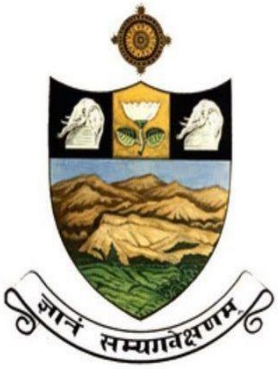
SRI VENKATESWARA UNIVERSITY :: TIRUPATI

Department of Mechanical Engineering

S.V. University College of Engineering:: Tirupati



R – 20 Scheme of Instruction and Syllabi of III & IV – Semesters (2nd Year) B. Tech Programme

in

Mechanical Engineering

Effective from the batches admitted in

2020 – 21 onwards

PROGRAM OUTCOMES

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineeringproblems reaching substantiated conclusions using first principles of mathematics, natural sciences,andengineering sciences.
3. **Design/development of solutions**: Design solutions for complex engineering problems and designsystem components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
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 theinformationto providevalid conclusions.
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 anunderstandingofthelimitations.
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 theprofessionalengineering practice.
7. **Environment and sustainability**: Understand the impact of the professional engineering solutions insocietal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multi-disciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineeringcommunity 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.
11. **Project management and finance**: Demonstrate knowledge and understanding of the engineeringand management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multi-disciplinary environments.
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.

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI

K. Rajesh Babu **13th July, 2022.**

Chairman, BoS (PASS) – U.G. Programme

To

The Registrar,

S.V. University,

TIRUPATI – 517 502.

THROUGH *DEAN, FoE, SVUCE*

Sir,

Sub: Sending of scheme of instruction and syllabi of II B. Tech Programme relevant to 3rd and 4th Semesters in Mechanical Engineering – Regarding.

$$$$$$

I am herewith sending the scheme of instruction and syllabi of III & IV Semesters of B. Tech (Regular) progamme under CBCS and R – 20 regulations in Mechanical Engineering (both hard and soft copies). The above will be effective from the batches admitted in 2020 – 21 onwards. This is for your kind information and necessary action at your end.

With regards,

Yours faithfully,

Encls: as above

(K. RAJESH BABU)

SRI VENKATESWARA UNIVERSITY
COLLEGE OF ENGINEERING: TIRUPATI 517 502

R-20 – Scheme of Instruction effective from the academic year 2020-2021
B.Tech. (Mechanical Engineering)

I Semester

Code	Category	Course Title	Scheme of Instruction (hr/Week) Lecture	Tutorial	Practical	Total Instruction	Credits
MA101	Basic Sci.	Mathematics – I	3	1	-	4	**4**
CY 101	Basic Sci	Engg Chemistry	3	1	-	4	**4**
EN103	Humanities	English	2	-	-	2	**2**
EE104	Basic Engg	Basic Electrical and Electronics Engineering	3	1	-	4	**4**
ME105	Basic Engg	Engineering Graphics and Design	2	-	3	5	**3.5**
EN 106	Humanities	English Communication Lab	-	-	3	3	**1.5**
		TOTAL	13	3	6	22	**19**

II Semester

Code	Category	Course Title	Scheme of Instruction (hr/Week) Lecture	Tutorial	Practical	Total Instruction	Credits
MA201	Basic Sci.	Mathematics – II	3	1	-	4	**4**
PY 202	Basic Sci	Engineering Physics	3	1	-	4	**4**
CS 203	Basic Engg	Programming for Problem Solving	2	1	-	3	**3**
CE 204	Basic Engg	Engineering Mechanics	3	1	-	4	**4**
ME 205	Basic Engg. Lab	Workshop / Manufacturing Practices	-	-	3	3	**1.5**
CS 206	Humanities Lab	Programming for Problem Solving Lab	-	-	3	3	**1.5**
CE 207	Audit	Environmental Science	4	-	-	4	**0**
		TOTAL	13	3	6	22	**18**

- All courses - 40 marks (Internal) + 60 marks (Univ. Semester End)
- Audit Course – 100 marks (Internal) -Zero Credits

Department of Mechanical Engineering

S. V. University College of Engineering:: TIRUPATI

Semester – III (Second year)

Sl. No	Course Code	Name of the Course	Category	Scheme of Instructions Hours per week				Credits
				Lecture	Tutorial	Practical	Drawing	
01	MA301B	Mathematics – III	BSC	03	01			03
02	ME302C	Strength of Materials	ESC	03	01			03
03	HS303C	Managerial Economics and Accountancy	HSMC	03				03
04	ME304C	Manufacturing Processes	PCC	03	01			03
05	ME305C	Basic Thermodynamics	PCC	03				03
06	ME306L	Strength of Materials Lab	ESC			03		1.5
07	ME307L	Manufacturing Process Lab	PCC			03		1.5
08	ME308L	Fuels Lab	PCC			03		1.5
09	ME309S	CAD Laboratory	SDC	01		02		02
10	MC310A	Constitution of India	MC	02				00
	Total			**18**	**03**	**11**		**21.5**

BSC – Basic Science Course: 03Credits;
SDC – Skill oriented course: 02 Credits
ESC – Engineering Science Course : 4.5 Credits
PCC – Professional Core Course: 09 Credits
HSMC – Humanities and Social Sciences :03 Credits
MC – Mandatory Course as prescribed by AICTE, New Delhi and it is a **non – credit** course

Note 1: Evaluation of SDC/SAC is similar to the evaluation process of regular laboratory work.

Department of Mechanical Engineering

S. V. University College of Engineering:: TIRUPATI

Semester – IV (Second year)

Sl. No	Course Code	Name of the Course	Category	Scheme of Instructions Hours per week				Credits
				Lecture	Tutorial	Practical	Drawing	
01	ME401C	Fluid Mechanics and Hydraulic Machinery	ESC	03	01			03
02	ME402C	Kinematics of Machinery	PCC	03	01			03
03	ME403C	Applied Thermodynamics	PCC	03	01			04
04	ME404C	Advanced Engineering Graphics	PCC	01			04	03
05	ME405C	Machine Tools and Metal Cutting	PCC	03				03
06	ME406L	Fluid Mechanics and Hydraulic Machinery Lab	ESC			03		1.5
07	ME407L	IC Engines Lab	PCC			03		1.5
08	ME408L	Electronics and Electrical Engineering Lab	ESC			03		1.5
09	ME409S	MATLAB	SDC	01		02		02
	Total			**14**	**03**	**11**	**04**	**22.5**

PCC – Professional Core Courses: 14.5 Credits;
ESC– Engineering Science Core: 06 Credits;
SDC – Skill Oriented Course: 02

Note 1: Evaluation of SDC/SAC is similar to the evaluation process of regular laboratory work.

Note 2: Summer Internship for two months after second year (to be evaluated during V semester)

I Semester **MA 101MATHEMATICS –I**

(I Semester - Common for all branches)

Instruction: 3(L) +1(T) /week **Credits:4** **Assessment: 40 + 60**

UNIT I

Differential Equations: Linear differential equations of second and higher order with constant coefficients-particular integrals-homogeneous differential equations with variable coefficients-method of parameters-simulation equations.

UNIT II

Laplace Transforms I: Laplace transforms of standard functions-inverse transforms-transforms of derivatives and integrals-derivatives of transforms-integrals of transforms.

UNIT III

Laplace Transforms II: Transforms of periodic functions-convolution theorem-applications to solution of ordinary differential equations.

UNIT IV

Calculus: Roll's and Mean value theorems - Taylor's and Maclaurins's series-maxima and minima for functions of two variables - Infinite series - Convergence Tests series of positive terms - comparison, Ratio tests - Alternating series - Leibnitz's rule - Absolute and conditional convergence.

UNIT V

Multiple Integrals: Curve tracing (both Cartesian and polar coordinate) - Evaluations of double and Triple integrals-change of order of integrations-change of variables of integrations-simple applications to areas and volumes.

Text/Reference Books

1. B S Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. M K Venkataraman, Engineering Mathematics, National Publishing Company, Chennai.
3. B V Ramana, Higher Engineering Mathematics, 6th Reprint, Tata McGraw-Hill, 2008.
4. Bali and Iyengar, Engineering Mathematics, 6th Edition, Laxmi Publications, 2006.

Course Outcomes: At the end of the course, students will be able to

1. analyze differential equations and solve them
2. apply differential equations to engineering problems.
3. Use transformation to convert one type into another type presumably easier to solve.
4. use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.
5. solve an initial value problem for an n^{th} order ordinary differential equation using the Laplace transform.
6. expand functions as power series using Maclaurin's and Talor's series
7. optimize the problems related to OR, Computer science, Probability and Statistics
8. draw an approximate shape by the study of some of its important characteristics such as symmetry, tangents, regions enclosing curve tracing method to find length, area, volume.
9. use multiple integral in evaluating area and volume of any region bounded by the given curves.

Mapping of Course Outcomes with Program Outcomes:

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

I & II Semesters **CY 101/ CY 202 ENGINEERING CHEMISTRY**

(I Semester - CY 101 for Civil & Mechanical Engg) (II Semester -CY 202 for EEE, ECE & CSE)

Instruction: 3(L) +1(T) /week **Credits: 4** **Assessment: 40**

+ 60 UNIT I

Atomic and molecular structure (**12 lectures**)

Postulates of quantum chemistry. Schrodinger equation. Particle in a box solutions, Molecular orbitals of diatomic molecules and plots of the multicenter orbitals, Equations for atomic and molecular orbitals, Energy level diagrams of diatomics, Pi-molecular orbitals of butadiene and benzene. Band structure of solids and the role of doping on band structures

UNIT II

Spectroscopic techniques and applications

Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclearmagnetic resonance and magnetic resonance imaging, surface characterization techniques.

UNIT III

Chemical equilibria, Intermolecular forces and potential energy surfaces

Use of free energy in Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cellpotentials, the Nernst equation and applications.

Use of free energy considerations in metallurgy through Ellingham diagram. Equations of state of real gases and critical phenomena.

UNIT IV

Periodic properties

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states,

coordination numbers and geometries, hard soft acids and bases, molecular

geometries, Born- Haber cycle, The use of reduction potentials, Properties of ionic and covalent compounds.

UNIT V

Stereochemistry, **Organic reactions and synthesis of a drug molecule**

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings Synthesis of a commonly used drug molecule.

Reference/Textbooks

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A.
Plane 3.Fundamentals of Molecular Spectroscopy, by C. N. Banwell
4. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
5. Physical Chemistryby P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Ed.
7. Principles of physical chemistry, Puri, Sharma and Pattania

Course Outcomes: At the end of the course, students will be able to

1. analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. rationalize bulk properties and processes using thermodynamic considerations.
3. distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. rationalize periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
5. list major chemical reactions that are used in the synthesis of molecules.

Mapping of Course Outcomes with Program Outcomes:

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

I & II Semesters **EN 103/ EN 203 ENGLISH**

(I Semester - EN 103 forChE,CE & ME)

(II Semester - EN 203 for EEE, ECE & CSE)

Instruction: 2(L) **Credits: 2** **Assessment: 40 + 60**

UNIT I Vocabulary Building

The concept of Word Formation- Root words from foreign languages and their use in English- Acquaintance with prefixes and suffixes from foreign languages in English form derivatives- Synonyms, antonyms, and standard abbreviations.

UNIT II Basic Writing Skills

Sentence Structures – Use of phrases and clauses in sentences –Importance of proper punctuation - Creating coherence – Organizing principles of paragraphs in documents - Techniques for writing precisely

UNIT III Identifying Common Errors in Writing

Subject-verb agreement -Noun-pronoun agreement -Misplaced modifiers -Article - Prepositions - Redundancies -Clichés

UNIT IV Nature and Style of sensible Writing

Describing - Defining - Classifying –Providingexamples or evidence –Writingintroductionand conclusion

UNIT V Writing Practices

Comprehension - Précis Writing –EssayWriting

Reference/Textbooks:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper ResourceBook. 2001
4. Study Writing. LizHamp- Lyonsand Ben Heasly. Cambridge University Press. 2006.
5. Communication Skills. Sanjay KumarandPushpalata. Oxford University Press. 2011.
6. Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford University Press

Course Outcomes: At the end of the course, students will be able to

1. learn the elements of grammar and composition of English Language.
2. Learn literary texts such as Short stories and prose passages.
3. maintain linguistic competence through training in vocabulary, sentence structures and pronunciation.
4. develop communication skills by cultivating the habit of reading comprehension passages.
5. develop the language skills like listening, speaking, reading and writing.

Make use of self-instructed learner friendly modes of language learning through competence

Mapping of Course Outcomes with Program Outcomes:

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

I Semester **EE104BASIC ELECTRICAL AND ELECTRONICS ENGG.**

(I Semester – for ChE, CE & ME)

Instruction: 3(L) +1(T) /week **Credits: 4** **Assessment: 40 + 60**

Unit-I

Electric DC Circuits: Kirchhoff's Voltage & Current laws, Superposition Theorem, Star – Delta Transformations.
AC Circuits: Complex representation of Impedance, Phasor diagrams, Power & Power Factor, Solution of Single Phase Series & Parallel Circuits. Solution of Three Phase circuits and Measurement of Power in Three Phase circuits.

Unit-II

Single Phase Transformers: Principle of Operation of a Single phase Transformer, EMF equation, regulation and Efficiency of a single phase transformer.
DC Machines: Principle of Operation, Classification, EMF and Torque equations, Characteristics of Generators and Motors

UNIT-III

Three Phase Induction Motor: Principle of Rotating Magnetic Field, Principle of Operation of 3- φ I.M., Torque-Speed Characteristics of 3-φ I.M.

UNIT-IV

p-n junction operation, diode applications, Zener diode as regulator.
Transistor and applications: Introduction to transistors, BJT Characteristics, biasing and applications

UNIT-V

Integrated Circuits: Operational amplifiers, Applications: adder, subtractor, Integrator and Differentiator.
Digital Circuits: logic gates, Combinational Logic circuits, Flip-Flops, counters and shift registers, Laboratory measuring instruments: digital multi-meters and Cathode Ray Oscilloscopes (CRO's).

Textbooks:

1. Electrical Technology by Edward Hughes
2. Basic Electrical Engineering by Nagrath and Kothari

Course Outcomes: At the end of the course, students will be able to

1. understand the basic concepts of D.C. single phase and 3- phase supply and circuits and solve basic electrical circuit problems
2. understand the basic concepts of transformers and motors used as various industrial drives

3. understand the concept of power factor improvement for industrial installations and concepts of most economical power factor
4. understand the operation and characteristics of diodes, transistors, integrated circuits and digital circuits.

Mapping of Course Outcomes with Program Outcomes:

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

I & II Semesters

ME 105 / ME 205ENGINEERING GRAPHICS AND DESIGN

(I Semester - ME105 for ChE, CE & ME)
(II Semester - ME205 for EEE,ECE & CSE)

Instruction: 2(L) +3 (Drg) /week Credits: 3.5 Assessment: 40 + 60

Unit I Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of Drawing instruments,lettering, Conic sections including the Rectangular Hyperbola (General method only);Cycloid,Epi-cycloid, Hypo- cycloid and Involutes.

Unit II

Scales- Scales– construction of Plain &Diagonal Scales.

Projections of points, lines - Projections of Points and lines inclined to both planes, including traces;

Question Paper
Modular – 4 questions from
Units I t0 IV, 15 marks each

Unit III

Projections of planes

Projections of planes (Regular surfaces only) inclined Planes-Auxiliary Planes

Projections of Regular Solids (Simple solids – cylinder, cone, prism & pyramid) those inclined

to both the Planes-Auxiliary Views

Unit IV

Isometric Projections& Orthographic projections
Principles of Orthographic Projections-Conventions Draw simple objects, dimensioning and scale. Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

Unit V Introduction to CAD
CAD workstation and peripherals, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars Standard, Object Properties, Draw, Modify and Dimension, Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom used in CAD, Select and erase objects.;

Text/Reference Books:

1. Bhatt N.D., Panchal V.M. &Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah,M.B.&RanaB.C.(2008),EngineeringDrawingandComputerGraphics,PearsonEducation
3. Agrawal B. & Agrawal C.M.(2012),Engineering Graphics, TMH Publication
4. Narayana, K.L. &P Kannaiah(2008),Text book on Engineering Drawing, Scitech Publishers
5. Corresponding set of) CAD Software Theory and User Manuals

Course Outcomes: At the end of the course, the student will be able to

1. make a distinction between first angle projection and third angle projection of drawing.
2. draw hyperbola, parabola, Involutes and Cycloidal curves.
3. draw sections of solids including cylinders, cones, prisms and pyramids.
4. draw projections of lines, planes, solids and sections of solids.

draw orthographic projections of lines, planes, and solids.

Mapping of Course Outcomes with Program Outcomes:

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

I & II Semesters EN 106 / EN 206 ENGLISH COMMUNICATION LAB
(I Semester - EN 106 for ChE, CE & ME) (II Semester - EN206 for EEE, ECE & CSE)

Instruction: 0(L) +3(Lab) /week Credits: 1.5 Assessment: 40 + 60

Listening Comprehension -Pronunciation, Intonation, Stress and Rhythm -Common Everyday Situations: Conversations and Dialogues -Communication at Workplace - Interviews -Formal Presentations

Reference/Text Books:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007
3. On Writing Well. William Zinsser. Harper Resource Book. 2001
4. Study Writing. LizHamp– Lyons and Ben Heasly. Cambridge Univ. Press. 2006
5. Communication Skills. Sanjay Kumar and Pushpalata. Oxford Univ. Press.2011
6. Exercises in Spoken English. PartsI-III.CIEFL, Hyderabad. Oxford Univ. Press

Course Outcomes:
The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Mapping of Course Outcomes with Program Outcomes:

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

II Semester MA 201MATHEMATICS II

(II Semester - for all branches)

Instruction: 3(L) +1(T) /week Credits: 4 Assessment: 40 + 60

Unit I

Matrices: rank of a matrix-solution of system of linear equations-Eigen values, vectors –Canley-Hamilton theorem-quadratic forms-diagonalization.

Unit II

Vector Calculus: Gradient, Divergence, Curl of a vector and related properties-line, surface, volume integrals- Green's, Stokes's and Gauss Divergence theorems and its applications.

Unit III

Fourier Series: Fourier series-even and odd functions, periodic functions-half range sine and cosine series-harmonic analysis.

Unit IV

Special Functions I: Gamma and Beta functions-series solutions of differential equations-ordinary points.

Unit V

Special Functions II: Bessel function-recurrence formulae-generating function for $J_n(X)$-Lengender polynomials-recurrence formulae-generating function for $P_n(X)$ - Rodriguez's formula - orthogonality of Lengender polynomials.

Text/Reference Books

1. B S Grewal, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. M K Venkataraman, Engineering Mathematics, National Publishing Company, Chennai.
3. B V Ramana, Higher Engineering Mathematics, 6th Reprint, Tata McGraw-Hill, 2008.
4. Bali and Iyengar, Engineering Mathematics, 6th Edition, Laxmi Publications, 2006.

Course Outcomes: At the end of the course, students will be able to

1. use ranks of matrices to decide whether the system of linear equations is consistent or not
2. use Cayley-Hamilton theorem to find inverses or powers of matrices.
3. use Eigen values and vectors to reduce Quadratic forms to normal form.
4. to analyze motion problems from real lines to curves and surfaces in 3-D and use tools such as divergence and curl of vector and gradient, directional derivatives that play significant roles in many applications.
5. use Green's theorem to evaluate line integrals along simple closed contours on the plane
6. use Stokes' theorem to give a physical interpretation of the curl of a vector field
7. use the divergence theorem to give a physical interpretation of the divergence of a vector field.

8. find the Fourier Series to represent a function as a series of constants times sine and cosine functions of different frequencies in order to observe periodic phenomenon.
9. Evaluate certain improper integrals to make them simple with introduction of Gamma and Beta functions.
10. study certain special functions that arise in solving certain ordinary differential equations to model many physical phenomena.

Mapping of Course Outcomes with Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2	2		2	1						
CO2	1	1		2	2							
CO3		1		2	2							
CO4		2		2	2							
CO5		1	2	2								

II Semester **PY 202ENGINEERING PHYSICS**

(II Semester - for ChE, CE& ME)

Instruction: 3(L) +1(T) /week **Credits: 4** **Assessment: 40 + 60**

UNIT I Wave Optics

Interference: Huygen`s Principle-Principle of Superposition-Interference of Light-Young`s double slit experiment- -Newton's Rings.

Diffraction: Fraunhofer Diffraction at a Single Slit and a Circular Aperture-Plane Diffraction grating –Resolving Power-Rayleigh`s Criterion-Resolving power of Grating and Microscope.

Lasers : Introduction – Spontaneous and Stimulated Emission of Radiation – Population Inversion – Types of Lasers – Ruby Laser – He-Ne Laser – Semiconductor Laser – Applications of Lasers.

UNIT II Mechanics of Rigid Body

Rigid Body-Rotational Motion and Kinematics Relations-Kinetic Energy and Angular Momentum of a Rotating Body-Equation of Motion of a Rigid body (Torque of a Rigid Body)-Combined Translation and Rotational Motion of a Rigid Body- Body Rolling on an inclined Plane.

Mechanics of Continuous Media

Elasticity, Stress and Strain- Hook`s Law and Behaviour of Wire Under Load- Elastic Constants-Relation Between Elastic Modulii-Types of Supports, Beams and Loads-Different types of Bending- Cantilever with an End Load. Ultrasonic Waves - Sound Absorption and Reverberation -Sabine Formula - Acoustics of Buildings.

UNIT III Electromagnetism and magnetic properties of Materials

Laws of Electrostatistics- Electric Current- Laws of Magnetism- Ampere`s, Faraday`s laws-Maxwells Equations – Polarization - Permeability and dielectric constant- Polar and non-polar Dielectrics, Clausius-Mossotti equation, Applications of Dielectrics.

Magnetization - Permeability and Susceptibility- Classification of Magnetic Materials, Ferromagnetism-Magnetic Domains and Hesteresis, Applications of ferromagnetic materials.

UNIT IV Quantum Mechanics

Wave – Particle duality – de Broglie Concept of Matter Waves – Properties of Matter Waves – Davison and Germer Experiment – G.P.Thomson Experiment – Heisenberg's Uncertainty Principle – Schrödinger's Time Independent and Time Dependent Wave equation – Significance of Wave

Function – Electron in an Infinite Square Potential Well – Probability Densities and Energy Levels.

UNIT V NanoPhysics and Nanotechnology

Introduction to Nanomaterials –Properties: Optical Properties – Quantum Confinement – Electrical properties. Synthesis of Nanomaterials: Ball milling, Arc deposition method – Chemical Vapour Deposition-Pulsed laser deposition. Characteristics of C^{60} (Zero dimensional), Carbon Nanotubes (One Dimensional) and Graphene(Two Dimensional). Applications of Nanomaterials.

Text Books / Reference Books:

1. R.K.Gaur and S.L.Gupta ``Engineering Physics" Sultan and Chand Pub., New Delhi
2. S.L.Gupta and SanjeevGupta`UnifiedPhysics`Vol.I Jai PrakashNath& Co., Meerut.
3. HitendraK.Malik and A.K.Singh ``Engineering Physics" TataMCGraw Hill Education Pvt.Ltd., New Delhi
4. M.N.Avadhanulu and P.G.Kshirsagar ``A Textbook of Engineering Physics`` S.Chand and Company Pvt.Ltd., New Delhi
5. B.L Theraja, "Modern physics", S.Chand& Company.
6. V. Raghavan "Material Science", Tata McGraw Hill Publications.
7. M.S.RamachandraRao and Shubra Singh, ``Nanoscience and Nanotechnology`` Wiley India Pvt.Ltd, New Delhi

Course Outcomes: At the end of the course, students will be able to

1. Develop appropriate competence and working knowledge of laws of modern Physics in understanding advanced technical engineering courses
2. understand the quantum mechanics and ultimately the quantum behavior of charged particles when they are in motion.
3. identify and apply appropriate analytical and mathematical tools of Physics in solving Engineering problems
4. apply the basic principles of Mechanics of rigid body and continuous media and their applicationsunderstand the principles in electrostatics and electromagnetics and magnetic properties of materials.
5. understand size depended properties of nano-dimensional materials and their effective utilization in making nano- and micro-devices for further microminiaturization of electronic devices.
6. think and participate deeply, creatively, and analytically in emerging areas of engineering technology.
7. Learnthe basics of instrumentation, design of laboratory techniques, measurement, data acquisition, interpretation, and analysis.
8. provide multidisciplinary experiences throughout the curriculum.

OUTCOMES WITH PROGRAM OUTCOMES:

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

I & II Semesters CS 103 / CS203 PROGRAMMING FOR PROBLEM SOLVING

(I Semester –CS 103 for EEE, ECE & CSE)

(II Semester –CS 203 for ChE, CE & ME)

Instruction: 3(L) +1(T) /week **Credits: 4** **Assessment: 40 + 60**

Course Objectives:

1. To acquire problem solving skills
2. To be able to develop flowcharts and algorithms for the given problem
3. To learn how to write modular programs in C
4. To enable to use arrays, pointers, strings and structures in solving problems.
5. To explain the difference between object-oriented programming and procedural programming.
6. To understand principles of object-oriented programming.

UNIT-I

Problem Solving : Problem solving techniques, Computer as a problem solving tool, Programming Languages – Machine Language, Assembly Language, Low and High-Level Languages, Procedural and Object-Oriented Languages. Algorithm definition, Features, Criteria, Flowchart definition, Basic symbols, Sample flowcharts, Problem solving aspects, Efficiency of algorithms.

Basics of C: Structure of a C program, C tokens, Keywords, Identifiers, Basic data types and sizes, Constants, Variables, Operators in C, Operator Precedence and Associativity, Expressions, Type conversions, Basic input/output statement, Sample programs.

UNIT-II

Conditional Statements: Selection statements, Decision making within a program, Simple if statement, if-else statement, Nested if-else, if-else ladder and switch-case. Iterative statements: while-loop, do-while loop, for loop, Nested loops, Infinite loops, goto, break and continue statements, Sample programs.

Functions: Introduction to modular programming and functions, Basics, Standard Library of C functions, Prototype of a function, Parameter passing, User defined functions, Recursive functions, Passing arguments to a function: Call by reference, Call by value, Storage Classes in a single source file, Scope rules, Header files, C Pre-processor.

UNIT-III

Arrays: Introduction to arrays, Definition, Declaration, Storing elements, Accessing elements, One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array, Two dimensional arrays, Addition/Multiplication of two matrices, Transpose of a square matrix, Passing array to functions, String fundamentals, String manipulations, Standard library string functions.

Pointers: Definition of pointer, pointer type declaration, pointer assignment, pointer

initialization, Pointer arithmetic, Functions and Pointers, Dangling memory, Character pointers and functions, Pointers to pointers, Arrays and Pointers, Pointer arrays, Pointers and structures, Dynamic memory management functions.

UNIT-IV

Structures: Structures declaration, Structure variables, Initialization of structures, Accessing structures, Nested structures, Arrays of structures, Structures containing arrays, Structures and functions, Pointers to structures, Self-referential structures, Unions, Typedef, Bit-fields.

File Processing: Concept of Files, Text files and binary files, File opening in various modes and closing of a file, Reading from a file, Writing onto a file.

UNIT V

Introduction to Object-Oriented Programming (OOP): Need for OOP, Principles of OOP, Basics of C++ Programming, Operator Overloading, Function Overloading, Inheritance: Derived classes, Protected access specifier, Derived class constructors, Overriding member functions, Class hierarchies, Public and Private inheritance, Multiple inheritance.

Course Outcomes: At the end of the course, student will be able to

1. Develop and test programs in C and correct syntax and logical errors.
2. Implement conditional branching, iteration and recursion.
3. Decompose a problem into functions and synthesize a complete program.
4. Use arrays, pointers, strings and structures to formulate algorithms and programs
5. Use files to perform read and write operations.
6. Handle programming assignments based on class,abstraction, encapsulation, overloading and inheritance.

Text Books

1. Ashok N Kamthane, Amit Ashok Kamthane, Programming in C, 3rd Edition, Pearson Education, 2019.
2. Scheldt H, C: The Complete Reference, 4th Edition, Tata McGraw-Hill, 2002.
3. R.G. Dromey, How to solve it by Computer, Pearson Education, 2019.
4. Hanly J R &Koffman E.B, “Problem Solving and Program design in C”, Pearson Education, 2019.
5. Herbert Schildt,The Complete Reference C++, 4th Edition, Tata McGraw-Hill.

Reference Books

1. C Programming-A Problem Solving Approach, Forouzan, Gilberg, Cengage.
2. Programming with C, Bichkar, Universities Press.
3. Programming in C, ReemaThareja, OXFORD.
4. C by Example, Noel Kalicharan, Cambridge.
5. The C++ Programming Language, Bjarne Stroustrup, 3rd Edition, Pearson Education.
6. Problem solving with C++: The Object of Programming, 9th Edition, Walter Savitch, Pearson Education.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

I & II Semesters CE 104 / CE 204 ENGINEERING MECHANICS

(I Semester –CE 104 for EEE)

(II Semester –CE 204 for CE & ME)

Instruction: 3(L) +1(T) /week Credits: 4 Assessment: 40 + 60

UNIT I

STATICS : Basic concepts – System of force, Concurrent and non-concurrent coplanar and non-coplanar forces – Resultant – Moment of force and its application – Couples and resultant of force systems – Equilibrium of systems of forces – Free body diagrams, Equations of equilibrium of coplanar systems and spatial systems.

UNIT II

Analysis of plane trusses: Types of supports – Types of trusses – Analysis of trusses using method of joints and method of sections.

UNIT III

CENTRE OF GRAVITY AND MOMENTS OF INERTIA: Theory of Pappus – Centroids of composite figures – Areas of gravity of bodies – Moment of inertia – Parallel and perpendicular axis theorems – Moments of inertia of composite areas (rolled and built up sections) – Radius of gyration of areas.

UNIT IV

SIMPLE STRESES AND STRAINS : Elasticity and plasticity – Types of stresses and strains – Hooke's law – Stress-strain diagram for mild steel – Working stress – Factor of safety.

Lateral strain – Poisson's ratio and volumetric strain – Elastic moduli and relationship between elastic constants – Bars of varying section – Composite bars – Temperature stresses.

UNIT V

STRAIN ENERGY: Gradual, sudden and impact loading – Endurance limit principles of virtual work and its applications.

TEXTBOOKS:

1. Ghose D.N. – Applied Mechanics and Strength of Materials.
2. Timoshenko & Young – Engineering Mechanics.
3. Junarkar SB – Mechanics of Structures – Vol. I.
4. Junarkar SB – Elements of Applied Mechanics.

Course Outcomes: At the end of the course, student will be able to

1. apply the basic knowledge of force system.
2. know the types of supports occur in civil engineering structures
3. know the geometrical properties of different cross sections.
4. understand different types of stresses and strains, elastic constants.
5. understand the behavior of different internal forces under different types of loading.

6.

7. **MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**
CO1		3										
CO2		3										
CO3		3							2			1
CO4									3			1
CO5			3						1			

I & II Semesters ME 105 / ME 205 WORKSHOP/MANUFACTURING PRACTICE

(ME 105 for EEE, ECE & CSE)

(ME 205 for ChE,CE & ME)

Instruction: 0(L) +3 (lab)/week Credits: 1.5 Assessment: 40 + 60

Workshop Practice: Five practices among

1. Machine shop 2.Fittingshop 3.Carpentry 4.Electrical wiring

5. Welding shop 6.Casting 7.Smithy 8.Plasticmoulding&GlassCutting

Examinations could involve the actual fabrication of simple components, utilizing one or More of the techniques covered above.

Detailed Contents

1. ManufacturingMethods-casting,forming,machining,joining, advanced manufacturing methods
2. CNC machining, Additive manufacturing
3. Fitting operations & power tools.
4. Electrical &Electronics
5. Carpentry
6. Plastic moulding. Glass cutting
7. Metal casting.
8. Welding(arc welding & gas welding), brazing

The above course content is learnt by online videos/ppt presentations.

Text/ReferenceBooks:

1. HajraChoudhury S.K., HajraChoudhury A.K.andNirjharRoy S. K., Elements of Workshop Technology", Vol. I 2008and Vol. II 2010, Media promoters and Publishers private limited, Mumbai.
2. Kalpakjian S. and Steven S. Schmid ManufacturingFngineeringand Technology", 4th edition, PearsonEducationIndiaEdition,2002.
3. GowriP.Hariharanand A. SureshBabu, Manufacturing Technology–I" Pearson Education,2008.
4. Roy A. Lindberg, Processes and Materials of Manufacture",4 th edition, Prentice Hall India,1998.
5. RaoP.N., "ManufacturingTechnology",Vol. I & II,TataMcGrawHillHouse, 2017

Laboratory Outcomes

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.

- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

Course Outcomes : Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry to fabricatecomponents using different materials.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	2		3									2
CO2	2		3									
CO3	2		3									
CO4	2		3									
CO5	2		3									

I & II Sem CS 106/ CS206 PROGRAMMING FOR PROBLEM SOLVING LAB
(CS 106 for EEE, ECE & CSE)
(CS 206 for ChE, CE & ME)

Instruction: 0(L) +3 (Lab)) /week Credits: 1.5 Assessment: 40 + 60

Course Objectives:

1. To provide exposure to problem-solving through programming
2. To train the student on the concepts of the C- Programming language

The following programs shall be developed and executed in Programming Language C.

1. Programs on conditional control constructs.
2. Programs on iterative statements (while, do-while, for).
3. Programs on recursive procedures
4. Programs on arrays, matrices (single and multi-dimensional arrays).
5. Programs using user defined functions, demonstrating parameter passing methods viz. call by value and call by reference.
6. Programs using different library functions viz. ctype.h, math.h, stdio.h, stdlib.h, string.h, conio.h and pre-processor directives.
7. Programs using pointers (int pointers, char pointers) and pointer arrays.
8. Programs on structures and unions
9. Programs on File Processing.
10. Programs on Pointers to structures and Self-referential structures

Course Outcomes: After Completion of this course the student would be able to

1. Develop the C code for the given algorithm.
2. Understand, debug and trace the execution of programs written in C language.

Reference Books:

1. Scheldt H, C: The Complete Reference, 4th Edition, Tata McGraw-Hill, 2002.
2. Hanly J R &Koffman E.B, "Problem Solving and Program design in C", Pearson Education, 2019.
3. R.G. Dromey, How to solve it by Computer, Pearson Education, 2019.
4. Behrouz A. Forouzan& Richard F. Gilberg, Computer Science: A Structured Programming Approach Using C, Third Edition, Cengage Learning

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

CE 107 / CE 207 **ENVIRONMENTAL SCIENCE** ***Audit Course***
(CE 107 for EEE, ECE &CSE) ***No Univ.Exam***
(CE 207 for ChE, CE & ME)

Instruction: 4(L) **Credits: 0(Zero)** **Assessment: 40 + 60**

UNIT I

Environmental Studies and Natural Resources

Definition, Scope and importance of Environment, Environmental studies, Need for public awareness

Components of Environment- Atmosphere, Hydrosphere, Lithosphere.

Renewable and **Non-Renewable Resources and associated problems**

Water resources: Use and over utilization of surface and ground water, floods, drought, conflicts over water, dam benefits and problems.

Forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.

Land resources: Land as a resource, land degradation, Man induced landslides, soil erosion and desertification.

Mineral resources: Use and overexploitation, Environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused agriculture and overgrazing, effects of modern agriculture, fertilizer – pesticide problems, water logging, salinity, Case studies.

Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

Role of an individual in conservation of natural resources.

UNIT II

Ecosystem and Biodiversity

Ecosystem - Concept of an ecosystem, Structure and functions 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 ecosystem (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation:

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, Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT – III

Environmental pollution and Global Effects

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.

Pollution case studies.

Disaster management: Floods, earthquakes, cyclone, landslides,

Tsunami. Climate change-Global warming, Acid rain, Ozone depletion.

UNIT – IV

Environment Issues and Management

- Environment and Human health – Epidemic diseases, HIV/AIDS, Aviation Flue, Water Borne Diseases.
- Environmental Impact Assessment, Sustainable Development, Clean Production and Clean Development Mechanisms
- Environment Legislation: Environmental Protection Act, Water Act, Air Act, Wild Life Protection Act, Forest Conservation Act, Public Liability & Insurance Act, Issues involved in Enforcement of Environmental legislation.

UNIT – V

Social Issues and the Environment

- Population growth, Population Explosion, Population Control, Women and Child welfare.
- Urbanization, Industrialization, Development projects, Resettlement and Rehabilitation of people – Problems concerned, Case studies.
- Consumerism and Waste Products Conservation, Public Awareness, Water Conservation, Rain water harvesting, watershed management, Wasteland reclamation, Human Rights, Value education, Environmental ethics- Issues and possible solution.
- Role of information Technology in Environment and Human Health.

Text Books / Reference Books :

1. AnubhaKaushik& C P Kaushik, Environmental studies, New age International Publishers, 2008
2. Benny Joseph, Environmental studies, Tata McGraw-Hill Publishers, 2005
3. M Chandra Sekhar, Environmental Science, Hi-Tech Publishers, 2004
4. Keerthinarayana and Daniel Yesudian, Principles of Environmental Sciences and Engineering , Hi-Tech Publishers, 2005
5. AmalK.Datta, Introduction to Environmental Science and Engineering, Oxford & IBH Publishing Co.Pvt.Ltd, 2000
6. SanthoshkumarGarg,RajeshawriGarg and RajniGarg, Ecological and Environmental studies, Khanna publishers, 2006
7. Gilbert M, Introduction to Environmental Engineering and Science, Masters Publication by Prentice –Hall of India Private Ltd., 1991
8. William P Cunningham and Mary Ann Cunningham, Principles of Environmental Science, Tata McGraw Hill Publishing Co.Ltd, 2002

Course Outcomes:

At the end of the course, students will be able to

1. acquire knowledge in
    - diverse components of environment and natural resources
    - ecosystem and biodiversity & its conservation methods
    - population growth and human health
    - green technology
2. identify and resolve the issues related to sources of different types of pollutions
3. provide solutions to individuals, industries and government for sustainable development of natural resources
4. apply environmental ethics in protection of diversified ecosystems.

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MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

MA301B MATHEMATICS - III

Instruction Hours/Week: 3(L) Credits: 3 Assessment : 40 + 60

Course Objectives:

1. This course aims at providing the student to acquire the knowledge on the calculus of functions of complex variables.
2. To understand power series and expansion of analytic function.
3. To understand Laurent Series, poles, singular points, Residue theorem and its applications.
4. The aim is to analyze the solutions of partial differential equations.
5. To discuss the boundary value problems, one dimensional wave equation, heat equation and Laplace Equation.

UNIT - I

Complex analysis - I: Analytical functions - Cauchy-Reimann equations – Construction of Analytic functions- Complex integration - Cauchy's theorem - Integral formula - Evaluation of integrals.

UNIT - II

Complex analysis - II**:** Taylor's and Laurents' series- Transformations- Conformal mapping - Bilinear transformations - Transformation of 1/z, z^2, sin z and cos z.

UNIT - III

Complex Analysis –III: Singularities - Poles - Residues - Residue theorem – Contour integration- Evaluation of real integrals

UNIT - IV

Partial differential equations - I : Formation of differential equations - Classification - First order linear partial differential equations – Legranges' linear equation - Method of multipliers - first order non-linear partial differential equations - Charpits method.

UNIT- V

Partial differential equations - II: Method of separation of variables - One dimensional wave equation - Heat equation – Laplace's equation.

Text Books:

1. Grewal B S, Higher Engineering Mathematics, 40th Edition, Khanna Publications, 2007.
2. Venkataraman M K, Engineering Mathematics, Vol. I & II, National Publishing Company, 1993.
3. Venkataraman M K, Engineering Mathematics, National Publishing Company, 1995.
4. Grewal B S, Engineering Mathematics, 13th Edition, Khanna Publications.
5. Kreyszig E, Advanced Engineering Mathematics, 8th edition, Wiley, 1998.

Course Outcomes: At the end of the course, students will be able to

1. After the completion of course, students will be able to Understand the analyticity of complex functions and conformal mappings.
2. Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
3. Describe basic properties of complex integration and having the ability to compute such integrals.
4. Describe conformal mappings between various plane regions.
5. Apply the concepts of Complex Analysis in many branches of Engineering, including the branches of hydrodynamics, thermodynamics, and particularly quantum mechanics.
6. Compute the residue of a function and use the Residue Theory to evaluate a contour integral or an integral over the real line.
7. Formulate/solve/classify the solutions of Partial differential equations.
8. Identify linear and nonlinear PDE and solve nonlinear PDE by Charpit's method.
9. Apply Variables separable methods to solve boundary value problems.
10. Find the solution of one dimensional wave equation, heat equation and Laplace equation.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1		3			2							
CO2		3			2							
CO3		3			2							
CO4		3			2							
CO5		3			2							

*ME302C S*TRENGTH OF MATERIALS

Instruction Hours/Week: 3(L) Credits: 3 Assessment : 40 + 60

CO1	Analyze the statically determinate and indeterminate problems
CO2	Determine the stresses and strains in the members subjected to axial, bending and torsional loads
CO3	Evaluate the slope and deflection of beams subjected to loads
CO4	Determine the principal stresses and strains in structural members
CO5	Determine the torsional stress of structural beam

SYLLABUS

UNIT I

Stress And Strain: Concept of statically determinacy and indeterminacy- Determinate and Indeterminate problems in Tension and Compression - Thermal Stresses.

Elastic Constants and Impact Loading: Stress-strain diagrams for brittle and ductile materials -working stress - Strain energy in tension and compression - Impact loading - pure shear - Modulus of rigidity and Bulk modulus - Relation between E, G and K.

UNIT II

Shear Force And Bending Moment: Types of supports - Types of determinate beams - Simply supported, Cantilever, Overhanging and compound beams with articulations -Shear Force and Bending Moment diagrams.

Theory of Simple Bending: Assumptions - Theory of Simple Bending - Bending stresses in beams.

UNIT III

Principal stresses and strains: Principal planes and principal stresses, methods of determining stresses on oblique section, analytical and graphical method for determining stresses on oblique section, Mohr's circle.

Beams: Deflection of cantilever beam, simply supported beam, fixed beam.

UNIT IV

Thin Cylinders & Thick cylinders: Circumferential stresses, longitudinal stresses, Lame's equations and hoop stress.

Torsion Of Circular Shafts: Theory of Pure Torsion in Solid and Hollow circular shafts - Torsional Shear Stresses and angle of twist - transmission of Power.

UNIT V

Theories of failure: Introduction, maximum principal stress theory, maximum principal strain theory, maximum shear stress theory.

Columns and struts: Introduction, failure of a column, assumptions made in the Euler's columntheory, end conditions for long columns, crippling load expressions for different conditions.

TEXT BOOKS:

1. Timoshenko and Gere, Mechanics of Materials, CBS Publishers, New Delhi, 1996.
2. T.D.GunneswraRao and MudimbyAndal, Strength of Materials - Fundamentals and Applications, Cambridge University Press, 1st Edition, 2018.
3. Beer and Johnston, Mechanics of Materials, McGraw Hill International Edition, 1995.
4. E.P.Popov, Engineering Mechanics of Solids, Prentice Hall of India Pvt. Ltd., 1998.

REFERENCE BOOKS:

1. Beer, F.P, Johnston, E.R., Mechanics of Materials, McGraw-Hill Education -7th edition, ISBN: 9780073398235, 2015.
2. Hibbeler, R.C., Mechanics of Materials, Pearson Prentice Hall, ISBN- 978-0136022305, 2010.
3. Gere, M.J., Timoshenko, S.P., Mechanics of Materials, C.B.S., Publishers, 2004. ISBN: 9788123908946.
4. Popov, E.P., Engineering Mechanics of Solids, Pearson,2006. ISBN: 8177585789.
5. Ramamurtham, S., Strength of Materials, DhanpatRai Publications, ISBN: 978-9384378267, 2014.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	1	2									
CO2	1	**1**		2								
CO3		1		**2**	2							
CO4			**2**	2	2							
CO5		1	2	2	**2**							

HS303C Managerial Economics and Accountancy

Course Code	Name of the Course	Category	L-T-P-C
HS303C	Managerial Economics and Accountancy	HSMC	3-0-0-3

Pre-requisites: Nil

Course Outcomes: After the completion of the course the student will be able to:

CO1	Understand Macro Economic environment of the business and its impact on enterprise.
CO2	Identify various cost elements of the product and its effect on decision making.
CO3	Understand the concepts of financial management and smart investment.
CO4	Prepare the Accounting records and interpret the data for Managerial Decisions.

Mapping of course outcomes with program outcomes:

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

Detailed Syllabus:

Unit -I

Introduction to Engineering Economics, Fundamental concepts, Time value of money, Cash flow and Time Diagrams, choosing between alternative investment proposals, Methods of Economic analysis (pay back, ARR, NPV, IRR and B/C ratio), The effect of borrowing on investment, Equity vs Debt Financing, concept of leverage, Income tax leverage.

Unit -II

Depreciation and methods of calculating depreciation (straight line, sum of the years digitmethod, Declining balance method, Annuity method, Sinking fund method), National income accounting Methods of estimation, Various concepts of National Income, Significance of National income Estimation and its limitations.

Unit -III

Inflation: Definition, Process and Theories of inflation and Measure of control. New Economic Policy 1991(Industrial Policy, Trade Policy, Fiscal Policy), Impact on Industry.

Unit -IV

Accounting Principles, procedure, Double entry system, Journal, ledger, Trial balance, Cashbook, preparation of Trading and Profit and Loss account, Balance sheet.

Unit -V

Cost Accounting: Introduction, Classification of costs, Methods of costing, Techniques ofcosting, Cost sheet and preparation of cost sheet, Break-even Analysis, Meaning and its application, Limitation.

Reading Text Books:

1. Henry Malcom Steiner, Engineering Economics Principles, 2nd Edition, McGraw Hill Education, 1996.
2. Dewett. K.K., Modern Economic Theory, Sultan Chand and Co., 2006.
3. A.N. Agarwal, Indian Economy, Wiley Eastern Limited, New Delhi.
4. Jain and Narang, Accounting Part-I, Kalyani Publishers, 2011.
5. Arora, M.N. Cost Accounting: Principles and Practice, 12th Edition, Vikas Publication, 2012.

Mapping of Course Outcomes with Program Outcomes:

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

ME304C MANUFACTURING PROCESSES

Lectures/week: 3 hours

Credits: 03

Sessionals: 20 +20

End Examination: 60

Course Outcomes (COs):

CO 1 Able to understand the basic concepts of manufacturing.
CO 2 Able to select suitable manufacturing process to produce products of desired size and shape.
CO3 Able to understand the basic manufacturing processes such as foundry and metal forming processes etc.
CO4 Ability to distinguish between gas welding and arc welding fabrication processes.

UNIT – I

Introduction – What is manufacturing? Basic history of manufacturing – Selecting materials – Basic properties of materials – Classification of Manufacturing Processes – Primary Shaping Processes – Secondary or Machining Processes – Selecting manufacturing processes – Mechanization and Automation – Computers in manufacturing industries.

UNIT – II

Metal – Casting Processes – Sand Casting – Sands – Types of sand moulds – Patterns – Cores – Core prints – Sand casting operation –Different types of casting processes – Melting furnaces – Foundry Automation – Inspection of Castings.

UNIT – III

Forming and Shaping Processes –Deformation of Metals – Elastic and Plastic Deformations – Force – Extension Curve – Metal working – Cold and Hot working processes.

Rolling – Flat rolling – Roll force and power requirement – Flat rolling practice – Cold rolling – Pack rolling – Thread rolling

Forging – Open die forging – Forging force – Impression die forging – Closed – die forging – Forgeability – Forging machines – Presses and Hammers.

UNIT – IV

Extrusion and Drawing – Introduction – Different Types of Extrusion Processes – Equipment – Defects in Extrusion – Drawing Processes – Drawing practice and Drawing defects – Drawing equipment.

UNIT – V

Sheet metal forming processes – Press tool operations – shearing action – Formability – Bending – Deep drawing – Spinning – Embossing and Coining.

Fabrication Processes – Classification – Joining processes – Fusion welding processes – Solid state welding processes – Soldering and Brazing.

TEXTBOOKS:

1. **SeropeKalpakjian:** Manufacturing Engineering and technology, 5th Edition, Pearson Prentice Hall, 2005.
2. **P.N. Rao:** Manufacturing Technology, 2nd Edition, TataMcGraw – Hill, 2007.
3. **P.C. Sharma**: A Textbook of Production Technology: Manufacturing Processes, 7th Edition, S. Chand and Company Ltd., 2007

REFERENCES:

1. **J.P. Kaushish**: Manufacturing Porcesses, 2nd Edition
2. **R.S. Khurmi and J.K. Gupta**: A Textbook of Workshop Technology: Manufacturing Processes, 7th Edition, S.Chand and Company Limited, 2008.
3. **HajraChoudury S.K.**: Elements of Workshop Technology, Volume – 1, Indian Book Distribuiton Co. Calcutta.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

ME305C - BASIC THERMODYNAMICS

B.Tech IIISemester Effective from 2021-2022

Lectures / Week: 3 periods Credits:03

Objectives:

- To learn about work and heat interactions, and balance of energy between system and itssurroundings.
- To learn about application of I law to various energy conversion devices.
- To learn about the II & III laws of thermodynamics with relations.
- To understand the difference between high grade and low grade energies and law limitationson energy conversion
- To learn about the air standard cycles

UNIT - I

Basic Concepts: System, boundary, Surrounding, Universe, control volume, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process – Reversible, Quasi static & Irreversible Processes, cycle, Causes of Irreversibility. Energy in State and in Transition – Types, Work and Heat, Point and Path function.Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Const. Volume gas Thermometer – Scales of Temperature.

UNIT – II

First Law for Cyclic & Non-cyclic processes; Concept of total energy E; Demonstration that E is a property; Various modes of energy, Internal energy and Enthalpy; First Law of Thermodynamics and Flow Processes - Derivation of general energy equation for a control volume; Steady state steady flow processes including throttling; Unsteady processes; examples of steady unsteady Firs law applications for system & control volume

UNIT – III

Limitations of the First Law – Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance, Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence, Corollaries, PMM of Second kind, Carnot cycle and its specialties, Carnot's theorem, Thermodynamic scale of Temperature. Clausius Inequality, Entropy, Principle of Entropy Increase, Availability and Irreversibility (Basic definitions) – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT-IV

Exergy balance equation and Exergy analysis. Definition of Pure substance, Ideal Gases and ideal gas mixtures, Real gases and real gas mixtures, Compressibility charts- Properties of two- phase systems - Const. temperature and Const. pressure heating of water.

UNIT -V

Thermodynamic and Air standard cycles -; Basic Brayton cycle; Introduction to basic concepts of Gas Turbines; Sterling Engine, Otto, Diesel and Dual cycles; Air Standard Efficiency and comparison with Carnot Cycle Efficiency.

Course Outcomes:

- After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions
- Students can evaluate changes in thermodynamic properties of substances
- The students will be able to evaluate the performance of energy conversion devices
- The students will be able to differentiate between high grade and low grade energies.
- The students will be able to evaluate the performance of air standard cycles.

References:

- R.K. Rajput, 2007, 3rdEdition, EngineeringThermodynamics**,** Laxmi Publications (P) LTD.
- Nag, P.K, 1995, *Engineering Thermodynamics*, Tata McGraw-Hill Publishing Co. Ltd.
- Domakundwar and Kothandaraman, *A Course in Thermal Engineering* Moran, M. J. and Shapiro, H. N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
- Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, *Fundamentals of Thermodynamics*, John Wiley and Sons.
- Jones, J. B. and Duggan, R. E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**1**	1		2								
CO2	1			1								
CO3		2	**1**	**1**								
CO4		2	**2**	1								
CO5			2	2	**1**							

ME306L - STRENGTH OF MATERIALS LABORATORY

B.Tech III Semester Effective from- 2021-22

(P/D) / Week: 3 periods **Credits:1.5**

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LIST OF EXPERIMENTS:

1. Tension test on mild steel bar
2. Tension test on HYSD steel bar
3. Compression test on wood
4. Shear test on wood
5. Torsion test on steel
6. Test on close coiled helical spring
7. Bending test on rolled steel joist
8. Bending test carriage spring
9. Charpy impact test
10. Deflection test on a beam under Uniform Bending
11. Deflection test on simple supported beam
12. Deflection test on fixed beam

ME307L - MANUFACTURING PROCESS LAB

B.Tech IIISemester Effective from- 2021-22

(P/D) / Week: 3 periods **Credits:1.5**

LIST OF EXPERIMENTS:

I. LATHE

1:Step Turning

2:Taper Turning with Knurling

3:V Threading

II. SHAPER

4: Making Square prism on Shaper

5: Slot Cutting with Shaping Machine

III. MILLING MACHINE

6: Rectangular Slot Cutting on Vertical Milling Machine

7: Hexagonal Cutting on Horizontal Milling Machine

8: Spur Gear cutting on Milling

IV. THREADING

9: Square Threading

10: Double Start V Threading

11: Drilling ,Boring and Tapping

V. WELDING

12: Joining of Two Metal Work Pieces with Arc Welding or Gas Welding

ME308L - FUELS LABORATORY

B.Tech III Semester Effective from- 2021-22

(P/D) / Week: 3 periods **Credits: 1.5**

LIST OF EXPERIMENTS:

1. Measurements of Viscosity using Redwood Viscometer
2. Measurements of Viscosity using Saybolt Viscometer
3. Test on Cleaveland flash point apparatus
4. Test on Cleaveland fire point apparatus
5. Test on Ables Flash Point Apparatus
6. Test on Distillation Apparatus
7. Test on Aniline Point Apparatus
8. Test of calorific value of fuels using Bomb Calorimeter
9. Determine the Pour point of given samples

ME309S – CAD Laboratory

B.Tech III Semester Effective from- 2021-22

(P/D) / Week: 3 periods **Credits: 1.5**

Course objectives:

- Navigate through the drafting user interface.
- Create and maintain drawing sheets and views.
- Create and edit user-defined view boundaries.
- Create and edit associative section views.
- Create view dependent geometry.
- Create and edit symbols, dimensions and text.
- Generate an assembly parts list.

Introduction of 2-D and 3-D modeling:

Part Navigator, Master model drawings and drafting standards, drawing sheets, Drafting views Custom views, Move, copy, and align views, hiding geometry in drafting views, Updating drawings and drafting views, Centerline symbols, Dimensions, Notes and labels, Balloon, symbols, GD&T symbols, Surface finish, weld, and custom symbols, Section views, Editing section lines, Maintaining associativity, Detail views, View boundaries, Broken views, Break-out section views, View dependent edits, Part Attributes, Parts lists, Sectioning assembly views, Exploded views, ordinate dimensions, Hole Tables.

SYLLABUS:

Student will perform six exercises on the following,

2-D Modeling

1. Geometrical construction.
2. Orthographic projections.
3. Isometric projections.
4. Sectional views.

3-D Modeling

5. Machine components such as bolt & nuts, bearing brackets, vice bodies, etc.
6. Assembly drawing of any three simple components.

MC310A **Constitution of India**	
Instruction : Hours/Week : **2L:0T:0P** Sessional Marks : **100**	**Credits: 0**

Course Objectives: Students will be able to

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

Unit-I

History of Making of the Indian Constitution: History
Drafting Committee, (Composition & Working)
Philosophy of the Indian Constitution: Preamble
Salient Features

Unit-II

- **Contours of Constitutional Rights & Duties:**
- Fundamental Rights
- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

Unit-III

- **Organs of Governance:**
- Parliament
- Composition
- Qualifications and Disqualifications
- Powers and Functions
- Executive
- President
- Governor
- Council of Ministers
- Judiciary, Appointment and Transfer of Judges, Qualifications
- Powers and Functions

Unit-IV

- **Local Administration:**
- District's Administration head: Role and Importance,
- Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.

- Pachayati raj: Introduction, PRI: Zila Pachayat.
- Elected officials and their roles, CEO Zila Pachayat: Position and role.
- Block level: Organizational Hierarchy (Different departments),
- Village level: Role of Elected and Appointed officials,
- Importance of grass root democracy

Unit-V

- **Election Commission:**
- Election Commission: Role and Functioning.
- Chief Election Commissioner and Election Commissioners.
- State Election Commission: Role and Functioning.
- Institute and Bodies for the welfare of SC/ST/OBC and women.

Text Books/References:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME401C- FLUID MECHANICS AND HYDRAULIC MACHINERY

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Lectures/ Week :3 Hours Tutorials/ Week : 1 Hour Credits: 3

COURSE OBJECTIVES:

- To learn about the application of fluid flow concepts and fundamental equations.
- To apply the knowledge of flow through pipes and laminar flow in circular pipes.
- To understand the importance of dimensional analysis and Boundary layer concepts.
- To apply the knowledge of theory of rotodynamic machines and pumps.
- To design the different types of turbines and analyze their performance.

CONTENTS:

UNIT- I

Definition of fluid, Units and dimensions- properties of fluids, mass density, specific volume, specific gravity, viscosity, Newton's law of viscosity, compressibility, surface tension and capillarity – Fluid flow characteristics- Velocity, Acceleration, Types of flows – Stream lines, Path lines, Streak lines – Continuity Equation – Energy Equation - Momentum equation - Euler's equation of motion along a stream line- Bernoulli's equation and its applications.

UNIT –II

Flow through pipes – Laws of fluid Friction, Darcy-Weisbach equation and other formulae for Head loss due to friction in pipes, Minor losses in pipes, Pipes in Series and Pipes in Parallel, Moody's diagram - Laminar flow through circular pipes, Hagen-Poiseuille Equation.

UNIT-III

Boundary layer theory, thickness, measurement– Drag force on a flat plate due to boundary layer - Need for dimensional analysis – methods of dimension analysis – Similitude – type of similitude Dimensionless parameters – application of dimensionless parameters – Model analysis.

UNIT – IV

Theory of Rotodynamic machines - various efficiencies – velocity components at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done by the impeller, performance curves – Cavitations in pumps- Reciprocating pump – working principle.

UNIT- V

Classification of water turbines, heads and efficiencies, velocity triangles – Axial, radial and mixed flow turbines – Pelton wheel, Francis turbine, Kaplan turbine, working principles – Draft tube – Specific speed, Unit quantities, Performance curves.

Text Books:

1. Hydraulics and Fluid Mechanics by P.N. Modi and S.M. Seth.
2. Fluid Mechanics and Hydraulic Machines by R.K.Rajput.
3. Fluid Mechanics and Hydraulic Machines by R.K.Bansal.

References:

1. Fluid Mechanics by V.L. Streeter and E.Benzamine, Wylie.
2. Fluid Mechanics and Turbo machines by Madan Mohan Das.– PHI Learning Pvt.Ltd., New Delhi.

COURSE OUTCOMES: Upon completion of this course, students will be able to

	DESCRIPTION OF THE COURSE OUTCOME
CO1	Understand and analyze simple flow situations and solve fluid flow problems.
CO2	Classify flows and evaluate the flow through pipes and laminar flows.
CO3	Apply the knowledge of boundary layer theory and dimensional analysis.
CO4	Design and evaluate the performance of centrifugal and reciprocating pumps.
CO5	Design and analyze the characteristics of turbines.

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

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME402C – KINEMATICS OF MACHINERY

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Lectures/ Week : 3 Hours Tutorials/ Week : 1 Hour Credits: 3

COURSE OBJECTIVES:

- The course under kinematics of Machinery has been designed to cover the basic concepts of kinematic aspects of machine elements which are useful for design of machines.
- This course provides the knowledge of mechanical engineers in Dynamic synthesis and analysis by providing significant skills and also experience in creating and modeling mechanisms and also provides the knowledge for doing position analysis of mechanisms of various machines.
- This course provides the understanding of the concepts of displacement on kinematics analysis.
- This course provides the kinematic analysis of gears and gear trains which are used in different machines.
- Ability to analyze the kinematics of cams, design of cams and followers. And also understanding of the concepts of displacement, velocity and acceleration of followers and how to determine them.

CONTENTS:

UNIT–I

BASICS OF MECHANISMS :

Elements or Links – Classification – Rigid Link, flexible and fluid link –Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higherpairs– closedandopenpairs–constrainedmotion–completely,partially orsuccessfullyconstrainedand incompletelyconstrained – Degree of freedom, Mobility – Kutzbach criterion, Gruebler's criterion – Grashof's Law – Kinematic inversions of four-bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission Angle – Quick return mechanisms.

UNIT–II

STRAIGHT LINE MOTION MECHANISMS:

Exact and approximate, copied and generated types –Peaucellier - Hart - Scott Russel – Grasshopper – Watt- Tchebicheff - Robert Mechanisms and Pantograph.

STEERING MECHANISMS:

Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.

UNIT–III

VELOCITY AND ACCELERATION ANALYSIS:

Instantaneous centers of rotation – Kennedy's theorem and its applications to planar mechanism for velocity analysis – Velocity analysis of various mechanisms using Relative velocity method, Velocity Images, Rubbing Velocity – Acceleration of simple mechanisms. Coriolis component of acceleration.

UNIT–IV

GEARS: Toothed gears – types – law of gearing, Forms of tooth- cycloidal and involute profiles. Velocity of sliding – phenomena of interference– Methods to avoid interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact.

GEAR TRAINS: Introduction –Types of gears trains – Simple, Compound, Reverted and Epicyclic gear trains. Train value and Velocity ratios of gear trains.

UNIT–V

CAMS:

Classification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, parabolic, simple harmonic and cycloidal motions – Cam profiles for specified motions – disk cam withradial Knife edge follower, flat faced follower , roller follower – Oscillatory follower cams of specified contours.

Text Books:

1. Theory of Machines :S.S.Rathan / TMH
2. Theory of Machines :R.S.Khurmi. / S.Chand
3. Mechanisms and Machine theory :J.S.RaoandR.V.Dukkipati./NewAge
4. Theory of Machines &Mechanisms :PL. Ballaney / Khanna Publishers

References:

1. The theory of Machines : ShigleyJ.E/Oxford University Press
2. Mechanisms and Dynamics of Machinery: Hamilton Mabie H. and F. W. Ocvirk / Oxford University Press.

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

COURSE OUTCOMES: Upon completion of this course, students will be able to

DESCRIPTION OF THE COURSE OUTCOME	
CO1	Understand the principles of kinematic pairs, chains and their classification, DOF, inversions, equivalent chains and planar mechanisms.
CO2	Acquire knowledge and develop straight line motion mechanisms and steering mechanisms.
CO3	Able to draw velocity and acceleration diagrams for different mechanisms.
CO4	Able to design and develop gear and gear train depending on application.
CO5	Design cams and followers for specified motion profiles.

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME403C – APPLIED THERMODYNAMICS

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Lectures/ Week : 3 Hours Tutorials/ Week : 1 Hour Credits: 4

COURSE OBJECTIVES:

- Able to learn about the Ist law analysis of combustion reactions.
- Able to learn about steam power cycles, boilers and draughts.
- Able to understand the steam generators and steam properties.
- Able to understand the compressible flows of nozzles.
- Able to analyse the performance of steam turbines.

CONTENTS:

UNIT–I

Introduction to Fuels: Solid, liquid and gaseous fuels– Calorific Value of Fuels: Determination and Calculation of from Chemical Analysis, Combustion equations – Air required complete combustion. Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions-Heat calculations.

UNIT–II

Steam power cycles: Steam Power plant and its components, site selection, Carnot Vapour Power Cycle, Rankine cycle, Rankine Cycle with Reheat, Superheat, and Regeneration, Plant efficiency, Comparison of Carnot and Rankine cycles.

BOILERS: Classification Based on Working Principles & Pressures of Operation - L.P & H.P. Boilers – Mountings and Accessories. DRAUGHT: Classification – Height of Chimney for Given Draught and Discharge, Condition for Maximum Discharge, Efficiency of Chimney – Artificial Draught, Induced and Forced Draught.

UNIT–III

Steam Properties: Properties of Steam, Definitions of saturated states; PV, TS, HS Diagrams, P-V-T surface, Principle of increase of entropy; Steam Processes – Constant Volume, Constant pressure – Isothermal, Adiabatic and Hyperbolic Process, Throttling expansion.Identification of states & determination of properties.

UNIT–IV

Basics of compressible flow: Stagnation properties, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows- normal shocks- use of ideal gas tables for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, super saturation- compressible flow in diffusers, efficiency of nozzle and diffuser.

UNIT–V

Analysis of steam turbines: Principles and operation – Classification - velocity and pressure compounding of steam turbines – Work done – Diagram Efficiency, Effect of

Blade friction – stage efficiency, Turbine reheat factor, Height of Turbine blade – Axial Thrust – losses in steam turbine; Governing of turbines.

Text Books:

1. P. K. Nag, "Engineering Thermodynamics", 4thEdition, McGraw Hill, 2014.
2. Thermal Engineering, R.K. Rajput, 9/e, Lakshmi Publications, 2013.
3. Thermal Engineering, R.S Khurmi& JS Gupta, S.Chand, 2012.
4. Engineering Thermodynamics R.K. Rajputh, 3rdEdition, Lakshmi Publications, 2007.
5. Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., 2003, 6th Edition, Fundamentals of Thermodynamics, John Wiley andSons.

References:

1. Jones, J. B. and Duggan, R. E., 1996, Engineering Thermodynamics, Prentice-Hall of India
2. Moran, M. J. and Shapiro, H. N., 1999, Fundamentals of Engineering Thermodynamics, John Wiley and Sons.
3. Eastop and McKaney, Applied Termodynamics.
4. Domakundwar and Kothandaraman, A Course in Thermal Engineering.

COURSE OUTCOMES: Upon completion of this course, students will be able to

DISCRIPTION OF THE COURSE OUTCOME	
CO1	Understand the Ist law analysis of combustion reactions
CO2	Understanding of various steam power cycles, boilers and droughts.
CO3	Acquire the knowledge about the steam generators and steam properties
CO4	Acquire the knowledge on compressible flows of nozzles
CO5	Acquire the knowledge on the performance of steam turbines.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO12
CO1	2			3			2					
CO2	1			2			3					
CO3			2	3								
CO4		3		2								
CO5		3		1								

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME404C – Advanced Engineering Graphics

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Lectures/ Week: 1 Hour Drawing / Week: 4 Hours Credits: 3

COURSE OBJECTIVES:

- To understand the basics of Projections of solids and Auxiliary projections of solids in different inclinations of the principle planes
- To provide the knowledge of section of solids and to provide sufficient knowledge to draw section planes perpendicular to HP and inclined to VP and also of solids inclined to both the planes.
- To provide knowledge of development of surfaces, and to know how to unwound an object / solid when it is being cut by an inclined plane.
- To impart the students, the ability to analyze the interpretation of solids intersections.
- To analyze the isometric projections of simple objects.

CONTENTS:

UNIT–I

Projections of Solids (Simple Solids - Cylinder, Cone, Cube, Prism, & pyramid, Octahedron and Tetrahedron) those inclined to both the planes by Auxiliary projections.

UNIT–II

Sections of solids of tetrahedron, cube, prism, pyramids and cone, section planes perpendicular to HP and inclined to VP, Section planes perpendicular to VP and inclined to HP sections plane Perpendicular to both HP and VP true shape of the sections

UNIT-III

Development of surfaces: Development of lateral surfaces of right regular solids as prisms, pyramids, cylinders and cones which are cut by plane inclined to HP only.

UNIT-IV

Introduction to interpenetration of solids of intersection of two prisms, cylinders, cone and cylinder.

UNIT-V

Isometric Projections: Isometric Projections and views such as prisms, Pyramids, cylinders and cones. Solids placed one over the other simple mechanical components.

Text Books:

1. Bhatt N.D. and V.M. Panchal, &Ingle P. R., (2014), Engineering Drawing, Charatar Publishing House.
2. Shah, M.B. &Rana B.C, (2008), Engineering Drawing and Computer Graphics, Pearson Education.
3. K.L.Narayana and P. Kannaih, A text Book of Engineering Drawing, SCITECH Publications – (2008)

References:

1. Agrawal B. &Agrawal C.M. (2012), Engineering Graphics, TMH Publishers.
2. K. Venugopal: Engineering Drawing & Graphics, New age International Publishers.

COURSE OUTCOMES: Upon completion of this course, students will be

DISCRIPTION OF THE COURSE OUTCOME	
CO1	Able to draw Projections of solids and Auxiliary projections of solids parallel to one plane perpendicular to both the planes
CO2	Able to analyze and draw section of solids inclined to both the planes
CO3	Able to develop surfaces of solids which are perpendicular to both the planes
CO4	Able to draw interpretation of solids in any angle
CO5	Able to draw isometric projections of simple objects

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

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

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI
(w.e.f. AY: 2020 – 2021)

ME405C MACHINE TOOLS AND METAL CUTTING

Lectures/week: 3 hours Credits: 03

Sessionals: 20 +20

End Examination: 60

Course Outcomes (COs):

CO 1 Able to understand the basic concepts of metal cutting and basic machine tools of workshop practice.
CO 2 Able to make a distinction between machine tools employing single point cutting tool and multipoint cutting tool.
CO3 Prepared to cut gear teeth on a given job on a milling machine by adopting suitable indexing method.
CO4 Ability to understand the basic features of Capstan and Turret lathes and machining by abrasive grains.

UNIT – I

Cutting tools: Classification – Nomenclature/Signature of Single Point Cutting Tool – Differences between orthogonal cutting and oblique cutting – Mechanism of metal cutting – Types of Chips – Chip Breakers – Forces acting on a single point cutting tool – Merchant's Circle Force Diagram – Velocity relations – Specific energy in cutting – Tool life – Tool life equation.

UNIT – II

Lathe and Shaper: Types – operations done on Lathe. Work holding devices. Boring Machines – types and constructional details – Jig boring machine – Shaper, Slotting and Planer Machines – Constructional details – Quick return mechanisms – Estimation of machining time in lathe, shaper, and planer.

UNIT – III

Drilling and Milling Machines: Types of Drilling machines – Constructional details – Operations performed on them. Twist drill elements. Classification of milling machines – Constructional details of various types – Operations performed on them. Milling methods – Up – cut and Down – cut milling. Estimation of machining time in drilling and milling.

UNIT – IV

Gear cutting by Milling and Finishing Operations: Indexing head and types of indexing methods – Simple, Compound, Differential and Angle indexing. Spur and Helical gear cutting – Gear generating methods – Gear shaping and Gear hobbing. Finishing of gear by gear shaving, gear grinding, and gear lapping.

UNIT – V

Broaching and Grinding Machines : Types of broaches – broaching operations – types of broaching machines – Vertical, Horizontal, Continuous, and Rotary broaching machines. Grinding – Grinding wheels – Manufacturing, Specification – Wheel selection. Wheel dressing and truing. Different types of grinding machines. Use of magnetic chucks – Precision grinding processes – Lapping, Honing and Super finishing. Brief introduction to Capstan and Turret lathes.

TEXTBOOKS:

1. **Serope Kalpakjian**: Manufacturing Engineering and Technology, 5th Edition, Pearson Prentice Hall.
2. **Hazra Choudary and Bose S.K.:** Workshop Technology Volume II, 10th Edition, Media Promoters and Publishers , Pvt. Ltd. 2000
3. **B.S. Raghuvamshi** : Workshop Technology Volume II (Machine Tools), Dhanpat Rai and Co, Pvt. Ltd, 2009.
4. **Sharma P.C.**: Production Engineering, 10th Edition, S. Chand and Co, 2008
5. **Haslehurst M**.: Manufacturing Technology, 3rd Edition, Viva Books Pvt. Ltd. 1998
6. **Gupta S.C and Jain R.K.:** Production Technology, 9th Edition, Khanna Publishers, 2002.

References:

1. **HMT**: Production Technology, McGraw – Hill Education (India) Pvt. Ltd, 28th reprint, 2008.

MAPPING OF COURSE OUTCOMES WITH PROGRAM OUTCOMES:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
CO1	2		3									
CO2	1	2	3									
CO3	1		3									
CO4		2	3									
CO5	1		3									

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME406L- FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Practical/ Week : 3 Hours

Credits: 1.5

COURSE OBJECTIVES:

- To determine the coefficient of discharge in flow measuring devices.
- To determine the coefficient of different losses in pipe flow.
- To determine Specific Speed and draw the performances Characteristic curves of pumps.

CONTENTS:

FLOW MEASURMENT

1. Calibration of Small Orifice
2. Calibration of Venturi Meter
3. Calibration of Orifice Meter
4. Calibration of Triangular Notch

HEAD LOSSES IN PIPES

5. Determination of Friction factor of the pipe material
6. Determination of Head Loss coefficient due to sudden contraction
7. Determination of Head Loss coefficient due to Gate valve in a pipe line

HYDRAULIC MACHINES

8. Characteristic curves of 0.8 KW two stage centrifugal pump
9. Characteristic curves of 5.5 KW variable speed centrifugal pump

COURSE OUTCOMES: Upon completion of this course, students will be able to

	DISCRIPTION OF THE COURSE OUTCOME
CO1	Able to calibrate the flow measuring devices
CO2	Able to calculate loss coefficients for use in the pipe flow analysis.
CO3	Able to prepare the characteristic curves for the pumps.

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME407L- IC ENGINES LAB

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Practical/ Week : 3 Hours
Credits: 1.5

LIST OF EXPERIMENTS:

1. HeatbalancesheetonListerEngines.
2. PerformanceTeston2-stage Air Compressor.
3. Economical Speed Test on Kirloskar Engine.
4. Load Test on Kirloskar Engine by using Bio diesel.
5. Air fuel ratio& volumetric efficiency test on Kirloskar Engine.
6. Valve Timing diagrams for Cooper Engine.
7. Load Test on 4- stroke Kirloskar Diesel Engine
8. Smoke and Emission Test on four stroke diesel engine with 5-Gas Analyzer.

COURSE OUTCOMES: Upon completion of this course, students will be able to

DISCRIPTION OF THE COURSE OUTCOME	
CO1	Estimate energy distribution by conducting heat balance test on IC engines.
CO2	Conduct constant speed and variable speed tests on IC engines and interpret their performance.
CO3	Evaluate the performance of air compressor.

B.TECH IV SEMESTER, MECHANICAL ENGINEERING

ME408L- ELECTRONICS AND ELECTRICAL ENGINEERING LAB

EFFECTIVE FROM 2021-22 (R20- Regulations 2020)

Practical/ Week :3 Hours Credits: 1.5

COURSE OBJECTIVES:

- To study and analyze basic magnetic and electric circuits.
- To acquire knowledge on operating characteristics of Transformer and DC Machines.
- To study the characteristics of various electronic components.

LIST OF EXPERIMENTS:

1. Verification of KCL & KVL
2. Measurement of Inductance
3. Verification of Super position Theorem
4. Measurement of 3 phase power
5. OC & SC Test on 1 phase Transformer
6. Brake test on DC Shunt Motor
7. OCC on DC Shunt Generator
8. 1 Phase Half wave rectifier
9. 1 Phase full wave rectifier
10. PN Junction Diode Characteristics
11. V-I Characteristics of Zener Diode
12. Logic gates (NAND & NOR)

COURSE OUTCOMES: Upon completion of this course, students will be able to

	DISCRIPTION OF THE COURSE OUTCOME
CO1	Verify Network Theorem and analysis of Electrical Circuits
CO2	Understand the Significance and performance of DC Machines and Single phase Transformers
CO3	Design and analyze various Rectifiers & Logic Gates

Mapping of Course Outcomes with Program Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	1	2							3	2		
CO2	3					2			2	2		
CO3	2		1						2	2		

Department of Mechanical Engineering
S. V. University College of Engineering:: TIRUPATI
(w.e.f. AY: 2020 – 2021)

ME409S MATLAB

Lectures/week: 1 hours — Credits: 02

Laboratory/week: 2 hours* — Continuous Assessment: 40

End Examination: 60

***Evaluation is similar to regular Practical/Laboratory Class Model/Pattern**

Course Outcomes (COs):

CO 1 Able to understand the basic features of MATLAB platform
CO 2 Able to distinguish between Script file and Function file
CO3 Prepared to write simple programmes and to solve systems of linear algebraic equations – that is problem solving techniques.
CO4 Ability to make use of the numerical power of MATLAB in practical applications such as linear regression and interpreting and plotting of complex data with ease.

UNIT – I

Introduction: What is MATLAB? – MATLAB System – Starting MATLAB on Windows Platforms – MATLAB Environment – Basic commands and Syntax – Arrays and Matrices – Arithmetic and Array operations – Matrix operations and manipulations – Practice Exercises.

UNIT – II

Scripts and Functions: Script and Function files (M – files) – Control loops – Sample/simple Programmes – Basic Plotting – 2D and 3D plotting – Multiple plots – Additional plotting features – Practice Exercises.

UNIT – III

Matrix Algebra and Solutions to Systems of Linear Equations: Solving Linear algebraic equations by matrix methods – Polynomials – Symbolic mathematics – Preliminaries – Practice Exercises.

UNIT – IV

Solving Linear algebraic equations by Symbolic mathematics – Differentiation and Integration by Symbolic mathematics – Practice Exercises.

UNIT – V

Numerical Techniques: Numerical differentiation and Numerical integration – Fitting of data – Curve fitting – Interpolation of functions – Practice Exercises.

TEXTBOOKS:

1. **Tobin A. Driscoll**: Learning MATLAB, Siam, Cambridge University Press, India, 2005.
2. **Hanselman and Littlefield**: Mastering MATLAB 7, 1st Edition, PHI, 1997.
3. **Rudra Pratap**: Getting Started with MATLAB 7, Oxford University Press, 2006.
4. **Stevan C. Chapra**: Applied Numerical Methods with MATLAB for Engineers and Scientists, 3rd Edition, McGrawHill Companies, Inc, NY, 2012.