and center of pressure on plane surfaces, Buoyancy and Metacentric height. UNIT – II Fluid kinematics: Description of fluid flow, Velocity and acceleration												

	<p>[3] S.S.Rattan, "Strength of Materials", Second Edition, Tata McGraw Hill Education Private Limited, 2012.</p> <p>[4] Steven C Chapra & Raymond P Canale, "Numerical Methods for Engineers", McGraw Hill International Edition.</p> <p>[5] Tirupathi R Chandrupatla & Ashok D Belegundu, "Introduction to Finite Elements in Engineering"</p>
E-resources and other digital material	<p>[1] Prof. M.S. Sivakumar, IIT Madras, Strength of material, [English], Web Available: http://nptel.ac.in/courses/112106141/</p> <p>[2] Dr. Satish C Sharma, IIT Roorkee, Strength of material, [English], Web Available: http://nptel.ac.in/courses/112107146/</p> <p>[3] Dr. S. P. Harsha, IIT Roorkee, Strength of material, [English], Video Available: http://nptel.ac.in/courses/112107147/</p>

	<p>UNIT III DIGITAL ELECTRONICS Number systems – binary codes - logic gates - Boolean algebra, laws & theorems - simplification of Boolean expression - implementation of Boolean expressions using logic gates - standard forms of Boolean expression.</p> <p>UNIT IV COMMUNICATION SYSTEMS Block diagram of a basic communication system – frequency spectrum - need for modulation - methods of modulation - principles of AM, FM, pulse analog and pulse digital modulation – AM / FM transmitters & receivers (block diagram description only)</p>
Text books and Reference books	<p>TEXT BOOKS:</p> <ol style="list-style-type: none"> 1. Thyagarajan. T, Sendur Chelvi. K. P, Rangaswamy. T. R, "Engineering Basics: Electrical, Electronics and Computer Engineering", New Age International, Third Edition, 2007. 2. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education, 2013. 3. G.K.Mithal, "Radio Engineering", 20th Edition, Khanna Publishers, 2011. <p>REFERENCES:</p> <ol style="list-style-type: none"> 1. Somanathan Nair. B, Deepa. S. R, "Basic Electronics", I.K. International Pvt. Ltd., 2009. 2. S. Salivahanan, N.Suresh Kumar & A. Vallavaraj, "Electronic Devices & Circuits", 2nd Edition, Tata Mc Graw Hill, 2008.
E-resources and other digital material	<ol style="list-style-type: none"> 1. http://www.nptel.ac.in/courses/Webcourse-contents/IIT-ROORKEE/BASIC-ELECTRONICS/home_page.htm

14ME3306: KINEMATICS OF MACHINES

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14ME1107 Mechanics for Engineers 14ME1205 Adv. Mech. For Engineers 14ME1205 Engg. Graphics	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Analyze different mechanisms.											
	CO2	Determine position, velocity, and acceleration of linkages											
	CO3	Analyze and Synthesize kinematic linkages											
	CO4	Determine parameters of gears and gear trains											
		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H		M		L							
	CO2	L		M		H							
	CO3	M		H		H							
	CO4	M		H		H							
Contribution of Course Outcomes towards achievement of Program Outcomes													
(L – Low, M- Medium, H – High)													
Course Content	UNIT I : INTRODUCTION : Mechanisms and machines, Rigid and resistant bodies, Link, Kinematic pair, Degrees of Freedom, Classifications of Kinematic pairs, kinematic-chain, Linkage, Mechanism and structure, Classification of mechanisms, Inversions of Mechanism: Four - Link (bar) chain, Single Slider - Crank Chain, Double – Slider Chain. Instantaneous centre, Notation, Number of I - Centres, Kennedy's theorem, Locating I - Centres, Angular velocity by I - Centre Method for simple mechanisms.												

STATICALLY INDETERMINATE BEAMS: Statically indeterminate Beams, Analysis by the differential equations of the Deflection curve, Moment Area Method.

UNIT - II

CONTINUOUS BEAMS: Clapeyron's theorem of three moments, Beams with constant and varying moments of inertia.

CURVED BEAMS: Stresses in Beams of small and large initial curvature, The Winkler-Bach theory, Stresses in Crane Hook with trapezoidal cross- section.

UNIT – III**THIN AND THICK CYLINDRICAL PRESSURE VESSELS:**

Stresses in thin cylindrical vessel subjected to internal pressure. Effect of internal pressure on the dimensions of the thin cylindrical vessel. Stresses in a thick cylindrical shell, Stresses in compound thick cylinders, Initial difference in radii at the junction of the compound cylinder for Shrinkage.

CENTRIFUGAL STRESSES: Introduction, Rotating Ring, Rotating Disc, Rotating Disc of uniform strength.

UNIT - IV

COLUMNS: Buckling and Stability, Columns with Pinned ends, Columns with other support conditions, Limitations of Euler's Formula, Rankine's Formula, Columns with eccentric Axial Loads, Secant formula.

APPLICATION OF NUMERICAL METHODS:

Finite difference methods – uniform bar and beams, Introduction to Finite Element Methods with an example of stepped bar.

Text books and Reference books**Text Books:**

- [1] James M. Gere and Barry J. Goodno, "Mechanics of Materials", Seventh edition, CENGAGE Learning, 2009
- [2] R.K.Bansal, "Strength of Materials" Fifth edition, Laxmi Publishers, 2012

Reference books:

- [1] Dr. Sadhu Singh, "Strength of Materials", Ninth edition, Khanna Publishers, 2007.
- [2] R.K. Rajput, "Strength of Materials", First Edition, S.Chand & Company, 2006.

14ME3402 - ADVANCED MECHANICS OF MATERIALS

Course Category:	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial - Practice:	4 - 1 - 0
Prerequisites:	14ME1107 Mechanics for Engineers 14ME1205 Advanced Mechanics for Engineers 14ME3302 Mechanics of Materials	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Determine stress, strain and deformations for statically indeterminate members.											
	CO2	Understand the concept and to determine stresses in curved beams and safe load on columns.											
	CO3	Analyze and determine stresses and strains for pressure vessels & rotating discs.											
	CO4	Analyze bar and beam structures using numerical methods.											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H		L		M							
	CO2	M		M		H							
	CO3	M		M		H							
	CO4	M		M		H							
(L – Low, M- Medium, H – High)													
Course Content	UNIT – I STATICALLY INDETERMINATE BARS: Analysis of bars of composite sections, Temperature stresses in composite sections, Effects of misfits and pre-strains or prestress.												

UNIT II :

VELOCITY ANALYSIS: Introduction, Absolute and Relative Motion, Vectors, Addition and subtraction of Vectors, Motion of a Link, Four Link Mechanism, Angular Velocity of Links, Slider - Crank Mechanism, Crank and Slotted Lever Mechanism.

ACCELERATION ANALYSIS : Acceleration, Four-Link Mechanism, Angular acceleration of Links, Acceleration of Intermediate and offset points, slider-Crank Mechanism, Coriolis acceleration component, Crank and slotted lever Mechanism.

UNIT III :

KINEMATIC SYNTHESIS : Stages of synthesis-Concepts of type, Number and dimensional synthesis - Tasks of dimensional synthesis, Concepts of function generation, Rigid body guidance and path generation, Freudenstein equation for function generation using three precision points for four bar mechanism. (3 precision points only).

CAMS: Introduction, Types of cams, Types of Followers, Definitions, Graphical synthesis of cam profile limited to reciprocating & radial follower. (Knife Edge, Roller and Flat faced Followers).

UNIT IV :

GEARS : Introduction, Classification of gear terminology, Law of Gearing, Velocity of Sliding, Forms of Teeth- Cycloidal Profile Teeth, Involute Profile Teeth, Path of contact, Arc of contact, Number of pairs of Teeth in contact, Interference in Involute Gears, Minimum number of Teeth in Involute Gears, Comparison of Cycloidal and Involute tooth forms.

GEAR TRAINS: Introduction, simple Gear Train, Compound Gear Train, Reverted Gear train, Planetary or Epicyclic Gear Train, Analysis of Epicyclic Gear Train, Torques in Epicyclic Gear Trains. Tabular method only.

Text books and Reference books**Text Books:**

1. S.S.Rattan, "Theory of Machines". 3rd Edition, 15th Reprint. TMH. 2012.
2. J.E. Shigley, "Mechanism and Machine Theory", 4th Edition. Oxford university press. 2011.

Reference Books:

1. C S Sharma and Kamlesh Purohit, "Theory of Mechanisms and Machines", Prentice Hall of India.2006.
2. Ghosh and Mallik, "Theory of Mechanisms and Machines", 3rd Edition. East West Press. 2006.
3. Dr. J.S. Brar, DR. R.K. Bansal, "A text book of Theory of Machines", 5th edition. Laxmi publications.2015

E-resources and other digital material	<ol style="list-style-type: none"> 1. Prof. A. K. Mallik, NPTEL >> Mechanical Engineering >> Kinematics of Machines (Video) 2. http://freevideolectures.com/Course/2359/Kinematics-of-Machines 3. http://www.rapidmaniac.com/search/relevant/All/solution-manual-kinematics-and-dynamics-of-machines 4. http://nptel.iitg.ernet.in/Mech_Engg/IIT%20Delhi/Kinematics%20of%20Machines.htm
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	<p>Fourier transforms, Fourier sine and cosine transforms - Finite Fourier sine and cosine transforms, Fourier transforms of the derivatives of a function. Parseval's Identity for Fourier Transforms.</p> <p>Z-Transforms: Definition, Some Standard Z-Transforms, Linearity Property, Damping Rule, Some Standard Results, Shifting un to the Right, Multiplication by 'n', Two Basic Theorems.</p> <p>UNIT III: Probability Densities: Continuous random variables – Normal distribution – Normal approximation to the binomial distribution – Other probability densities – Uniform distribution – Log – Normal distribution – Gamma distribution – Beta distribution – Weibull distribution – joint distributions – Discrete and continuous checking if the data are normal – Transforming observations to near normally.</p> <p>UNIT – IV Sampling Distributions: Populations and samples – Sampling distribution of the mean (SD known) – Sampling distribution of the mean (SD unknown) – Sampling distribution of the variance. Statistics: Method of Least Squares – correlation – Regression</p>
Text books and Reference books	<p>Text Book: [1] B.S.Grewal, "Higher Engineering Mathematics", 42nd Edition Khanna Publishers, 2012.(Unit I and Unit II) (2) Richard A.Johnson, " Probability and statistics for Engineers"– Prentice Hall of India (Unit III and Unit IV)</p> <p>Reference Books: (1) Krezig, "Advanced Engineering Mathematics "8th Edition JohnWiley & sons, , 2007. (2) H.K.Das, Er. Rajnish Verma, "Higher Engineering Mathematics ", 1st Edition, S.Chand 2011. (3) T.K.V.Iyengar, " Probability and Statistics " S.Chand & Company, 4th Edition, 2012 (4) Rukmangadachari E, " Probability and Statistics", Pearson, 2012</p>
E-resources and other digital material	<ol style="list-style-type: none"> [1] probweb.berkeley.edu/teaching.html [2] statsci.org/teaching.html [3] mathworld.wolfram.com/fourierseries.html [4] www.thefouriertransform.com

**14MA1401:
TRANSFORMATIONS&PROBABILITY DISTRIBUTIONS (T&P)**

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	Basic concepts of probability, statistics and Trigonometry	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Analyze general periodic functions in the form of an infinite convergence series of sines and cosines.											
	CO2	Apply Fourier Transforms and Z- Transforms to evaluate indefinite integrals and engineering problems.											
	CO3	Understand the probability densities of continuous random variables for different distributions											
	CO4	Understand the concepts of sampling distribution, estimate correlation and regression coefficients											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	M			M						M	
	CO2	H	M			M						M	
	CO3	H	M			M						M	
	CO4	H	M			M						M	
Course Content	UNIT – I Fourier Series: Introduction, Euler's Formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, change of interval, odd and even functions, Expansions of odd and even periodic functions, Half - range series, Parseval's formula, complex form of Fourier series. Practical harmonic analysis. UNIT – II Fourier Transforms: Introduction, Definition, Fourier integrals, Fourier sine and cosine integrals - complex form of Fourier integrals.												

14ME 3307: MANUFACTURING PROCESSES

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial - Practice:	3 - 1 - 0
Prerequisites:	14PH1102/14PH1202 Engineering Physics 14ME1106 Basics of Mechanical Engineering	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Understand the technology of the casting processes.											
	CO2	Differentiate various casting methods and their applications.											
	CO3	Differentiate various joining processes with applications.											
	CO4	Understand various bulk forming and sheet metal processes											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H		H		H							
	CO2	H		L		L							
	CO3	H		L		L							
	CO4	H		H		H							
Course Content	UNIT I Metal casting: Introduction, General method in making a Casting, pattern: types, materials and allowances. Moulding materials and equipment, Preparation, control and testing of moulding sands. Types of Cores, Gating system design, Riser design and Caines method-simple problems. Cupola: Description, operation and zones. UNIT II : Special casting methods: Permanent Mould Casting, Die Casting: Hot chamber die casting, Cold chamber die casting, Air blown type die casting, Vacuum die casting. Centrifugal casting: True centrifugal casting, Semi-centrifugal casting Centrifuging. Investment casting, shell												

	<p>moulding, CO₂ process and continuous casting. Fettling of castings, casting defects: causes, remedies and testing.</p> <p>UNIT III : Welding: Gas and arc welding, principles of oxy-acetylene welding, TIG, MIG, submerged arc welding, arc length, arc blow, duty cycle. Resistance welding principles, Butt welding, Spot welding, Seam welding. Thermit Welding, Electroslag welding. Laserbeam welding. Brazing & Soldering, welding defects, causes and remedies, Weld design-simple problems.</p> <p>UNIT IV : Bulk forming processes: Introduction, Hot and Cold working of metals. Rolling, Forging, Extrusion, Tube making, and Wire drawing.</p> <p>Sheet metal working operations: Introduction, Sheet metal Blanking and Punching operations. Clearance and shear as applied to Punching/Blanking operations. simple related problems. Elastic recovery in bending operation.</p> <p>Text books and Reference books</p> <p>Text Books:</p> <ol style="list-style-type: none"> 1. Manufacturing Technology by PN Rao Vol.1, Edition-3, 2009, TMH 2. Principles of Metal Casting by Heine, Loper, Rosenthal. 33rd Reprint, 2008, TMH 3. A course in Work shop technology Vol-I by V.S. Raghuvamshi, 2007, Dhanpatrai & sons. 4. Mechanical Metallurgy by George. E. Dieter, SI Metric Edition 2000, McGraw Hills. <p>Reference Books:</p> <ol style="list-style-type: none"> 1. Welding and welding Technology by Richard L. Little, 1973, McGraw Hill 2. Workshop Technology Vol.1 by S.K. Hazra Chowdary. Khanna publishers.
E-resources and other digital material	<ol style="list-style-type: none"> 1. http://nptel.iitm.ac.in 2. http://www.egr.msu.edu 3. http://www.engr.sjsu.edu 4. http://mechatronic.me.hfu.edu.tw 5. http://web.iitd.ac.in

SEMESTER-IV

	IV . CASTING :To make the following castings using Lead or Aluminum metals a. Solid Casting like Dumbell b. Casting with a Central hole c. Rectangular Stepped Block d. Cylindrical Block
Text books and Reference books	Text Books: 1.S.K.Hajra Chowdary, A.K. Hajra Chowdary, Nirjhar Roy,"Elements of Workshop Technology, Vol.I".Media Promoters and Publishers Pvt.Ltd, Mumbai,Scitech Publications, Chennai, 2013

14ME3351 - COMPUTER AIDED DRAFTING LABORATORY

Course Category:	Programme Core	Credits:	2
Course Type:	Laboratory	Lecture - Tutorial - Practice:	0 - 0 - 3
Prerequisites:	14ME1251 Engineering graphics	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:												
	CO1	To develop drafting features of simple mechanical components.											
	CO2	To develop part drawing views of mechanical components.											
	CO3	To develop assembly views of mechanical components.											
Contribution of Course Outcomes towards achievement of Program Outcomes		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	L		H						M		H	
	CO2	L		H						M		H	
	CO3	L		H						M		H	
(L – Low, M- Medium, H – High)													
Course Content	Computer Aided Drafting: Introduction, Overview, Required Equipment, Computer, Terminal, Keyboard, Plotters, Printers, Digitizers, Locators and Selectors, Display Technology: Plotting the Drawings, Basics of Operating System: Starting AutoCAD, Invoking AutoCAD Commands, Interactive Techniques, Planning for a Drawing: Co-ordinate System, Basic Geometric Commands, Drawing Entity-POINT, LINE, ELLIPSE, POLYGON, RECTANGLE, CIRCLE, ARC Object Selection: Edit Commands Zoom Command Cross-hatching and Pattern Filling Utility Commands. Any Eight of the following Part drawing (using Computer Aided Drafting software) <ol style="list-style-type: none"> 1. Part drawing of Screw jack 2. Part drawing of stuffing box 3. Part drawing of Drill jig 4. Part drawing of Pipe vice 												

	<p>5. Part drawing of eccentric</p> <p>Assembly drawing (using Computer Aided Drafting software)</p> <ol style="list-style-type: none"> 1. Assembly of Screw jack 2. Assembly of Stuffing box 3. Assembly of Drill jig 4. Assembly of Pipe vice 5. Assembly of eccentric
Text books and Reference books	<p>Text Books:</p> <p>[1] K L Narayana, P. Kannaiah, K. Venkat Reddy," Machine Drawing", Fourth Edition, New age international publishers, 2014</p> <p>Reference Manual:</p> <p>[1] Auto CAD Manual by Department of Mechanical Engineering, V.R.Siddhatha Engg College.</p>
E-resources and other digital material	<p>[1] Auto Desk, Machine drawing, [English], Web Available: http://www.autodesk.com/education/free-software/autocad</p> <p>http://www.cadtutor.net/tutorials/autocad/</p>

14ME3352 MANUFACTURING PROCESS LAB

Course Category:	Institutional Core	Credits:	2
Course Type:	Practice	Lecture - Tutorial - Practice:	3 hrs./week
Prerequisites:	Nil	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes		Upon successful completion of the course, the student will be able to:											
	CO1	Prepare various joints used in fitting.											
	CO2	Prepare various sand moulds.											
	CO3	Fabricate various welding joints.											
Contribution of Course Outcomes towards achievement of Program Outcomes	CO4	Manufacture various solid castings.											
		PO a	PO b	PO c	PO d	PO e	PO f	PO g	PO h	PO i	PO j	PO k	PO l
	CO1	H	H	H								L	
	CO2	H	H	H								L	
	CO3	H	H	M								L	
(L – Low, M- Medium, H – High)	CO4	H	H	M								L	
Course Content	I . FITTING : To make the following joints a. Half round joint b. Stepped joint c. Rectangular joint d. Triangular Joint II . MOULDING : To make the following sand moulds a. Single piece pattern (Stepped Rectangular Block) b. Two piece pattern (Step Cone Pulley) c. Two piece pattern (Dumbell) d. Pattern with Core III .WELDING : To make the following welding joints a. To make V-Joint using TIG welding b. To make T- Joint using MIG welding c. To make Butt Joint using MIG welding d. To make Lap Joint using Resistance welding												