KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15

(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTIONS & EVALUATION FOR B.TECH. 4-YEAR DEGREE PROGRAMME

BRANCH : COMMON FOR ALL BRANCHES
SEMESTER : FIRST

S. No.	Course Code	Course Name	Periods			Credits (C)	Evaluation Scheme				
							CIE			ESE	Total Marks
			L	T	P		TA	MSE	Total		
1	U14MH101	Engineering Mathematics-I	3	1	-	4	15	25	40	60	100
2	U14CS102	Programming in C	3	1	-	4	15	25	40	60	100
3	U14PH103	Engg. Physics /	3	1	-	4	15	25	40	60	100
	U14CH103	Engg. Chemistry	3	1	-	4	15	25	40	60	100
4	U14MH104	English for Communication /	2	2	-	3	15	25	40	60	100
	U14ME104	Engineering Drawing	2	4	-	4	15	25	40	60	100
5	U14EI105	Basic Electronics Engg. /	3	-	-	3	15	25	40	60	100
	U14EE105	Basic Electrical Engg.	3	-	-	3	15	25	40	60	100
6	U14ME106	Basic Mechanical Engg.	3	-	-	3	15	25	40	60	100
	U14CE106	Basic Engg. Mechanics	3	1	-	4	15	25	40	60	100
7	U14CS107	Programming in "C" Lab	-	-	3	2	40	-	40	60	100
8	U14PH108	Engg. Physics Lab /	-	-	3	2	40	-	40	60	100
	U14CH108	Engg. Chemistry Lab	-	-	3	2	40	-	40	60	100
9	U14ME109	Engg. Workshop Practice /	-	-	3	2	40	-	40	60	100
	U14CH109	Environmental Studies #	2	-	-	2	15	25	40	60	100
10	U14EA110	EAA: Physical Education & NSS #	-	-	2	1	100	-	100	-	100
		Total	17/ 19	5/ 8	11/ 8	28/ 30					1000

Note: **L** – Lectures; **T**- Tutorials; **P** – Practicals; **CIE** – Continuous Internal Evaluation; **TA** – Teachers Assessment; **MSE** – Mid Semester Examination; **ESE** – End Semester Examination; **EAA** – Extra Academic Activity;

***indicates Mandatory Course***

Student Contact Hours / Week : Stream – I = 33 (periods/week); Stream-II = 35 (periods/week)

Total Credits (C) : Stream – I = 28 Credits; Stream-II = 30 Credits

U14MH101 ENGINEERING MATHEMATICS- I

Class: B. Tech., I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To enable the student to acquire fundamental knowledge of mathematical concepts and mathematical methods and apply in engineering disciplines.*
- *To introduce the basic concepts such as convergence and divergence of series, tests for convergence of series; limit, continuity, differentiability of a function, mean value theorems, expansion of a function in series*
- *To introduce the concept of partial differentiation and total differentiation , and maxima & minima of functions of two/several variables*
- *To introduce the concept of double integral and triple integral*
- *To introduce differential equations of first order along with simple applications*

UNIT-I (9+3)

Infinite Series:

Sequences & Series, General properties of series, Series of positive terms, Comparison test, Limit comparison test, Integral test, D'Alembert's Ratio test, Cauchy's nth root test; Alternating series-absolute convergence.

Differential Calculus (Functions of One variable):

Limits, Continuity, Differentiability, Rolle's theorem (Physical and algebraic interpretations), Lagrange's mean value theorem (Geometrical interpretation), Cauchy's mean value theorem. Taylor's theorem and Power series representation of functions, Maclaurin's series, Asymptotes and Tracing of Simple Curves.

UNIT-II (9+3)

Differential Calculus (Functions of Several variables):

Partial differentiation, Total differentiation, Change of variables, Jacobians, Application to find Tangent plane and Normal to a surface. Taylor's theorem for function of two variables (without proof), Maximum and minimum values of functions of two variables. Langrage's method of undetermined multipliers. Differentiation under integral sign.

UNIT-III (9+3)

Multiple Integrals and Applications:

Double integral, Change of order of integration, Double integration in polar coordinates, Triple integrals, Applications: Area enclosed by plane curves, Volumes of solids, Calculation of mass, Center of gravity, Moment of Inertia of plane lamina.

Beta and Gama functions and their relations. Evaluation of improper integrals in terms of Beta and Gamma functions.

UNIT-IV (9+3)

Differential Equations of first order:

Practical approach to differential equations. Formation and solution of differential equation. Solution of first order and first degree differential equation, variables separable form, homogeneous form, reducible to homogeneous form, First order linear equations, Equations

reducible to linear equation (Bernoulli's equation), Exact differential equations, Equations reducible to exact form.

Applications of first order differential equations: Simple examples of Physical applications (Orthogonal trajectories, RL series circuit problem)

Text Books:

1. Grewal, B.S., "Higher Engineering Mathematics", *Khanna Publishers,* Delhi
2. Shanti Narayan, "Differential Calculus", *S. Chand & Co.*, New Delhi

Reference Books:

1. Jain R.K.& Iyengar SRK , "Advanced Engineering Mathematics", *Narosa Publishers*
2. Kreyszig E., "Advanced Engineering Mathematics", *New Age International*
3. Sastry S.S., "Engineering Mathematics - Vol. I & II", *Prentice Hall of India*

Course Learning Outcomes:

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

- *test the convergence/divergence of a given series by Comparison test, Limit comparison test, Integral test, D'Alembert's Ratio test, Cauchy's nth root test*
- *understand the basic concepts of limit, continuity, differentiability of a function, and will be able to expand a given function in series*
- *trace a given curve*
- *apply the technique of differentiation under integral sign to solve an integral*
- *find maxima & minima of functions of two/several variables*
- *find double integral and triple integral and apply them to find moment of inertia, centre of gravity of plane lamina*
- *understand Beta and Gama functions and their relations and evaluate an improper integral in terms of Beta and Gamma functions*
- *solve a given differential equations of first order and understand the application of differential equations of first order*

U14CS102 PROGRAMMING IN C

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To expose the students to the concepts of problem solving using structured programming language*
- *To improve students capability in applying logical skills in problem solving*
- *To improve students expertise in C Programming concepts.*
- *To make students capable of using memory management techniques like pointers, files, dynamic memory allocation in c programming*

UNIT-I (9+3)

Introduction:
Definition of a computer, Types of computers, Operating system functions, Computer languages, Problem solving and Program development steps, Algorithm, Flowchart. **C Language Preliminaries:**
History, Character set, Identifiers, Keywords, Data types, Variable declarations, Expressions, Symbolic constants, Input-Output statements. **Operators:** Arithmetic, Relational, Increment, Decrement, Conditional, Logical, Bit-wise and Special operators**.**

UNIT-II: (9+3)

Flow Control Statements: Simple if, If-Else, Nested–if, Else-If ladder, Switch and Goto.
Iterative Statements: While, Do-While and For statements, Nested loops, Break, Continue.
Arrays: One dimensional, Two dimensional arrays. Linear search, Binary search, Bubble sort.

UNIT-III (9+3)

Functions: Definition, Function prototypes, Types of arguments, Parameter passing mechanisms, Recursion, Storage classes.
Strings: Operations on strings, String-Handling functions.
Structures and Unions: Definition, Declaration of structure and union variables, Memory allocation, Nested structures, Array of structures

UNIT-IV (9+3)

Pointers: Pointer declaration, pointers arithmetic, Pointer to arrays, Array of pointers, Pointer to strings, Pointer to function, and Pointer to Structures, Dynamic memory allocation.
Files: File operations, File handling functions, Random access files

Text Books:

1. E.Balagurusamy, "Programming in ANSIC", *Tata McGraw Hill*, 6th Edn, ISBN-13: 978-1-25- 90046-2, 2012
2. Herbert Schildt, "Complete Reference with C", *Tata McGraw Hill,* 4th Edn., ISBN-13: 9780070411838, 2000

Reference Books:

1. Kerninghan and Ritchie, "The C Programming Language", *Prentice Hall of India*, 2nd Edn., ISBN-13:007-6092003106, 1988
2. Yaswanth Kkanetkar, "Let Us C", *BPB Publications*, 13th Edn., ISBN-13: 9788183331630, 2012

Course Learning Outcomes:

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

- *know the fundamentals of computers*
- *understand applying logical skills for problem solving*
- *learn C programming language concepts*
- *apply C programming language concepts for problem solving*
- *gain knowledge in using memory management techniques in c programming*
- *develop modular programming using functions*

U14PH103 ENGINEERING PHYSICS

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To make the bridge between physics in intermediate level and its applications in engineering by giving proper inputs.*
- *To introduce the basic concepts of all types of oscillations with illustrations by mechanical examples.*
- *To introduce the basic concepts of coherence and polarized nature (interference, diffraction & polarization) of light waves and their applications.*
- *To introduce and explore the knowledge of high frequency sound waves & their application in different fields.*
- *To introduce the basic concepts of modern physics by introducing the fundamental elements of Quantum mechanics, which are essential to understand the mechanics of microscopic particles.*
- *To introduce the basic concepts of modern science like Photonics (lasers, Fiber optics, etc.,.), modern materials (magnetic materials, superconductors, nano material etc.,.)*

UNIT-I (9+3)

Oscillations:

Physical examples of simple harmonic motion –Torsional pendulum, Physical pendulum, Spring - Mass systems and Loaded beams - Two body oscillations – Qualitative treatment of Free, Damped & Forced Oscillations and Resonance.

Interference:

The Superposition principle –Coherence –Phasor method of adding wave disturbances – Phase changes on reflection - Anti reflection coating –Interference of reflected light from uniform and wedge shaped film –Newton's rings in reflected light-Determination of wavelength of monochromatic light using Newton's rings experiment –Michelson's Interferometer, Types of fringes, Determination of wavelength of monochromatic light, thickness and refractive index of a thin transparent sheet using Michelson's Interferometer.

UNIT-II (9+3)

Diffraction:

Fraunhofer diffraction at a single slit, measurement of slit width –Fraunhofer diffraction at a circular aperture –Rayleigh's criterion for resolution - Diffraction grating (Qualitative) – Experimental determination of wavelength using a plane transmission grating- Dispersion and Resolving power of a grating.

Polarization:

Polarized light-Double refraction, Geometry of calcite crystal, Construction and working of a Nicol prism – Theory of polarized light - Production and Detection of plane, circularly and elliptically polarized light – Quarter and Half-wave plates - Optical activity – Laurent's half-shade Polarimeter – Application of polarization in LCDs.

Ultrasonics:

Ultrasonic waves – Properties - Production of Ultrasonic waves - Magnetostriction method, Piezo-electric method – Detection of Ultrasonics - Determination of wavelength (Acoustic grating) - Application of ultrasonic waves.

UNIT-III (9+3)

Lasers (Qualitative):

Absorption, Spontaneous and Stimulated emission – Relation among Einstein coefficients – Difference between conventional and laser light – Population inversion, Methods of achieving population inversion – Types of Lasers – Ruby Laser, Helium-Neon Laser, Carbon dioxide Laser and Nd-YAG Laser – Applications of lasers.

Holography: Introduction – Formation and Reconstruction of a Hologram – Applications of Holography.

Fiber Optics (Qualitative):

Introduction – Total internal reflection – Fiber construction – Numerical aperture and Acceptance angle – Types of Optical fibers (Step and Graded index) – Power losses in Optical fibers –Attenuation, Dispersion, Bending – Light wave Communication using Optical fibers – Applications of Optical fibers - Fiber optic Sensors (Temperature and Displacement), Endoscope.

UNIT-IV (9+3)

Elements of Quantum Mechanics:

De-Broglie concept of matter waves – De-Broglie wavelength, Properties of matter waves – Schrodinger's wave equation – Time independent wave equation (one dimension), Particle in a box (one dimension), energy quantization, Wave functions.

Modern Materials (Qualitative):

Magnetic materials: Introduction –Permeability - Magnetization –Classification of magnetic materials . Applications of magnetic materials – magnetic recording, magnetic memories.

Superconducting materials: Superconductivity – Meissner effect –Transition temperature – Isotope effect. Types of Superconductors - Soft and Hard Superconductors – Applications of Superconductors.

Nanomaterials: Introduction – Classification of nanomaterials – Properties of nanomaterials – Physical, Chemical, Electrical, Optical, Magnetic and Mechanical properties (in brief) - Applications of nanomaterials (in brief).

Text Books:

1. Bhattacharya and Bhaskaran, "Engineering Physics", *Oxford University Press.*
2. V.Rajendran, "Engineering Physics", *McGraw Hill Education*.

Reference Books:

1. David Halliday and Robert Resnick, "Physics Part I & II", *Wiley Eastern Limited.*
2. R.K. Gaur and S.L.Gupta, "Engineering Physics", *Dhanpath Rai and Sons*.
3. P.K. Palanisamy, "Engineering Physics", *Scitech Publishers.*

Course Learning Outcomes:

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

- *understand the basic concepts of physics for its applications to Engineering.*
- *understand the basic principles of oscillations that can be applied to all types of oscillatory phenomena like acoustic, mechanical, electromagnetic, atomic, nuclear etc.,.*
- *appreciate the knowledge acquired in studying interference, diffraction and polarization in the application of thickness measurement of thin films, refractive indices and wavelength determinations using interferometric techniques, fringe pattern etc.,.*
- *appreciate the knowledge gained in studying ultrasonics and their multi dimensional applications in various fields like industrial, engineering (like NDT etc.,.) and medical etc.,.*
- *understand the fundamental principles and applications of lasers and Optical fibers.*
- *exposed to various material properties which are used in engineering applications and devices.*

U14CH103 ENGINEERING CHEMISTRY

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To understand the fundamental principles and applications of chemistry.*
- *To identify the significance of electro chemistry.*
- *To introduce and explore the knowledge of corrosion and its prevention*
- *To impart and inculcate proper understandings of energy sources, phase rule, organic and polymer chemistry*
- *To acquire the techniques of water analysis and treatment*
- *To understand the role of chemistry in the field of engineering*

UNIT-I (9+3)

Electrochemistry:

Specific and equivalent conductance, Conductometric titrations, Electrode potential, Nernst equation, Electrochemical series, Reference electrodes : Calomel electrode, Ag/AgCl electrode, Ion-selective electrode : glass electrode, Determination of pH using Glass, Quinhydrone and Hydrogen electrodes, Potentiometric titrations, Commercial cells: Hydrogen-Oxygen fuel cell, Lead-acid storage cell.

UNIT-II (9+3)

Corrosion:

Introduction: Corrosion by pure chemical reaction, Electrochemical theory of corrosion, Galvanic corrosion, Differential aeration corrosion, Factors influencing corrosion, Prevention of corrosion: Cathodic Protection, Hot Dipping, Cementation, Cladding, Electroplating, Corrosion inhibitors, Anodized coatings.

Phase Rule:

Description of the terms: 'Phase', 'Component' and 'Degrees of freedom'. Gibbs Phase rule equation. Application of the phase rule to one-component system (Water system) and two-component system (silver-lead system).

Energy Sources:

Characteristics of fuels for internal combustion (IC) engines, Knocking, Octane number. Unleaded petrol, Cetane number, Power alcohol, Compressed Natural gas (CNG), Liquified petroleum gas (LPG).

UNIT-III (9+3)

Introduction to Methods of Chemical Analysis:

Introduction to spectroscopy, Microwave spectra: Theory, Application of microwave spectra in the determination of bond length of a diatomic molecule. Infra-Red spectra: Theory, Applications: Calculation of force constant and identification of functional groups in organic compounds. UV-Visible spectra: Lambert-Beer's law and its applications, Types of electronic transitions.

Water Analysis and Treatment:

Hardness of Water, determination of hardness of water by using EDTA, determination of Alkalinity, determination of Chloride by argentometry, determination of Fluoride by spectrophotometry, determination of Dissolved Oxygen, Biochemical Oxygen Demand and

Chemical Oxygen Demand, Softening of water by Zeolite process and Ion-exchange process, Reverse Osmosis, Electrodialysis.

UNIT-IV (9+3)

Organic Chemistry:

Fission of a covalent bond, Types of electron effects: Inductive effect, Mesomeric effect and Hyperconjugation, Reaction intermediates and their stabilities, Types of reagents: Electrophilic, Nucleophilic and Free radical reagents. Study of the mechanisms of substitution (SN^1 and SN^2) and Addition (Electrophilic, Nucleophilic and Free radical) reactions, Role of inductive effect, mesomeric effect and hybridazation on the dissociation constant of carboxylic acids.

Polymers:

Introduction : Types of Polymerization reactions (Addition and Condensations), Mechanism of free radical, cationic and anionic addition polymerization, Condensation polymerization, Thermo setting and thermo plastic resins, Silicone rubber, Conducting polymers, Laminated plastics.

Text Books:

1. Jain and Jain, "Engineering Chemistry", *Dhanpat Rai Publishers.*
2. Shashi Chawla, "Text book of Engineering Chemistry", *Dhanpat Rai Publishers.*

Reference Books:

1. J C Kuriacose and J.Rajaram, "Chemistry in Engineering and Technology (Vol .I&II)", *Tata McGraw Hill Publishers.*
2. Suba Ramesh, Vairam et. al "Engineering Chemistry", *Wiley India.*
3. O P Agarwal, "Engineering Chemistry", *Khanna Publishers.*
4. S.S.Dara, "A Text book of Engineering Chemistry", *S.Chand & Company Ltd.*

Course Learning Outcomes:

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

- *understand basic principles and role of chemistry in the field of engineering*
- *gain the knowledge of interrelationship between electrical and chemical energy*
- *make a judicious selection of materials in the field of engineering*
- *understand the phase rule and its application in the study of material science*
- *understand the methods of chemical analysis of water and its treatment*
- *know the synthetic methods and versatile applications of polymers*
- *understand the advantage of spectrometric methods of chemical analysis over the conventional methods*

U14MH104 ENGLISH FOR COMMUNICATION

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
2	2	-	3

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To acquire writing skills with a focus on accuracy avoiding common errors in English.*
- *To acquire word power enabling to use them in speaking and writing.*
- *To develop reading comprehension skills with local and global comprehension.*
- *To acquire listening and speaking skills using language laboratory.*

UNIT-I (6)

Grammar

1. Clause Analysis
2. Tenses
3. Reported Speech

UNIT-II (6)

Vocabulary

1. Collocations
2. Idioms & Phrasal verbs

UNIT-III (6)

Reading Comprehension

1. "Stopping by Woods on a Snowy Evening" by Robert Frost
2. " Adivasis" by Kancha Ilaiah

UNIT-IV (6)

Writing Devices

1. Application for jobs and preparing a curriculum vitae
2. Report writing
3. Project Writing

Text Books:

1. Damodar G., & Surender Kumar M., "English for Communication", *KGA Publications,* Warangal.
2. Purushotham K., "English for fluency", *Orient Blackmen*, Hyderabad.

Reference Book:

1. Krishna Swamy N., "Modern English Grammar"**,** *MacMillan India Ltd.*

English Language Lab:
{Teacher Assessment (TA) is done through English Language Lab}

Listening Skills (6x2)

1. Listening to sounds, stress and intonation
2. Listening for information

Speaking Skills (6x2)

a. Presentation Techniques

- Group Discussions
- Interview Skills

b. Assignment

Students have to prepare and present an assignment on the following through PPT in the communication skills laboratory.

- Presentation of Oneself

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

- develop writing skills with a focus on accuracy to develop error free English.
- develop word power to enable to use them in speaking and writing.
- develop reading skills with a focus on developing reading comprehension skills .
- enhance listening and speaking skills.

Note:

Teacher Assessment	:	15 marks
• Assignment	:	05 marks
• Lab Performance	:	05 marks
• Lab Attendance	:	05 marks
Total	**:**	**15 marks**

U14ME104 ENGINEERING DRAWING

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
2	4	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To understand the importance of Engineering Drawing*
- *To communicate effectively through Engineering Drawing*
- *To impart and inculcate proper understanding of theory of projections*
- *To identify the significance and application of the orthographic and isometric drawings.*

UNIT – I (6+12)

Introduction:
Importance of Engineering Drawing, instruments- uses; Conventions - ISO and BIS, Layout of drawing sheets, Types of Lines, Lettering and dimensioning.

Geometrical Constructions:
Bisection of a line, arc and angle; division of a line, Construction of polygons- triangle, square, pentagon and hexagon.

Projection of Points:
Introduction to orthographic projections-Vertical Plane, Horizontal plane; Views-Front view, Top view and Side view; Projection of Points.

Projection of Straight lines - I:
Line parallel to both the planes, Line parallel to one plane and perpendicular to the other reference plane, Line parallel to one plane and inclined to the other reference plane.

UNIT – II (6+12)

Projection of Straight lines – II: Line- inclined to both the planes-Traces.

Projection of Planes:
Planes - Perpendicular and Oblique planes; Projections of planes - parallel to one of the reference plane, inclined to one of the reference plane and perpendicular to the other; Projections of oblique planes.

UNIT – III (6+12)

Projection of Solids:
Types-prisms, pyramids, cylinder and cone; Simple Positions-axis parallel to a reference plane and perpendicular to the other plane, axis parallel to one plane and inclined to other reference plane; axis inclined to both the reference planes.

Sections of Solids:
Types-prisms and pyramids; Section planes, Sectional views and true shape of a section.

UNIT – IV (6+12)

Isometric Projections:
Terminology; difference between isometric projection and view; Construction of isometric projection of different solids-box method and offset method.

Orthographic projections: Conversion of isometric views into orthographic views.

Text Books:

1. Bhatt N.D., "Elementary Engineering Drawing", *Charotar Publishing House,* Anand.

Reference Books:

1. Dhananjay A Jolhe, "Engineering Drawing", *TMH,* 2008.
2. Venugopal K. "Engineering Graphics with Auto CAD", *New Age International Publishers Ltd.*, Hyderabad.
3. K. L. Narayana & P. Kannaiah, "Engineering Drawing'', *SciTech Publications,* Chennai
4. W J Luzadder and J M Duff, "Fundamentals of Engineering Drawing", *Prentice-Hall of India*, 1995.

Course Learning Outcomes:

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

- *develop concepts on Engineering Drawing in order to become professionally efficient*
- *understand the theory of projections*
- *improve their spatial imagination skills to develop new products.*

U14EI105 BASIC ELECTRONICS ENGINEERING

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives:

- *To introduce basic concepts of semi conductors and conductivity in semiconductors*
- *To introduce the operation and applications of semiconductor diodes*
- *To introduce the basic concepts of BJT & its DC biasing concepts and FET*
- *To introduce the fundamental concepts and basic principles of Electronic Measuring instruments*

UNIT-I (9)

Introduction to Electronics:

Analog Signals (DC & AC), Sources (DC & AC), Digital Signals

Semiconductors:

Energy bands in solids, Concept of forbidden gap, Insulator, Metals and Semiconductors, Transport phenomenon in semiconductors: Mobility and conductivity, Intrinsic semiconductor, Donor and Acceptor impurities, Fermi level, Recombination and Minority carrier Injection, Drift currents and Diffusion currents, Temperature dependence of conductivity, Hall Effect

Semiconductor Diode:

P-N Junction, Band diagram, Depletion layer, V-I characteristics of P-N Diode, Diode resistance and capacitance, Avalanche and Zener breakdown mechanisms

UNIT-II (9)

Diode Circuits:

Rectifier circuits – Half wave, Full wave & Bridge rectifiers, Ripple voltage and Diode current with and without filters, Voltage regulation using Zener diode, Block diagram of DC adapter, Operation of LED & Photodiode

Bipolar Junction Transistor:

Physical structure, Transistor current components, CE, CB & CC configurations and their Input & Output characteristics

UNIT-III (9)

DC Analysis of BJT Circuits:

DC load line, Need for biasing, Transistor biasing methods for CE configuration, Basic transistor applications: Switch and Amplifier, Block diagram of a Public Address system

Field Effect Transistor:

Physical **s**tructure, Operation and Characteristics of a Junction Field Effect Transistor (JFET)

UNIT-IV (9)

Measurement Systems:

Block diagram of Measurement system, Ideal requirements of Measurement system, Performance characteristics of Measurement system, Errors in Measurement system

Electronic Instruments:

PMMC Mechanism, Ammeter, Voltmeter & Ohmmeter, Loading effects of Ammeter & Voltmeter, Block diagram of Digital Multimeter (DMM), Block Diagram of Cathode Ray Oscilloscope (CRO), Expression for deflection sensitivity, CRT Screens, Measurement of time period and amplitude

Text Books:

1. David.A.Bell, "Electronic Devices and Circuits", *Oxford University Press,* New Delhi, India.
2. Neil storey, "Electronics: A systems Approach", *4/e-Pearson Education Publishing company Pvt. Ltd*, India.
3. Helfrick. A.D and Cooper W.D., "Modern Electronic Instrumentation and Measurement Techniques", *PHI,* India.

Reference Books:

1. Jacob Millman, Christos C Halkias, "Electronic Devices and Circuits", 3/e, *TMH,* India.
2. Bhargava and Kulashresta, "Basic Electronics and Linear Circuits", *TTTI, TMH,* India.
3. Sawhney A.K, "Electrical and Electronic Measurements and Instrumentation", *Dhanpat Rai & Sons,* New Delhi, India.

Course Learning Outcomes:

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

- *learn the concepts of conductivity in semi conductors*
- *learn the operation of basic semi conductor devices and their V-I characteristics*
- *get familiarized with the concepts of BJT& FET*
- *use basic electronic measuring instruments like DMM and CRO*

U14EE105 **BASIC ELECTRICAL ENGINEERING**

Class: B. Tech., I Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	:	40 marks
End Semester Exam	:	60 marks

Course Learning Objectives:

- *To impart basic knowledge about the Electrical & Magnetic Circuits.*
- *To apply Kirchhoff's laws and Equivalent circuit models to analyze voltage & current relationship in passive circuit.*
- *To inculcate the understanding about A.C. fundamentals and transformers.*
- *To understand the working principles and applications of DC and AC Machines.*

UNIT – I (9)

D.C. Circuits:

Ohm's Law, Network Elements, Kirchhoff's Laws, Source Transformation, Mesh and Nodal Analysis, Power in D.C. Circuits, Series, Parallel and Series Parallel combination of Resistances ,network reduction by Star – Delta Transformation.

Magnetic Circuits:

Introduction, Magnetic Circuits, Magnetic Field Strength, Magnetomotive Force, Permeability, Relative Permeability, Analogy between Electric and Magnetic Circuits, Series Magnetic Circuit, Parallel Magnetic Circuit, Self-Inductance and Mutual Inductance.

UNIT – II (9)

D.C. Machines:

Constructional features, Methods of Excitation, E.M.F. Equation, Torque development in D.C motor, Characteristics of Series, Shunt and Compound motors and Applications.

1-ϕ A.C. Circuits:

Phasor representation of sinusoidal quantities, Average, R.M.S. values and Form factor, A.C. through Resistor, Inductor and Capacitor, Analysis of R-L-C series and Power factor, Power triangle, Series Resonance.

Measurements:

Working principle of Moving coil, Moving Iron Ammeters and Voltmeters Dynamometer type Wattmeter.

UNIT – III (9)

3-ϕ A.C. Circuits:

Production of 3 -ϕVoltages, Voltage & Current relationships of Line and Phase values for Star and Delta connections , 3-ϕ Power Measurement by two-wattmeter method.

1-ϕ Transformers:

Construction and operation principle, Development of No Load & On Load Phasor diagrams, Equivalent circuit, O.C. and S.C. tests, Losses and Efficiency, Voltage regulation.

UNIT – IV (9)

3-ϕ Induction Motor:
Constructional features, Principle of Operation, Production of Rotating Magnetic Field, Torque – Slip Characteristics, Applications.

1-ϕ Induction Motors:
Production of Rotating Field in various type of 1 – Phase Motors Split Phase, Capacitor Start, Capacitor run, Shaded Pole motors and Applications.

Text Books:

1. Edward Hughes, "Electrical & Electronics Technology", 10th edn., *Pearson Education,*2010

Reference Books:

1. M.S. Naidu & S.Kamakshaiah, "Introduction to Electrical Engineering", *Tata McGraw Hill Ltd*, New Delhi.
2. B.L.Thereja, A.K.Thereja, "Electrical Technology Vol. I & II", *S.Chand & Company Ltd,* 2005 Edn.
3. Chakravarthy A, Sudhipanath and Chandan Kumar, "Basic Electrical Engg.", *Tata McGraw Hill Ltd*, New Delhi.

Course Learning Outcomes:

After completion of the course, the students will be able to,

- *predict the behavior of any Electrical & Magnetic Circuits.*
- *solve Electrical Networks by mesh & nodal analysis.*
- *analyze 1-ϕ & 3 -ϕ AC Basic network and measure the 3-ϕ power*
- *identify the type of Electrical Machines used for that particular application.*

U14ME106 BASIC MECHANICAL ENGINEERING

Class: B. Tech., I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To identify various engineering materials and applications.*
- *To understand the basic elements of power transmission.*
- *To know the basic manufacturing processes.*
- *To understand fundamental principles and applications of thermodynamics.*
- *To know working principles of SI and CI engines.*

UNIT- I (9)

Engineering Materials: Classification; properties and applications.
Power Transmission: Classification; Flat belt drives - open and cross belts; Introduction to Gears.
Bearings: Types - Sliding and rolling contact; Lubricants - Objectives, types, properties and applications.

UNIT- II (9)

Manufacturing Processes: Classification and their applications.
Sand Casting: Terminology; Mould cross section; Moulding sand-types and properties; Patterns-types, materials and allowances.
Welding: Principle and applications of gas and arc welding
Machining: Classification; Lathe machine-line diagram and functions of various parts.

UNIT- III (9)

Fundamental Concepts: Introduction to SI units, System, Thermodynamic state, Property, Process and Cycle; Energy, Work and Heat; Thermodynamic Equilibrium, Zeroth law of Thermodynamics, Laws of perfect gases.
First Law Of Thermodynamics: First law- Applications to Closed system, Internal energy, Enthalpy; Processes of Closed systems- Isobaric, Isochoric, Isothermal, Adiabatic and Polytropic.

UNIT- IV (9)

Second Law Of Thermodynamics: First law limitations, Second law Statements and their equivalence, Carnot Cycle, Carnot Theorem, Heat engine, Heat pump and Refrigerator.
IC Engines: Classification; Working principle of two and four stroke SI and CI engines.

Text Books:

1. Basant Agrawal and C M Agrawal, "Basic Mechanical Engineering", *Wiley India Pvt. Ltd,* New Delhi
2. Mathur, Mehta and Tiwari, "Elements of Mechanical Engineering", *Jain Brothers*, New Delhi
3. Hazra Chowdary. S. K and Bose, "Basic Mechanical Engineering", *Media Promoters and Publishers Pvt. Ltd,* India.

Reference Books:

1. P. K. Nag, "Engineering Thermodynamics", *Tata McGraw Hill*, New Delhi.
2. Hazra Chowdary. S. K and Bose, "Workshop Technology, Vol. I & II", *Media Promoters and publishers Pvt Ltd,* India.

Course Learning Outcomes:

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

- *know the properties and applications of various engineering materials*
- *learn the basic concepts of power transmission*
- *follow the principles and operations of manufacturing technology*
- *understand the laws of thermodynamics and their applications*
- *know the working principle of Heat engine, Heat pump and Refrigerator.*

U14CE106 BASIC ENGINEERING MECHANICS

Class: B. Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *Study the concept of force, principles of force and their application on engineering structures and machines.*
- *To expose the students various kinds of statically determinate pin jointed structures and methods of analysing the truss.*
- *To know the importance of geometric centre, cross sectional areas of plane bodies through centre of gravity and moment of inertia respectively.*
- *Study the dynamic behavior of particles in motion subjected to force system.*

UNIT – I (9+3)

Introduction:

Basic Definitions – Mass, Particles, Rigid Body, Time, Space, Force, Branches of Mechanics, Fundamental principles of Mechanics – Parallelogram and Triangle laws of Forces, Newton's laws of Gravitation and Motion, Laws of superposition and Transmissibility of Forces.

Force Systems:

Types of Forces – Co-planar, Concurrent and Parallel Forces, Moment and Couple, Free Body Diagram, Types of Supports, Resultant of Force Systems, Resolution of Forces, Composition of Forces, Equilibrium equations of Forces, Lami's Theorem, Varignon's Theorem, Moment Equilibrium Equations, Distributed Forces, Resultant and Equilibrium of General Force System.

UNIT –II (9+3)

Friction:

Introduction, Classification, Laws of Friction, Coefficient of Friction, Angle of Friction, Angle of Repose, Ladder Friction, Wedge Friction .

Plane Trusses and Frames:

Basic Definitions, Stability and Determinacy Conditions, Rigid truss, Basic assumptions for a perfect truss, Assumptions in the Analysis of Trusses, Methods of Analysis of Trusses: Method of Joints and method of Sections of a Cantilever and simply supported statically determinate trusses.

Frames: Analysis of a Frames using Method of Members

UNIT– III (9+3)

Centroid and Centre of Gravity:

Introduction, Computation of Centroid, Centre of gravity of one dimensional and two dimensional figures- centroids of composite line, simple sections, composite sections-Centre of gravity of composite areas and composite bodies.

Moment of Inertia:

Introduction to Moment of Inertia, Transfer theorems of Moment of Inertia – Parallel Axis theorem and Perpendicular Axis theorem.

UNIT - IV (9+3)

Kinematics:

Introduction to Dynamics, Rectilinear Motion of a particle – Displacement, Velocity and Acceleration, Motion with uniform Acceleration and Motion with variable Acceleration.

Curvilinear Motion- Components of motion, Rectangular Components, Components of Normal and Tangential Acceleration.

Kinetics:

Rectilinear motion-Equations of Rectilinear motion, Equations of Dynamic Equilibrium, D'Alembert's Principle.

Curvilinear Motion-Equations of Motion in Rectangular components, Tangential and Normal Components, Equations of Dynamic Equilibrium.

Applications of Work-Energy, Impulse –Momentum principles of Rectilinear Motion and Curvilinear Motion.

Text Books:

1. Tayal A.K., "Engineering Mechanics: Statics and Dynamics", *Umesh Publishers,* New Delhi, 40th edn., 2014.
2. Timoshenko S., Young D.H., Rao J.V., and Sukumar Pati, "Engineering Mechanics in SI units", *McGraw Hill Education Pvt. Ltd.,* New Delhi, 5th edn., 2013.
3. Basudeb Bhattacharyya, "Engineering Mechanics", *Oxford University Press*, 9th edn., 2013.

Reference Books:

1. Singer F.L., "Engineering Mechanics: Statics and Dynamics", *Harper and Row Publishers,* 3rd edn., 1975.
2. Bhavikatti S.S., "Engineering Mechanics", *New Age International,* New Delhi, 4th edn., 2013 (reprint).

Course Learning Outcomes:

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

- *understand the physical action of forces on the bodies through free body diagrams and analyse the forces using principles of force.*
- *determine the axial forces in members of pin jointed structures subjected to various types of loadings.*
- *understand the technical importance of geometrical shapes and centre of various cross sections.*
- *understand equilibrium condition of particles in dynamic condition and can analyse the problems using various applications such as conservation of work energy principle.*

U14CS107 PROGRAMMING IN C LABORATORY

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To expose the undergraduate students to the practical implementation of C Programming concepts*
- *To improve students capability in applying C Programming for problem solving.*
- *To make students use effective memory management techniques in programming*
- *To expose students to modular programming concepts in problem solving*

LIST OF EXPERIMENTS

1. Programs using input output functions, operators (arithmetic, relational, conditional etc).
2. Programs using operators (bit-wise, logical, increment and decrement etc).
3. Programs using conditional control structures: if, if-else, nested if.
4. Programs using else if ladder, switch and goto.
5. Programs using loop control structures: while, do-while, for.
6. Programs on one dimensional array and two dimensional arrays.
7. Programs using functions: different types, parameter passing using call-by-value, call-by-reference, recursion and storage classes.
8. Programs using strings: one dimensional array, two dimensional array, string handling functions.
9. Programs using pointers, string pointers.
10. Programs using, structure pointers, functions pointers.
11. Programs using dynamic memory allocation.
12. Programs using file operations and file handling functions.

Course Learning Outcomes:

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

- *learn practical implementation of C programming language concepts.*
- *debug and document programs in C.*
- *know usage of logical skills in developing C programs.*
- *apply effective memory management techniques for problem solving*
- *understand the file management techniques*

U14PH108 ENGINEERING PHYSICS LABORATORY

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To understand the oscillatory phenomena in determining the various properties like rigidity modulus, moment of inertia, acceleration due to gravity and other elastic properties.*
- *To determine the wavelengths, slit widths, diameters of thin wires etc., with high degree of accuracy using interference and diffraction techniques.*
- *To study the optical activity of some substances.*
- *To determine the optical fiber characteristics.*

.

LIST OF EXPERMENTS

1 Newton's Rings: Determination of wavelength of a monochromatic light.
2 Determination of slit width using He-Ne Laser.
3 To find dispersive power of a prism using Spectrometer
4 Torsional pendulum: Determination of rigidity modulus of given wire and moment of inertia of ring.
5 Diffraction Grating: Determination of wave lengths of white light using normal incidence method.
6 To determine resolving Power of a Telescope.
7 To find the acceleration due to gravity (g) by Compound pendulum.
8 Polarimeter (Saccharimeter): Determination of specific rotation of sugar solution.
9 Photo Cell: To study the characteristics of a photo cell.
10 Determination of wavelength of He-Ne Laser.
11 Spiral spring: Determination of force constant of spiral spring.
12 Determination of Numerical Aperture of an Optical fiber.
13 Determination of diameter of a thin wire using Interference method.

Course Learning Outcomes:

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

- *handle and apply the powerful radiations like lasers and radioactive rays.*
- *know the interference and diffraction patterns and apply them in precise measurements.*
- *make preferential selection of Optical fibers.*
- *determine the various optical, mechanical and magnetic properties*

U14CH108 ENGINEERING CHEMISTRY LABORATORY

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To gain hands-on experience of conventional and instrumental methods of chemical analysis*
- *To introduce water analysis techniques*
- *To understand the principles involved in the polymerization reactions*
- *To gain the knowledge of estimation of metals from their ores*
- *To expose the experiments such as estimation of metal ion by using ion-exchange resin, instrumental methods of chemical analysis, adsorption*
- *To introduce a photo chemical reduction*

LIST OF EXPERIMENTS

1 Determination of Alkalinity of test sample of water.
2 Estimation of Available Chlorine in test sample of Bleaching powder.
3 Determination of Hardness of water using complexometric method.
4 Determination of Calcium in Lime Stone / Dolomite.
5 Estimation of Cupric ions in the test solution.
6 Adsorption of an acid on a charcoal -Applicability of adsorption Isotherm.
7 Photochemical reduction of Ferric salt.
8 Synthesis of a polymer.
9 Conductometric Titrations.
10 Potentiometric Titrations.
11 Colorimetric analysis – Verification of Lambert-Beer's Law.
12 Estimation of Metal ion using ion-exchange resin.

Course Learning Outcomes:

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

- *handle analytical instruments for chemical analysis.*
- *determine alkaline species, temporary and permanent hardness of a water sample.*
- *estimate some metals from their ores.*
- *understand the advantages of instrumental methods of chemical analysis over conventional methods.*
- *understand the principles involved in photo chemical and polymerization reaction.*

U14ME109 ENGINEERING WORKSHOP PRACTICE

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To understand the importance of workshop practice in Engineering*
- *To acquire proper understanding of various manufacturing processes*
- *To identify the significance and application of various tools and equipment used in workshop*

LIST OF EXPERIMENTS

Foundry:

1. Prepare a Sand Mould using bracket pattern
2. Prepare a Sand Mould using dumbbell pattern

Fitting:

3. Prepare a Square fit using Mild Steel Plates
4. Prepare a Half round fit using Mild Steel Plates

Welding:

5. Prepare a Lap joint on Mild Steel Plates using Arc Welding
6. Prepare a Single V – Butt Joint on Mild Steel Plates using Arc Welding

Carpentry:

7. Prepare a Half lap joint of a given Wooden pieces
8. Prepare a Bridle joint of a given Wooden pieces

Plumbing:

9. Prepare a Pipe joint with elbows & tee using PVC pipes
10. Prepare a Pipe joint with union & coupling using PVC pipes

Machine Shop:

11. Perform a Step turning operation on mild steel bar
12. Perform a Taper turning operation on mild steel bar

Text Books:

1. Hazra Chowdary. S.K and Bose, "Elements of Workshop Technology, Vol-I &II", *Media Promoters and publishers Pvt. Ltd,* India.
2. W.A.J.Chapman, "Workshop Technology, Vol-I", *Edward Arnold*

Course Learning Outcomes:

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

- *know and understand the types of trades in engineering*
- *improve their practical skills to develop new products*

U14CH109 ENVIRONMENTAL STUDIES

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
2	-	-	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To incorporate the basic knowledge of the environmental studies*
- *To understand the need to use resources more equitably*
- *To understand the knowledge of conversation of biodiversity*
- *To introduce the causes, effects and control measures of environmental pollution*
- *To know the issues involved in enforcement of environmental legislation*

UNIT-I (6)

Introduction:
The Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance.

Natural Resources:
Forest Resources: Use and over – exploitation of forests, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.
Water Resources: Use and over- utilization of surface and ground water, floods; drought; conflicts over water.
Mineral Resources: Environmental effects of extracting and using mineral resources.
Agricultural Land: Land as a resource, land degradation, soil erosion and desertification.
Food Resources :World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy Resources: Renewable and non-renewable energy sources, use of alternate energy sources.

UNIT-II (6)

Ecosystem and Biodiversity:
Ecosystem: Concepts of an ecosystem: Food chain, food webs and ecological pyramids: Energy flow in the ecosystem: ecological succession.
Biodiversity and its conservation: Introduction: Definition. genetic, species and ecosystem diversity; value of biodiversity. Biodiversity in India, Hot spots of biodiversity, Man- wildlife conflicts, Endangered and endemic species of India, In-situ and Ex-situ conservation

UNIT-III (6)

Environmental Pollution:
Global climatic change, Green house gases, Acid rain.
Causes and effects of Air, Water, Soil, Marine and Noise pollution with case studies.
Solid and Hazardous waste management, effects of urban, industrial and nuclear waste. Natural disaster management: flood, earthquake, cyclone and landslides.

UNIT-IV (6)

Environment Protection and Society:
Role of Individual and Society: Role of individual in prevention of pollution, Water conservation, Rain water harvesting, Watershed management, wasteland reclamation.

Environmental Protection / Control Acts: Environmental legislation with respect to Air, Water, Forest and Wildlife, Enforcement of environmental legislations, Population growth, Role of Information Technology in Environment and Human Health.

Text Books:

1. Erach Bharucha, "Text Book of Environmental Studies for Under Graduate Courses – 2nd edn., *Universities Press (India) Private Limited*
2. Anjaneyulu Y., "Environmental Studies", *B.S. Publications*.

Reference Books:

1. Bharucha Erach, "The Biodiversity of India" *Mapin Publishing Pvt. Ltd.*
2. Odum, E.P. 1971, "Fundamental of Ecology", *W.B. Saunders Co.,* USA, 574p.
3. Trivedi R.K. and P.K. Goel, "Introduction to Air Pollution", *Technoscience Publications.*
4. Gilbert M. Masters, **"Introduction to Environmental Engineering & Science",** 1991, *PHI*
5. A.S. Chauhan, "Environmental Studies", *Jain Brothers* (New Delhi) 3rd revised and enlarged edition
6. R.Rajagopalan, "Environmental Studies from crisis to cure", *Oxford University Press*

Course Learning Outcomes:

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

- *understand human interaction with the environment*
- *understand utmost importance of the sustainable use of natural resources*
- *get acquainted with ecosystem and conservation of biodiversity*
- *gain the knowledge of control measures of environmental pollution and natural disaster management*
- *understand the conflict between the existing development strategies and need for environmental conservation*
- *understand various environmental protection / control acts*
- *understand the role of individual in the environment protection*

U14EA110 EAA: PHYSICAL EDUCATION & NSS

Class: B.Tech. I Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation :	100 marks
End Semester Exam :	-

I. PHYSICAL EDUCATION

Course Learning Objectives & Outcomes:

- *To perform and engage in a variety of physical activities*
- *To develop and maintain physical health and fitness through regular participation in physical activities*
- *To demonstrate positive self esteem, mental health and physiological balance through body awareness and control*
- *To exhibit the spirit of fair play, team work and sportsmanship*

Activities related to :

1. Physical Fitness
2. Games & Sports

II. NATIONAL SERVICE SCHEME (NSS)

Course Learning Objectives:

The objectives of the NSS is to

- *arouse the social consciousness of the students*
- *provide them with opportunity to work with people in villages and slums*
- *expose them to the reality of life*
- *bring about a change in their social perceptions*
- *develop competence required for responsibility sharing and team work*

List of Activities:

1. Shramadanam
2. Tree Plantation
3. General Medical Camps in Villages
4. Awareness on Eye Donation
5. Awareness on "Child Labour and Child Marriages"
6. Awareness programs on "Literacy, Good Health Practices, etc."
7. Safe Riding Program
8. Awareness program on "RTI Act"
9. Awareness on Blood Donation

Course Learning Outcomes:

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

- *develop his / her personality through community service rendered*
- *apply their education to find solutions to individual and community problems*
- *acquire capacity to meet emergencies and natural disasters*
- *acquire a democratic attitude, leadership qualities and practice national integration*

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE, WARANGAL – 15

(An Autonomous Institute under Kakatiya University, Warangal)

SCHEME OF INSTRUCTIONS & EVALUATION FOR B.TECH. 4-YEAR DEGREE PROGRAMME

BRANCH : COMMON FOR ALL BRANCHES
SEMESTER : SECOND

S. No.	Course code	Course Name	Periods			Credits (C)	Evaluation Scheme				
							CIE			ESE	Total Marks
			L	T	P		TA	MSE	Total		
1	U14MH201	Engineering Mathematics-II	3	1	-	4	15	25	40	60	100
2	U14CS202	Object Oriented Programming through C++	3	1	-	4	15	25	40	60	100
3	U14CH203	Engg. Chemistry /	3	1	-	4	15	25	40	60	100
	U14PH203	Engg. Physics	3	1	-	4	15	25	40	60	100
4	U14ME204	Engineering Drawing /	2	4	-	4	15	25	40	60	100
	U14MH204	English for Communication	2	2	-	3	15	25	40	60	100
5	U14EE205	Basic Electrical Engg. /	3	-	-	3	15	25	40	60	100
	U14EI205	Basic Electronics Engg.	3	-	-	3	15	25	40	60	100
6	U14CE206	Basic Engg. Mechanics	3	1	-	4	15	25	40	60	100
	U14ME206	Basic Mechanical Engg.	3	-	-	3	15	25	40	60	100
7	U14CS207	Object Oriented Programming (OOP) Lab	-	-	3	2	40	-	40	60	100
8	U14CH208	Engg. Chemistry Lab /	-	-	3	2	40	-	40	60	100
	U14PH208	Engg. Physics Lab	-	-	3	2	40	-	40	60	100
9	U14CH209	Environmental Studies #	2	-	-	2	40	-	40	60	100
	U14ME209	Engg. Workshop Practice	-	-	3	2	15	25	40	60	100
10	U14EA210	EAA: Physical Education & NSS #	-	-	2	1	100	-	100	-	100
		Total	19/ 17	8/ 5	8/ 11	30/ 28					1000

Note: **L** – Lectures; **T**- Tutorials; **P** – Practicals; **CIE** – Continuous Internal Evaluation; **TA** – Teachers Assessment;
MSE – Mid Semester Examination; **ESE** – End Semester Examination; **EAA** – Extra Academic Activity;
***indicates Mandatory Course***
Student Contact Hours / Week : Stream – I = 35 (periods/week); Stream- II = 33 (periods /week)
Total Credits (C) : Stream – I = 30 Credits; Stream –II = 28 Credits

U14MH201 ENGINEERING MATHEMATICS- II

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To enable the student to acquire fundamental knowledge of mathematical concepts and methods and apply in engineering disciplines*
- *To introduce the methods of solving higher order linear differential equations with constant coefficients and introduce simple applications*
- *To introduce the concept of vector function and vector differential calculus*
- *To introduce integration of vector valued functions*
- *To introduce functions of complex variables and the property of analyticity of a function of complex variable*

UNIT-I (9+3)

Higher order linear differential equations with constant coefficients:

Liner differential Equations of higher order with constant coefficients, General solution, Complementary function, Particular Integral. Methods of evaluation of particular Integrals.

Simple examples of Physical applications (Free oscillations of Spring - Mass system, RLC series circuit problem)

Wronskian, Linear dependence of solutions, Method of Variation of parameters.

Cauchy's homogenous linear equation.

UNIT-II (9+3)

Vector Differential Calculus:

Vector functions - Derivative of a vector function of a scalar variable, Velocity and acceleration, Curves in Space, Tangent, Principal normal, Binormal, Curvature, Torsion of a given curve and Frenet -Serret Formulae.

Scalar and vector point functions, Vector operators – Gradient of a scalar field, Divergence of a vector field, Curl of a vector field and their physical interpretations. Directional derivative, Application to find angle between two surfaces and to find scalar potential of a vector field, Irrotational fields & Solenoidal fields.

UNIT-III (9+3)

Vector integration:

Integration of vector valued functions of a scalar variable, Application to find velocity and displacement of a particle;

Line integral of scalar point and vector point functions, Applications: Work done by a force, Circulation; Surface Integral & Volume integral.

Green's theorem in plane, and area of a plane region using Green's theorem, Stokes theorem & Gauss divergence theorems (without proof).

UNIT-IV (9+3)

Complex Variables:

Functions of complex variables, Limit, Continuity, Differentiability, Analytic Functions, Cauchy-Riemann Equations in Cartesian and Polar coordinates. Elementary functions, Harmonic Functions, Construction of Analytic functions.

Applications to find velocity potential and stream function of a fluid flow.
Conformal mapping and bilinear transformation.

Text Books:

1. Grewal, B.S., "Higher Engineering Mathematics", *Khanna Publishers,* Delhi,

Reference Books:

1. Churchill R.V., "Complex Variable and its Applications", *McGraw Hill*
2. Kreyszig E., "Advanced Engineering Mathematics" , *New Age International*
3. Spiegel M., "Vector Analysis -Schaum Series", *McGraw Hill*

Course Learning Outcomes:

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

- *solve a given higher order linear differential equation with constant coefficients*
- *understand few simple applications*
- *understand the concept of a vector function and vector differentiation and will be able to find the characteristics of a space curve such as tangent, normal, binormal, curvature and torsion*
- *understand the concept of gradient , divergence and curl of a vector point function and will be able to apply them to find angle between two surfaces, scalar potential*
- *find line, surface and volume integrals of vector valued functions and understand Green's theorem, Stokes theorem and Gauss theorem*
- *understand the concept of a function of complex variable and verify whether a function is analytic or not.*
- *construct analytic function when real/imaginary part of the function is known*
- *find velocity potential and stream function of a fluid flow using complex analytical methods*

U14CS202 OBJECT ORIENTED PROGRAMMING THROUGH C++

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *to expose the students to the concepts of Object-Oriented Paradigm*
- *to improve students capability in applying object oriented programming concepts in problem solving*
- *to improve students expertise in implementing object oriented concepts using C++ Programming*
- *to enable students to understand concepts of templates and exceptional handling*

UNIT – I (9+3)

Programming Paradigms: Procedural Programming, Modular Programming, Object-Oriented Programming and Generic Programming.

Introduction to C++: Structure of C++ program, Basic I/O, Tokens, Data types, Reference variables, Operators, Manipulators, Expressions, Control Structures, Name Spaces.

Functions in C++: Inline function, Default arguments, Overloading, Parameter passing mechanisms, Name Spaces.

UNIT – II (9+3)

Classes and objects: Structures, Access Control, Specifying a Class, Defining member functions, Making an outside function inline, Nesting of member functions, Arrays within class, Arrays of objects, Static data members, Static member functions, Friend functions, Objects as arguments, Returning objects, Pointers to members, Constructors and Destructors.

Operator Overloading: Overloading of Unary and Binary operators, Overloading of Unary and Binary operators using friend functions, String operations, Type conversions.

UNIT – III (9+3)

Inheritance: Single inheritance, Multilevel inheritance, Multiple inheritance, Hierarchical inheritance, Hybrid inheritance, Making private member inheritable, Virtual Base class, Abstract class, Constructors in derived classes.

Polymorphism: Pointers to objects, Pointers to derived classes, This pointer, Virtual Functions, Pure virtual functions.

Managing Console I/O operations: Introduction, C++ Streams, C++ Stream Classes, Un formatted I/O Operations, Formatted I/O Operations, Managing output with manipulators.

UNIT – IV (9+3)

Files: Classes for file stream operations, Opening and closing a file, Detecting EOF, File Modes, File pointers and their manipulators, Sequential input and output operations, Random access files, Command line arguments.

Templates: Class templates, Class templates with multiple parameters, Function templates, Function templates with multiple parameters, Overloading of template functions.

Exception Handling: Exception handling mechanism, Throwing mechanism, Catching mechanism, Rethrowing of exception, Specifying the exceptions.

Text Books:

1. E.Balagurusamy, "Object-Oriented Programming with C++", *McGraw-Hill Education India Pvt. Ltd* , Sixth Edition, ISBN-13:978-1-25-902993-6, 2012.
2. Bjarne Stroustrup, "The C++ Programming Language", *Addison-Wesley Publications*, Second Edition, ISBN No. 81-7808-126-1, 1991.

Reference Books:

1. K.R. Venugopal, Rajkumar, T.Ravishankar, "Mastering C++", *McGraw-Hill Education India Pvt.Ltd*, Second Edition, ISBN: 0-07-463454-2, 1997.
2. Timothy Bud, "An Introduction to Object Oriented Programming", *Pearson Education,* Second Edition, ISBN 81-7808-228-4, 2004.

Course Learning Outcomes:

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

- *know the differences between procedural language and object-oriented languages*
- *gain knowledge of Object-Oriented Paradigm for problem solving*
- *will be able to gain practical knowledge of OOP concepts using C++*
- *apply reusability concepts like inheritance, polymorphism in application development*
- *use generic programming concepts*
- *develop modular programming using classes*

U14CH203 **ENGINEERING CHEMISTRY**

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To understand the fundamental principles and applications of chemistry.*
- *To identify the significance of electro chemistry.*
- *To introduce and explore the knowledge of corrosion and its prevention*
- *To impart and inculcate proper understandings of energy sources, phase rule, organic and polymer chemistry*
- *To acquire the techniques of water analysis and treatment*
- *To understand the role of chemistry in the field of engineering*

UNIT-I (9+3)

Electrochemistry:

Specific and equivalent conductance, Conductometric titrations, Electrode potential, Nernst equation, Electrochemical series, Reference electrodes : Calomel electrode, Ag/AgCl electrode, Ion-selective electrode : glass electrode, Determination of pH using Glass, Quinhydrone and Hydrogen electrodes, Potentiometric titrations, Commercial cells: Hydrogen-Oxygen fuel cell, Lead-acid storage cell.

UNIT-II (9+3)

Corrosion:

Introduction: Corrosion by pure chemical reaction, Electrochemical theory of corrosion, Galvanic corrosion, Differential aeration corrosion, Factors influencing corrosion, Prevention of corrosion: Cathodic Protection, Hot Dipping, Cementation, Cladding, Electroplating, Corrosion inhibitors, Anodized coatings.

Phase Rule:

Description of the terms: 'Phase', 'Component' and 'Degrees of freedom'. Gibbs Phase rule equation. Application of the phase rule to one-component system (Water system) and two-component system (silver-lead system).

Energy Sources:

Characteristics of fuels for internal combustion (IC) engines, Knocking, Octane number. Unleaded petrol, Cetane number, Power alcohol, Compressed Natural gas (CNG), Liquified petroleum gas (LPG).

UNIT-III (9+3)

Introduction to Methods of Chemical Analysis:

Introduction to spectroscopy, Microwave spectra: Theory, Application of microwave spectra in the determination of bond length of a diatomic molecule. Infra-Red spectra: Theory, Applications: Calculation of force constant and identification of functional groups in organic compounds. UV-Visible spectra: Lambert-Beer's law and its applications, Types of electronic transitions.

Water Analysis and Treatment:

Hardness of Water, determination of hardness of water by using EDTA, determination of Alkalinity, determination of Chloride by argentometry, determination of Fluoride by

spectrophotometry, determination of Dissolved Oxygen, Biochemical Oxygen Demand and Chemical Oxygen Demand, Softening of water by Zeolite process and Ion-exchange process, Reverse Osmosis, Electrodialysis.

UNIT-IV (9+3)

Organic Chemistry:

Fission of a covalent bond, Types of electron effects: Inductive effect, Mesomeric effect and Hyperconjugation, Reaction intermediates and their stabilities, Types of reagents: Electrophilic, Nucleophilic and Free radical reagents. Study of the mechanisms of substitution (SN^1 and SN^2) and Addition (Electrophilic, Nucleophilic and Free radical) reactions, Role of inductive effect, mesomeric effect and hybridazation on the dissociation constant of carboxylic acids.

Polymers:

Introduction : Types of Polymerization reactions (Addition and Condensations), Mechanism of free radical, cationic and anionic addition polymerization, Condensation polymerization, Thermo setting and thermo plastic resins, Silicone rubber, Conducting polymers, Laminated plastics.

Text Books:

1. Jain and Jain, "Engineering Chemistry", *Dhanpat Rai Publishers.*
2. Shashi Chawla, "Text book of Engineering Chemistry", *Dhanpat Rai Publishers.*

Reference Books:

1. J C Kuriacose and J.Rajaram, "Chemistry in Engineering and Technology (Vol .I&II)", *Tata McGraw Hill Publishers.*
2. Suba Ramesh, Vairam et. al "Engineering Chemistry", *Wiley India.*
3. O P Agarwal, "Engineering Chemistry", *Khanna Publishers.*
4. S.S.Dara, "A Text book of Engineering Chemistry", *S.Chand & Company Ltd.*

Course Learning Outcomes:

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

- *understand basic principles and role of chemistry in the field of engineering*
- *gain the knowledge of interrelationship between electrical and chemical energy*
- *make a judicious selection of materials in the field of engineering*
- *understand the phase rule and its application in the study of material science*
- *understand the methods of chemical analysis of water and its treatment*
- *know the synthetic methods and versatile applications of polymers*
- *understand the advantage of spectrometric methods of chemical analysis over the conventional methods*

U14PH203 ENGINEERING PHYSICS

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To make the bridge between physics in intermediate level and its applications in engineering by giving proper inputs.*
- *To introduce the basic concepts of all types of oscillations with illustrations by mechanical examples.*
- *To introduce the basic concepts of coherence and polarized nature (interference, diffraction & polarization) of light waves and their applications.*
- *To introduce and explore the knowledge of high frequency sound waves & their application in different fields.*
- *To introduce the basic concepts of modern physics by introducing the fundamental elements of Quantum mechanics, which are essential to understand the mechanics of microscopic particles.*
- *To introduce the basic concepts of modern science like Photonics (lasers, Fiber optics, etc.,.), modern materials (magnetic materials, superconductors, nano material etc.,.)*

UNIT-I (9+3)

Oscillations:

Physical examples of simple harmonic motion –Torsional pendulum, Physical pendulum, Spring - Mass systems and Loaded beams - Two body oscillations – Qualitative treatment of Free, Damped & Forced Oscillations and Resonance.

Interference:

The Superposition principle –Coherence –Phasor method of adding wave disturbances – Phase changes on reflection - Anti reflection coating –Interference of reflected light from uniform and wedge shaped film –Newton's rings in reflected light-Determination of wavelength of monochromatic light using Newton's rings experiment –Michelson's Interferometer, Types of fringes, Determination of wavelength of monochromatic light, thickness and refractive index of a thin transparent sheet using Michelson's Interferometer.

UNIT-II (9+3)

Diffraction:

Fraunhofer diffraction at a single slit, measurement of slit width –Fraunhofer diffraction at a circular aperture –Rayleigh's criterion for resolution - Diffraction grating (Qualitative) – Experimental determination of wavelength using a plane transmission grating- Dispersion and Resolving power of a grating.

Polarization:

Polarized light-Double refraction, Geometry of calcite crystal, Construction and working of a Nicol prism – Theory of polarized light - Production and Detection of plane, circularly and elliptically polarized light – Quarter and Half-wave plates - Optical activity – Laurent's half-shade Polarimeter – Application of polarization in LCDs.

Ultrasonics:

Ultrasonic waves – Properties - Production of Ultrasonic waves - Magnetostriction method, Piezo-electric method – Detection of Ultrasonics - Determination of wavelength (Acoustic grating) - Application of ultrasonic waves.

UNIT-III (9+3)

Lasers (Qualitative):

Absorption, Spontaneous and Stimulated emission – Relation among Einstein coefficients – Difference between conventional and laser light – Population inversion, Methods of achieving population inversion – Types of Lasers – Ruby Laser, Helium-Neon Laser, Carbon dioxide Laser and Nd-YAG Laser – Applications of lasers.

Holography: Introduction – Formation and Reconstruction of a Hologram – Applications of Holography.

Fiber Optics (Qualitative):

Introduction – Total internal reflection – Fiber construction – Numerical aperture and Acceptance angle – Types of Optical fibers (Step and Graded index) – Power losses in Optical fibers –Attenuation, Dispersion, Bending – Light wave Communication using Optical fibers – Applications of Optical fibers - Fiber optic Sensors (Temperature and Displacement), Endoscope.

UNIT-IV (9+3)

Elements of Quantum Mechanics:

De-Broglie concept of matter waves – De-Broglie wavelength, Properties of matter waves – Schrodinger's wave equation – Time independent wave equation (one dimension), Particle in a box (one dimension), energy quantization, Wave functions.

Modern Materials (Qualitative):

Magnetic materials: Introduction –Permeability - Magnetization –Classification of magnetic materials . Applications of magnetic materials – magnetic recording, magnetic memories.

Superconducting materials: Superconductivity – Meissner effect –Transition temperature – Isotope effect. Types of Superconductors - Soft and Hard Superconductors – Applications of Superconductors.

Nanomaterials: Introduction – Classification of nanomaterials – Properties of nanomaterials – Physical, Chemical, Electrical, Optical, Magnetic and Mechanical properties (in brief) - Applications of nanomaterials (in brief).

Text Books:

1. Bhattacharya and Bhaskaran, "Engineering Physics", *Oxford University Press.*
2. V.Rajendran, "Engineering Physics", *McGraw Hill Education*.

Reference Books:

1. David Halliday and Robert Resnick, "Physics Part I & II", *Wiley Eastern Limited.*
2. R.K. Gaur and S.L.Gupta, "Engineering Physics", *Dhanpath Rai and Sons*.
3. P.K. Palanisamy, "Engineering Physics", *Scitech Publishers.*

Course Learning Outcomes:

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

- *understand the basic concepts of physics for its applications to Engineering.*
- *understand the basic principles of oscillations that can be applied to all types of oscillatory phenomena like acoustic, mechanical, electromagnetic, atomic, nuclear etc.,.*
- *appreciate the knowledge acquired in studying interference, diffraction and polarization in the application of thickness measurement of thin films, refractive indices and wavelength determinations using interferometric techniques, fringe pattern etc.,.*
- *appreciate the knowledge gained in studying ultrasonics and their multi dimensional applications in various fields like industrial, engineering (like NDT etc.,.) and medical etc.,.*
- *understand the fundamental principles and applications of lasers and Optical fibers.*
- *exposed to various material properties which are used in engineering applications and devices.*

U14ME204 ENGINEERING DRAWING

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
2	4	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To understand the importance of Engineering Drawing*
- *To communicate effectively through Engineering Drawing*
- *To impart and inculcate proper understanding of theory of projections*
- *To identify the significance and application of the orthographic and isometric drawings.*

UNIT – I (6+12)

Introduction:
Importance of Engineering Drawing, instruments- uses; Conventions - ISO and BIS, Layout of drawing sheets, Types of Lines, Lettering and dimensioning.

Geometrical Constructions:
Bisection of a line, arc and angle; division of a line, Construction of polygons- triangle, square, pentagon and hexagon.

Projection of Points:
Introduction to orthographic projections-Vertical Plane, Horizontal plane; Views-Front view, Top view and Side view; Projection of Points.

Projection of Straight lines - I:
Line parallel to both the planes, Line parallel to one plane and perpendicular to the other reference plane, Line parallel to one plane and inclined to the other reference plane.

UNIT – II (6+12)

Projection of Straight lines – II: Line- inclined to both the planes-Traces.

Projection of Planes:
Planes - Perpendicular and Oblique planes; Projections of planes - parallel to one of the reference plane, inclined to one of the reference plane and perpendicular to the other; Projections of oblique planes.

UNIT – III (6+12)

Projection of Solids:
Types-prisms, pyramids, cylinder and cone; Simple Positions-axis parallel to a reference plane and perpendicular to the other plane, axis parallel to one plane and inclined to other reference plane; axis inclined to both the reference planes.

Sections of Solids:
Types-prisms and pyramids; Section planes, Sectional views and true shape of a section.

UNIT – IV (6+12)

Isometric Projections:
Terminology; difference between isometric projection and view; Construction of isometric projection of different solids-box method and offset method.

Orthographic projections: Conversion of isometric views into orthographic views.

Text Books:

1. Bhatt N.D., "Elementary Engineering Drawing", *Charotar Publishing House,* Anand.

Reference Books:

1. Dhananjay A Jolhe, "Engineering Drawing", *TMH,* 2008.
2. Venugopal K. "Engineering Graphics with Auto CAD", *New Age International Publishers Ltd.*, Hyderabad.
3. K. L. Narayana & P. Kannaiah, "Engineering Drawing'', *SciTech Publications,* Chennai
4. W J Luzadder and J M Duff, "Fundamentals of Engineering Drawing", *Prentice-Hall of India*, 1995.

Course Learning Outcomes:

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

- *develop concepts on Engineering Drawing in order to become professionally efficient*
- *understand the theory of projections*
- *improve their spatial imagination skills to develop new products.*

U14MH204 ENGLISH FOR COMMUNICATION

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
2	2	-	3

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To acquire writing skills with a focus on accuracy avoiding common errors in English.*
- *To acquire word power enabling to use them in speaking and writing.*
- *To develop reading comprehension skills with local and global comprehension.*
- *To acquire listening and speaking skills using language laboratory.*

UNIT-I (6)

Grammar

1. Clause Analysis
2. Tenses
3. Reported Speech

UNIT-II (6)

Vocabulary

1. Collocations
2. Idioms & Phrasal verbs

UNIT-III (6)

Reading Comprehension

1. "Stopping by Woods on a Snowy Evening" by Robert Frost
2. " Adivasis" by Kancha Ilaiah

UNIT-IV (6)

Writing Devices

1. Application for jobs and preparing a curriculum vitae
2. Report writing
3. Project Writing

Text Books:

1. Damodar G., & Surender Kumar M., "English for Communication", *KGA Publications,* Warangal.
2. Purushotham K., "English for fluency", *Orient Blackmen*, Hyderabad.

Reference Book:

1. Krishna Swamy N., "Modern English Grammar", *MacMillan India Ltd.*

English Language Lab:

{Teacher Assessment (TA) is done through English Language Lab}

Listening Skills (6x2)

1. Listening to sounds, stress and intonation
2. Listening for information

Speaking Skills (6x2)

a. Presentation Techniques

- Group Discussions
- Interview Skills

b. Assignment

Students have to prepare and present an assignment on the following through PPT in the communication skills laboratory.

- Presentation of Oneself

Course Learning Outcomes:

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

- develop writing skills with a focus on accuracy to develop error free English.
- develop word power to enable to use them in speaking and writing.
- develop reading skills with a focus on developing reading comprehension skills .
- enhance listening and speaking skills.

Note:

Teacher Assessment	:	15 marks
• Assignment	:	05 marks
• Lab Performance	:	05 marks
• Lab Attendance	:	05 marks
Total	**:**	**15 marks**

U14EE205 BASIC ELECTRICAL ENGINEERING

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	:	40 marks
End Semester Exam	:	60 marks

Course Learning Objectives:

- *To impart basic knowledge about the Electrical & Magnetic Circuits.*
- *To apply Kirchhoff's laws and Equivalent circuit models to analyze voltage & current relationship in passive circuit.*
- *To inculcate the understanding about A.C. fundamentals and transformers.*
- *To understand the working principles and applications of DC and AC Machines.*

UNIT – I (9)

D.C. Circuits:

Ohm's Law, Network Elements, Kirchhoff's Laws, Source Transformation, Mesh and Nodal Analysis, Power in D.C. Circuits, Series, Parallel and Series Parallel combination of Resistances ,network reduction by Star – Delta Transformation.

Magnetic Circuits:

Introduction, Magnetic Circuits, Magnetic Field Strength, Magnetomotive Force, Permeability, Relative Permeability, Analogy between Electric and Magnetic Circuits, Series Magnetic Circuit, Parallel Magnetic Circuit, Self-Inductance and Mutual Inductance.

UNIT – II (9)

D.C. Machines:

Constructional features, Methods of Excitation, E.M.F. Equation, Torque development in D.C motor, Characteristics of Series, Shunt and Compound motors and Applications.

1-ϕ A.C. Circuits:

Phasor representation of sinusoidal quantities, Average, R.M.S. values and Form factor, A.C. through Resistor, Inductor and Capacitor, Analysis of R-L-C series and Power factor, Power triangle, Series Resonance.

Measurements:

Working principle of Moving coil, Moving Iron Ammeters and Voltmeters Dynamometer type Wattmeter.

UNIT – III (9)

3-ϕ A.C. Circuits:

Production of 3 -ϕVoltages, Voltage & Current relationships of Line and Phase values for Star and Delta connections , 3-ϕ Power Measurement by two-wattmeter method.

1-ϕ Transformers:

Construction and operation principle, Development of No Load & On Load Phasor diagrams, Equivalent circuit, O.C. and S.C. tests, Losses and Efficiency, Voltage regulation.

UNIT – IV (9)

3-ϕ Induction Motor:
Constructional features, Principle of Operation, Production of Rotating Magnetic Field, Torque – Slip Characteristics, Applications.

1-ϕ Induction Motors:
Production of Rotating Field in various type of 1 – Phase Motors Split Phase, Capacitor Start, Capacitor run, Shaded Pole motors and Applications.

Text Books:

1. Edward Hughes, "Electrical & Electronics Technology", 10th edn., *Pearson Education,*2010

Reference Books:

1. M.S. Naidu & S.Kamakshaiah, "Introduction to Electrical Engineering", *Tata McGraw Hill Ltd*, New Delhi.
2. B.L.Thereja, A.K.Thereja, "Electrical Technology Vol. I & II", *S.Chand & Company Ltd,* 2005 Edn.
3. Chakravarthy A, Sudhipanath and Chandan Kumar, "Basic Electrical Engg.", *Tata McGraw Hill Ltd*, New Delhi.

Course Learning Outcomes:

After completion of the course, the students will be able to,

- *predict the behavior of any Electrical & Magnetic Circuits.*
- *solve Electrical Networks by mesh & nodal analysis.*
- *analyze 1-ϕ & 3 -ϕ AC Basic network and measure the 3-ϕ power*
- *identify the type of Electrical Machines used for that particular application.*

U14EI205 BASIC ELECTRONICS ENGINEERING

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme:

L	T	P	C
3	-	-	3

Examination Scheme:

Continuous Internal Evaluation	40 Marks
End Semester Exam	60 Marks

Course Learning Objectives:

- *To introduce basic concepts of semi conductors and conductivity in semiconductors*
- *To introduce the operation and applications of semiconductor diodes*
- *To introduce the basic concepts of BJT & its DC biasing concepts and FET*
- *To introduce the fundamental concepts and basic principles of Electronic Measuring instruments*

UNIT-I (9)

Introduction to Electronics:
Analog Signals (DC & AC), Sources (DC & AC), Digital Signals
Semiconductors:
Energy bands in solids, Concept of forbidden gap, Insulator, Metals and Semiconductors, Transport phenomenon in semiconductors: Mobility and conductivity, Intrinsic semiconductor, Donor and Acceptor impurities, Fermi level, Recombination and Minority carrier Injection, Drift currents and Diffusion currents, Temperature dependence of conductivity, Hall Effect
Semiconductor Diode:
P-N Junction, Band diagram, Depletion layer, V-I characteristics of P-N Diode, Diode resistance and capacitance, Avalanche and Zener breakdown mechanisms

UNIT-II (9)

Diode Circuits:
Rectifier circuits – Half wave, Full wave & Bridge rectifiers, Ripple voltage and Diode current with and without filters, Voltage regulation using Zener diode, Block diagram of DC adapter, Operation of LED & Photodiode
Bipolar Junction Transistor:
Physical structure, Transistor current components, CE, CB & CC configurations and their Input & Output characteristics

UNIT-III (9)

DC Analysis of BJT Circuits:
DC load line, Need for biasing, Transistor biasing methods for CE configuration, Basic transistor applications: Switch and Amplifier, Block diagram of a Public Address system
Field Effect Transistor:
Physical **s**tructure, Operation and Characteristics of a Junction Field Effect Transistor (JFET)

UNIT-IV (9)

Measurement Systems:
Block diagram of Measurement system, Ideal requirements of Measurement system, Performance characteristics of Measurement system, Errors in Measurement system
Electronic Instruments:
PMMC Mechanism, Ammeter, Voltmeter & Ohmmeter, Loading effects of Ammeter & Voltmeter, Block diagram of Digital Multimeter (DMM), Block Diagram of Cathode Ray Oscilloscope (CRO), Expression for deflection sensitivity, CRT Screens, Measurement of time period and amplitude

Text Books:

1. David.A.Bell, "Electronic Devices and Circuits", *Oxford University Press,* New Delhi, India.
2. Neil storey, "Electronics: A systems Approach", *4/e-Pearson Education Publishing company Pvt. Ltd*, India.
3. Helfrick. A.D and Cooper W.D., "Modern Electronic Instrumentation and Measurement Techniques", *PHI,* India.

Reference Books:

1. Jacob Millman, Christos C Halkias, "Electronic Devices and Circuits", 3/e, *TMH,* India.
2. Bhargava and Kulashresta, "Basic Electronics and Linear Circuits", *TTTI, TMH,* India.
3. Sawhney A.K, "Electrical and Electronic Measurements and Instrumentation", *Dhanpat Rai & Sons,* New Delhi, India.

Course Learning Outcomes:

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

- *learn the concepts of conductivity in semi conductors*
- *learn the operation of basic semi conductor devices and their V-I characteristics*
- *get familiarized with the concepts of BJT& FET*
- *use basic electronic measuring instruments like DMM and CRO*

U14CE206 BASIC ENGINEERING MECHANICS

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *Study the concept of force, principles of force and their application on engineering structures and machines.*
- *To expose the students various kinds of statically determinate pin jointed structures and methods of analysing the truss.*
- *To know the importance of geometric centre, cross sectional areas of plane bodies through centre of gravity and moment of inertia respectively.*
- *Study the dynamic behavior of particles in motion subjected to force system.*

UNIT – I (9+3)

Introduction:

Basic Definitions – Mass, Particles, Rigid Body, Time, Space, Force, Branches of Mechanics, Fundamental principles of Mechanics – Parallelogram and Triangle laws of Forces, Newton's laws of Gravitation and Motion, Laws of superposition and Transmissibility of Forces.

Force Systems:

Types of Forces – Co-planar, Concurrent and Parallel Forces, Moment and Couple, Free Body Diagram, Types of Supports, Resultant of Force Systems, Resolution of Forces, Composition of Forces, Equilibrium equations of Forces, Lami's Theorem, Varignon's Theorem, Moment Equilibrium Equations, Distributed Forces, Resultant and Equilibrium of General Force System.

UNIT –II (9+3)

Friction:

Introduction, Classification, Laws of Friction, Coefficient of Friction, Angle of Friction, Angle of Repose, Ladder Friction, Wedge Friction .

Plane Trusses and Frames:

Basic Definitions, Stability and Determinacy Conditions, Rigid truss, Basic assumptions for a perfect truss, Assumptions in the Analysis of Trusses, Methods of Analysis of Trusses: Method of Joints and method of Sections of a Cantilever and simply supported statically determinate trusses.

Frames: Analysis of a Frames using Method of Members

UNIT– III (9+3)

Centroid and Centre of Gravity:

Introduction, Computation of Centroid, Centre of gravity of one dimensional and two dimensional figures- centroids of composite line, simple sections, composite sections-Centre of gravity of composite areas and composite bodies.

Moment of Inertia:

Introduction to Moment of Inertia, Transfer theorems of Moment of Inertia – Parallel Axis theorem and Perpendicular Axis theorem.

UNIT - IV (9+3)

Kinematics:

Introduction to Dynamics, Rectilinear Motion of a particle – Displacement, Velocity and Acceleration, Motion with uniform Acceleration and Motion with variable Acceleration.

Curvilinear Motion- Components of motion, Rectangular Components, Components of Normal and Tangential Acceleration.

Kinetics:

Rectilinear motion-Equations of Rectilinear motion, Equations of Dynamic Equilibrium, D'Alembert's Principle.

Curvilinear Motion-Equations of Motion in Rectangular components, Tangential and Normal Components, Equations of Dynamic Equilibrium.

Applications of Work-Energy, Impulse –Momentum principles of Rectilinear Motion and Curvilinear Motion.

Text Books:

1. Tayal A.K., "Engineering Mechanics: Statics and Dynamics", *Umesh Publishers,* New Delhi, 40th edn., 2014.
2. Timoshenko S., Young D.H., Rao J.V., and Sukumar Pati, "Engineering Mechanics in SI units", *McGraw Hill Education Pvt. Ltd.,* New Delhi, 5th edn., 2013.
3. Basudeb Bhattacharyya, "Engineering Mechanics", *Oxford University Press*, 9th edn., 2013.

Reference Books:

1. Singer F.L., "Engineering Mechanics: Statics and Dynamics", *Harper and Row Publishers,* 3rd edn., 1975.
2. Bhavikatti S.S., "Engineering Mechanics", *New Age International,* New Delhi, 4th edn., 2013 (reprint).

Course Learning Outcomes:

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

- *understand the physical action of forces on the bodies through free body diagrams and analyse the forces using principles of force.*
- *determine the axial forces in members of pin jointed structures subjected to various types of loadings.*
- *understand the technical importance of geometrical shapes and centre of various cross sections.*
- *understand equilibrium condition of particles in dynamic condition and can analyse the problems using various applications such as conservation of work energy principle.*

U14ME206 BASIC MECHANICAL ENGINEERING

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
3	-	-	3

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To identify various engineering materials and applications.*
- *To understand the basic elements of power transmission.*
- *To know the basic manufacturing processes.*
- *To understand fundamental principles and applications of thermodynamics.*
- *To know working principles of SI and CI engines.*

UNIT- I (9)

Engineering Materials: Classification; properties and applications.
Power Transmission: Classification; Flat belt drives - open and cross belts; Introduction to Gears.
Bearings: Types - Sliding and rolling contact; Lubricants - Objectives, types, properties and applications.

UNIT- II (9)

Manufacturing Processes: Classification and their applications.
Sand Casting: Terminology; Mould cross section; Moulding sand-types and properties; Patterns-types, materials and allowances.
Welding: Principle and applications of gas and arc welding
Machining: Classification; Lathe machine-line diagram and functions of various parts.

UNIT- III (9)

Fundamental Concepts: Introduction to SI units, System, Thermodynamic state, Property, Process and Cycle; Energy, Work and Heat; Thermodynamic Equilibrium, Zeroth law of Thermodynamics, Laws of perfect gases.
First Law Of Thermodynamics: First law- Applications to Closed system, Internal energy, Enthalpy; Processes of Closed systems- Isobaric, Isochoric, Isothermal, Adiabatic and Polytropic.

UNIT- IV (9)

Second Law Of Thermodynamics: First law limitations, Second law Statements and their equivalence, Carnot Cycle, Carnot Theorem, Heat engine, Heat pump and Refrigerator.
IC Engines: Classification; Working principle of two and four stroke SI and CI engines.

Text Books:

1. Basant Agrawal and C M Agrawal, "Basic Mechanical Engineering", *Wiley India Pvt. Ltd,* New Delhi
2. Mathur, Mehta and Tiwari, "Elements of Mechanical Engineering", *Jain Brothers*, New Delhi
3. Hazra Chowdary. S. K and Bose, "Basic Mechanical Engineering", *Media Promoters and Publishers Pvt. Ltd,* India.

Reference Books:

1. P. K. Nag, "Engineering Thermodynamics", *Tata McGraw Hill*, New Delhi.
2. Hazra Chowdary. S. K and Bose, "Workshop Technology, Vol. I & II", *Media Promoters and publishers Pvt Ltd,* India.

Course Learning Outcomes:

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

- *know the properties and applications of various engineering materials*
- *learn the basic concepts of power transmission*
- *follow the principles and operations of manufacturing technology*
- *understand the laws of thermodynamics and their applications*
- *know the working principle of Heat engine, Heat pump and Refrigerator.*

U14CS207 OBJECT ORIENTED PROGRAMMING LABORATORY

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To expose the students to the practical implementation of Object-Oriented concepts using C++ programming language*
- *To improve students capability of object oriented programming for problem solving*
- *To make students capable of using reusability and generic programming concepts in developing applications*

List of Experiments

Experiment-I

1. Read 10 numbers and displays them in sorted order.
2. Write functions to swap two numbers using pointers and references.
3. Write a program that prints the sizes of the fundamental types, a few pointer types and a few enumeration of your choice. Use the size of operator.

Experiment-II

4. Write a function that counts the number of occurrences of pair of letters in a string, for example the pair "ab" appears twice in "xabaacbaxabb".
5. Find LCM of two, three and four numbers using function overloading.
6. Create a structure for storing students details (sno, sname, course, Array of five subject's marks) provide the functions for printing the total marks, calculating percentage and the result. (Note: Include the functions within the structure).

Experiment-III

7. Write a macro to find square (A+B)-square (C+D).
8. Create a class for complex number and provide methods for addition, subtraction, multiplication and division. Display the output in "a+ib" form.
9. Create a Distance class and provide methods for addition and subtraction of two distances.

Experiment-IV

10. Create a complex number class with default, parameterized, copy constructors and a destructor.
11. Create a class which provides a method to count the number of objects that are created for that class. (Use static method).
12. Create a class INT that behaves exactly like an int. (Note: overload +, -, *, /, %).

Experiment-V

13. Create a string class and overload + to concatenate two Strings, overload () to print substring and overload <, <=, >, >=, = = operators to compare two string objects.
14. Create Date class and overload ++ to print next date and overload -- to print previous date.

Experiment-VI

15. Create a user defined array class Array and overload + to add two arrays, overload * to multiply two arrays, overload [] to access given position element and also to use left side of an assignment operator.

16. Create a complex number class and overload +, -, * operators using friend functions.
17. Program to perform Matrix operations using operator overloading with friend functions.

Experiment-VII

18. Programs to demonstrate Single, Multiple, Multilevel, Hierarchical, Hybrid and Multipath inheritance.
19. Programs to demonstrate constructors in inheritance.

Experiment-VIII

20. Create a Shape class with methods perimeter, area. Derive classes Circle, Square and Triangle from Shape class. Provide implementation for perimeter, area in the derived classes. (Declare perimeter, area as pure virtual functions).
21. Implement Multipath inheritance by declaring pointers to base class and access the derived class methods using base class pointers.
22. Program to demonstrate of manipulators

Experiment-IX

23. Write a function template to overload max method, which can find maximum of any data type.
24. Create function template to sort an array, which can sort array of any type.
25. Create a Generic calculator class to perform +, -, *, / operations on any type.
26. Create a Generic class for array of variable size and provide sorting, searching on any type.

Experiment-X

27. Find the roots of a quadratic equation. Handle exception for divide by zero.
28. Handle the Array Index out of Bounds Exception when accessing the elements of Arrays.
29. Create a text file of student information and display the contents of file.

Experiment-XI

30. Write a program to read a text file and remove all white space characters and replace each alphanumeric character with next character in the alphabet (Replace z by a and 9 by 0).
31. Copy the contents of one file into another except the blank lines using command line arguments.
32. Create a file with floating point numbers. Read pair of floating numbers from the file and write into another file.

Experiment-XII

33. Read the contents of three files, concatenate them and display it.
34. Write complex numbers into a file in binary format and in character format.
35. Create a class with integers and overload << to place integer into a file and overload >> to read an integer.

Course Learning Outcomes:

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

- *gain knowledge of implementing Object-Oriented Programming concepts using C++*
- *know the application of Object-Oriented Programming concepts for developing applications*
- *debug and document programs in C++*
- *develop applications using modularization technique*
- *apply reusability and generic programming concepts in application development*

U14CH208 ENGINEERING CHEMISTRY LABORATORY

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To gain hands-on experience of conventional and instrumental methods of chemical analysis*
- *To introduce water analysis techniques*
- *To understand the principles involved in the polymerization reactions*
- *To gain the knowledge of estimation of metals from their ores*
- *To expose the experiments such as estimation of metal ion by using ion-exchange resin, instrumental methods of chemical analysis, adsorption*
- *To introduce a photo chemical reduction*

LIST OF EXPERIMENTS

1 Determination of Alkalinity of test sample of water.
2 Estimation of Available Chlorine in test sample of Bleaching powder.
3 Determination of Hardness of water using complexometric method.
4 Determination of Calcium in Lime Stone / Dolomite.
5 Estimation of Cupric ions in the test solution.
6 Adsorption of an acid on a charcoal -Applicability of adsorption Isotherm.
7 Photochemical reduction of Ferric salt.
8 Synthesis of a polymer.
9 Conductometric Titrations.
10 Potentiometric Titrations.
11 Colorimetric analysis – Verification of Lambert-Beer's Law.
12 Estimation of Metal ion using ion-exchange resin.

Course Learning Outcomes:

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

- *handle analytical instruments for chemical analysis.*
- *determine alkaline species, temporary and permanent hardness of a water sample.*
- *estimate some metals from their ores.*
- *understand the advantages of instrumental methods of chemical analysis over conventional methods.*
- *understand the principles involved in photo chemical and polymerization reaction.*

U14PH208 ENGINEERING PHYSICS LABORATORY

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To understand the oscillatory phenomena in determining the various properties like rigidity modulus, moment of inertia, acceleration due to gravity and other elastic properties.*
- *To determine the wavelengths, slit widths, diameters of thin wires etc., with high degree of accuracy using interference and diffraction techniques.*
- *To study the optical activity of some substances.*
- *To determine the optical fiber characteristics.*

.

LIST OF EXPERMENTS

1 Newton's Rings: Determination of wavelength of a monochromatic light.
2 Determination of slit width using He-Ne Laser.
3 To find dispersive power of a prism using Spectrometer
4 Torsional pendulum: Determination of rigidity modulus of given wire and moment of inertia of ring.
5 Diffraction Grating: Determination of wave lengths of white light using normal incidence method.
6 To determine resolving Power of a Telescope.
7 To find the acceleration due to gravity (g) by Compound pendulum.
8 Polarimeter (Saccharimeter): Determination of specific rotation of sugar solution.
9 Photo Cell: To study the characteristics of a photo cell.
10 Determination of wavelength of He-Ne Laser.
11 Spiral spring: Determination of force constant of spiral spring.
12 Determination of Numerical Aperture of an Optical fiber.
13 Determination of diameter of a thin wire using Interference method.

Course Learning Outcomes:

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

- *handle and apply the powerful radiations like lasers and radioactive rays.*
- *know the interference and diffraction patterns and apply them in precise measurements.*
- *make preferential selection of Optical fibers.*
- *determine the various optical, mechanical and magnetic properties*

U14CH209 ENVIRONMENTAL STUDIES

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
2	-	-	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To incorporate the basic knowledge of the environmental studies*
- *To understand the need to use resources more equitably*
- *To understand the knowledge of conversation of biodiversity*
- *To introduce the causes, effects and control measures of environmental pollution*
- *To know the issues involved in enforcement of environmental legislation*

UNIT-I (6)

Introduction:
The Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance.

Natural Resources:
Forest Resources: Use and over – exploitation of forests, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.
Water Resources: Use and over- utilization of surface and ground water, floods; drought; conflicts over water.
Mineral Resources: Environmental effects of extracting and using mineral resources.
Agricultural Land: Land as a resource, land degradation, soil erosion and desertification.
Food Resources :World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy Resources: Renewable and non-renewable energy sources, use of alternate energy sources.

UNIT-II (6)

Ecosystem and Biodiversity:
Ecosystem: Concepts of an ecosystem: Food chain, food webs and ecological pyramids: Energy flow in the ecosystem: ecological succession.
Biodiversity and its conservation: Introduction: Definition. genetic, species and ecosystem diversity; value of biodiversity. Biodiversity in India, Hot spots of biodiversity, Man- wildlife conflicts, Endangered and endemic species of India, In-situ and Ex-situ conservation

UNIT-III (6)

Environmental Pollution:
Global climatic change, Green house gases, Acid rain.
Causes and effects of Air, Water, Soil, Marine and Noise pollution with case studies.
Solid and Hazardous waste management, effects of urban, industrial and nuclear waste. Natural disaster management: flood, earthquake, cyclone and landslides.

UNIT-IV (6)

Environment Protection and Society:
Role of Individual and Society: Role of individual in prevention of pollution, Water conservation, Rain water harvesting, Watershed management, wasteland reclamation.

Environmental Protection / Control Acts: Environmental legislation with respect to Air, Water, Forest and Wildlife, Enforcement of environmental legislations, Population growth, Role of Information Technology in Environment and Human Health.

Text Books:

1. Erach Bharucha, "Text Book of Environmental Studies for Under Graduate Courses – 2nd edn., *Universities Press (India) Private Limited*
2. Anjaneyulu Y., "Environmental Studies", *B.S. Publications*.

Reference Books:

1. Bharucha Erach, "The Biodiversity of India" *Mapin Publishing Pvt. Ltd.*
2. Odum, E.P. 1971, "Fundamental of Ecology", *W.B. Saunders Co.,* USA, 574p.
3. Trivedi R.K. and P.K. Goel, "Introduction to Air Pollution", *Technoscience Publications.*
4. Gilbert M. Masters, "Introduction to Environmental Engineering & Science", 1991, *PHI*
5. A.S. Chauhan, "Environmental Studies", *Jain Brothers* (New Delhi) 3rd revised and enlarged edition
6. R.Rajagopalan, "Environmental Studies from crisis to cure", *Oxford University Press*

Course Learning Outcomes:

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

- *understand human interaction with the environment*
- *understand utmost importance of the sustainable use of natural resources*
- *get acquainted with ecosystem and conservation of biodiversity*
- *gain the knowledge of control measures of environmental pollution and natural disaster management*
- *understand the conflict between the existing development strategies and need for environmental conservation*
- *understand various environmental protection / control acts*
- *understand the role of individual in the environment protection*

U14ME209 ENGINEERING WORKSHOP PRACTICE

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives:

- *To understand the importance of workshop practice in Engineering*
- *To acquire proper understanding of various manufacturing processes*
- *To identify the significance and application of various tools and equipment used in workshop*

LIST OF EXPERIMENTS

Foundry:

1. Prepare a Sand Mould using bracket pattern
2. Prepare a Sand Mould using dumbbell pattern

Fitting:

3. Prepare a Square fit using Mild Steel Plates
4. Prepare a Half round fit using Mild Steel Plates

Welding:

5. Prepare a Lap joint on Mild Steel Plates using Arc Welding
6. Prepare a Single V – Butt Joint on Mild Steel Plates using Arc Welding

Carpentry:

7. Prepare a Half lap joint of a given Wooden pieces
8. Prepare a Bridle joint of a given Wooden pieces

Plumbing:

9. Prepare a Pipe joint with elbows & tee using PVC pipes
10. Prepare a Pipe joint with union & coupling using PVC pipes

Machine Shop:

11. Perform a Step turning operation on mild steel bar
12. Perform a Taper turning operation on mild steel bar

Text Books:

1. Hazra Chowdary. S.K and Bose, "Elements of Workshop Technology, Vol-I &II", *Media Promoters and publishers Pvt. Ltd,* India.
2. W.A.J.Chapman, "Workshop Technology, Vol-I", *Edward Arnold*

Course Learning Outcomes:

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

- *know and understand the types of trades in engineering*
- *improve their practical skills to develop new products*

U14EA210 EAA: PHYSICAL EDUCATION & NSS

Class: B.Tech. II Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation :	100 marks
End Semester Exam :	-

I. PHYSICAL EDUCATION

Course Learning Objectives & Outcomes:

- *To perform and engage in a variety of physical activities*
- *To develop and maintain physical health and fitness through regular participation in physical activities*
- *To demonstrate positive self esteem, mental health and physiological balance through body awareness and control*
- *To exhibit the spirit of fair play, team work and sportsmanship*

Activities related to :

1. Physical Fitness
2. Games & Sports

II. NATIONAL SERVICE SCHEME (NSS)

Course Learning Objectives:

The objectives of the NSS is to

- *arouse the social consciousness of the students*
- *provide them with opportunity to work with people in villages and slums*
- *expose them to the reality of life*
- *bring about a change in their social perceptions*
- *develop competence required for responsibility sharing and team work*

List of Activities:

1. Shramadanam
2. Tree Plantation
3. General Medical Camps in Villages
4. Awareness on Eye Donation
5. Awareness on "Child Labour and Child Marriages"
6. Awareness programs on "Literacy, Good Health Practices, etc."
7. Safe Riding Program
8. Awareness program on "RTI Act"
9. Awareness on Blood Donation

Course Learning Outcomes:

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

- *develop his / her personality through community service rendered*
- *apply their education to find solutions to individual and community problems*
- *acquire capacity to meet emergencies and natural disasters*
- *acquire a democratic attitude, leadership qualities and practice national integration*

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University)

SCHEME OF INSTRUCTION AND EVALUATION

III SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAMME

MECHANICAL ENGINEERING

S. No.	Course Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	BS	U14MH301	Engineering Mathematics-III	3	1	-	4	15	25	40	60	100
2	ES	U14CE310	Mechanics of Fluids	3	1	-	4	15	25	40	60	100
3	PC	U14ME302	Material Science and Metallurgy	3	1	-	4	15	25	40	60	100
4	PC	U14ME303	Mechanics of Solids	3	1	-	4	15	25	40	60	100
5	PC	U14ME304	Manufacturing Processes	3	1	-	4	15	25	40	60	100
6	PC	U14ME305	Machine Drawing	2	4	-	4	15	25	40	60	100
7	PC	U14ME306	Material Science and Metallurgy Laboratory	-	-	3	2	40	-	40	60	100
8	ES	U14CE311	Mechanics of Fluids Laboratory	-	-	3	2	40	-	40	60	100
Total				**17**	**9**	**6**	**28**	**170**	**150**	**320**	**480**	**800**
9	MC	U14MH309	Soft and Interpersonal Skills	-	-	2	1	100	-	100	-	100

Student Contact Hours / Week : 34

Total Credits : 28

U14MH301 ENGINEERING MATHEMATICS- III

Class: B. Tech., III-Semester **Branch:** Common to all

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):

This course will develop students' knowledge in/on….

LO1: Laplace transform and its use to find the solutions of certain initial and boundary value problems occur in engineering

LO2: Fourier series and its importance

LO3: application of Fourier series to a few partial differential equations of specific importance like wave equation, heat conduction equation, etc. which arise in engineering

LO4: integration of a function of complex variable, and evaluation of certain real integrals using complex analysis

UNIT-I (9+3)

Laplace Transforms: Integral transforms, Kernel of a transform, Laplace transform of a function; Inverse Transform, Existence and uniqueness of Laplace Transforms, S- plane and region of convergence (ROC); Laplace Transform of some commonly used signals-Dirac-delta (impulse) function $[\delta(t)]$,Step $[u(t)]$,Ramp $[tu(t)]$,Parabolic $[t^2u(t)]$,Real exponential $[e^{at}u(t)]$, Complex exponential $[e^{j\Omega t}u(t)]$, Sine & cosine functions, Damped sine & cosine functions, Hyperbolic sine & cosine functions, Damped hyperbolic sine & cosine functions, Rectangular pulse & triangle; Properties of Laplace Transforms- Linearity, First shifting theorem (Frequency shift property),Multiplication by 't' and division by 't', Laplace transforms of derivatives and integrals, Time scaling property, Time reversal property, Laplace transform of Heaviside unit step function, Second shifting theorem (time shift property); Initial value and final value theorems; Laplace transform of periodic functions, Convolution theorem.

Operational Calculus: Transfer functions, Solution of ordinary differential equations with constant coefficients and system of ordinary differential equations with constant coefficients using Laplace transforms, Application of Laplace transforms to the first order and second order systems subjected to impulse, Step, Periodic, Rectangular, Square, Ramp, Triangular and Sinusoidal functions.

UNIT-II (9+3)

Fourier Series: Periodic functions, Orthogonal and orthonormal functions and systems of orthogonal functions, Representation of a function as trigonometric Fourier series (FS) in a range of length 2π, Euler formulae, Conditions for the existence of Fourier series (Dirichlet's conditions), FS for typical wave forms - Square wave, Pulse train, Impulse train(comb function), Periodic rectangular wave, Triangle, Saw-tooth, Half-wave rectified signal, Full-wave rectified signal; Plotting FS coefficients - Line spectrum (magnitude and phase spectra); Effects of symmetry of function on FS coefficients, Exponential FS ,Fourier series of $Sin\omega t$, $Cos\omega t$ and combination of Sinusoids, Fourier series on an arbitrary period; Half range series – Half range cosine and sine series expansions.

UNIT-III (9+3)

Applications of Partial Differential Equations: Basic concepts of partial differential equations, Classification of second order partial differential equations, Solution of a partial differential equation, Solution through the method of separation of variables.

Vibrating string: Wave equation and its solution by the method of separation of variables, D'Alembert's solution of wave equation, solutions of various boundary value problems based on vibrating string.

One dimensional heat flow: Transient heat flow equation, Heat flow through a bar of finite length with homogeneous and non homogeneous boundary conditions, Heat flow through a bar with insulated ends.

Two dimensional heat flow: Equation of two dimensional heat flow (Laplace's equation) under steady state/the electrostatic potential of electrical charges in any region that is free of these charges (problems based on Trigonometric FS only),Solution of Laplace's equation in cartesian and polar form, Heat flow through infinite rectangular plates, Finite square plate and semi circular and circular plates.

UNIT-IV (9+3)

Complex Integration: Line integration in complex plane, Integral of a non analytic function, Dependence on path of integration, Bounds for integrals, *ML*-Inequality, Cauchy's integral theorem, Cauchy's integral formula; Series expansion of complex functions- Taylor's series and Laurent's series; Zeros and **s**ingularities, Residues; Residue Theorem - Applications of Residue theorem to the properly chosen integrals around a unit circle and semi circle.

Text Books:

1. Grewal. B.S., "Higher Engineering Mathematics", *Khanna Publishers,* New Delhi, 43rd edn., 2014.

Reference Books:

1. Kreyszig E., "Advanced Engineering Mathematics", *John Wiley & Sons, Inc.,* U.K 9th edn., 2013.
2. R.V.Churchill, "Complex Variables and its Applications", *McGraw-Hill*, New York, 9th edn., 2013.
3. S.S.Sastry, "Engineering Mathematics", Vol. II, Prentice *Hall of India*, 3rd edn., 2014.

Course Learning Outcomes (CO):

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

CO1: find Laplace transform of a given function and apply Laplace transforms to solve certain differential equations

CO2: express given function as a Fourier series in an interval

CO3: find solutions of partial differential equations by the method of separation of variables and apply the same to wave equations, equation of heat flow and Laplace's equation (cartesian & polar forms)

CO4: represent a given function in Taylor's & Laurent's series along a given path and evaluate certain real integrals using integral theorems

U14CE310 **MECHANICS OF FLUIDS**

Class: B. Tech., III-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):
This course will develop students' knowledge in/on
LO1: fluid properties, hydrostatic forces on submerged plane and curved surfaces.
LO2: application of Euler's equation of motion and Bernoulli's equation.
LO3: methods of dimensional analysis and importance of Reynold's and Froude's model laws.
LO4: energy losses in pipe flows.

UNIT – I (9+3)

Fluid fundamentals: Introduction, difference between a Solid and Fluid, Conservation principles applied in Fluid Mechanics, Ideal fluid and Real fluid, Fluid Continuum, Fluid properties - Density, Specific weight, Specific gravity, Specific volume, Viscosity, Capillarity, Vapour pressure, Compressibility, Surface tension, Cohesion and Adhesion.

Fluid Statics: Equilibrium of fluid, Pressure at a point, Pascal's Law, Hydrostatic Law, Measurement of pressure, Atmospheric, Gauge and Absolute pressure, Manometers - Principle of Manometry, Piezometer, U-tube differential manometer, Inverted differential manometer; Mechanical gauges - Bourdon's tube pressure gauge, Hydrostatic forces on submerged plane and curved surfaces, Total pressure and Center of pressure. Buoyancy and Floatation - Archimedes principle, Metacentre, Metacentric height - Analytical expression for Metacentric height, Stability of floating and submerged bodies.

UNIT – II (9+3)

Fluid Kinematics: Classification of fluid flow – steady and unsteady, uniform and non uniform, one, two and three dimensional flow, Streamline, Path line, Streak line and Stream tube, Acceleration of fluid particle, Continuity equation in one, two and three dimensional flow, Circulation and vorticity, Rotational and Irrotational flow, Conditions for irrotational flow, Velocity potential and Stream function.

Fluid Dynamics: Forces causing motion, Euler's equation of motion and its integration, Bernoulli's Equation, Linear momentum equation, Application of Linear momentum equation to forces on pipe bend. Flow measurements - Venturimeter, Orificemeter, Pitot tube, Orifices, Mouthpieces, Notches and Weirs.

UNIT – III (9+3)

Dimensional Analysis: Dimensions and Dimensional Homogeneity, Dimensional analysis by Rayleigh's method and Buckingham's π-Theorem, Dimensionless numbers and their consequences in Fluid Mechanics.

Model Analysis: Forces Influencing Hydraulic Phenomena, Types of Similarities, Model Analysis, Similitude studies and Modeling, Classification of Models, Model Laws - Reynold's and Froude's Model laws.

UNIT – IV (9+3)

Flow Through Pipes: Energy losses in pipes - Major and Minor losses, Expression for head loss due to Friction-Darcy's Weisbach equation, Expressions for head loss due to pipe expansion and pipe contraction, Hydraulic Gradient and Total Energy Lines, Pipes in Series and parallel, Equivalent pipe, Power transmission through pipes.

Laminar Flow: Characteristics of Laminar flow, Reynold's experiment, Critical Reynold's number, Critical velocity, Steady laminar flow through a circular pipe, Hagen Poiseuille equation.

Text Books:

1. P. N. Modi and S. M. Seth, "*Hydraulics and Fluid Mechanics Including Hydraulic Machines*", Standard Book House, Rajsons Publications Private Limited, 18th edn., 2011.
2. A. K. Jain, "*Fluid Mechanics Including Hydraulic Machines*", Khanna Publications, 2010.

Reference Books:

1. L. Victor Streeter and E. Benjamin Wylie, "*Fluid Mechanics*", McGraw Hill, Singapore, 1st edn., 1983.
2. Frank M. White, "*Fluid Mechanics*", Special Indian Edition, Tata McGraw Hill, New Delhi, 2007.

Course Learning Outcomes (CO):

After completion of this course, students will be able to….

CO1: identify the properties of fluid and analyze the hydrostatic forces on plane and curved surfaces.
CO2: explain the kinematics of a fluid element and flow measurement techniques.
CO3: apply the Rayleigh's method and Buckingham's □-theorem.
CO4: evaluate energy losses in a pipe flow and apply the Hagen Poiseuille equation for pipe flow.

U14ME302 MATERIAL SCIENCE AND METALLURGY

Class: B. Tech., III-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LO):
This course will develop students' knowledge in/on
LO1: role of materials and their classification
LO2: various behaviors of materials
LO3: solidification Process and Imperfections in Solids
LO3: construct and interpret Phase diagrams
LO4: in familiarization with heat treatment of steel
LO5: concepts of extractive metallurgy

UNIT – I (9+3)

Materials: classification- Crystallography - planes and directions.-Miller indices-Miller Bravais indices- polymorphism- allotropy- density computations-Crystal structure determination-X-ray diffraction techniques- Solidification Process and Imperfections in Solids **-** point, line, surface and volume defects, grain-size determination; Role of dislocations in strengthening materials.

UNIT – II (9+3)

Various mechanisms of strengthening, deformation behaviors of materials, elastic deformation, plastic deformation, and time dependent deformation processes, materials failure and testing methods- stress-strain diagram, Fracture, fatigue and creep concepts and their significance. Diffusion processes and their mechanisms, factors influencing diffusion and diffusion paths, phase diagrams, construction and interpretation, Isomorphous and eutectic systems, Iron-carbon equilibrium diagrams, Gibb's phase rule and its application.

UNIT – III (9+3)

TTT diagram, Heat treatment of steel, Annealing, tempering, Jominy end quench test- surface hardening methods, age hardening, austempering, martempering, thermo-mechanical treatments.

Polymer and Ceramic Materials - Characteristics, applications and processing of polymers, mechanical and thermo-mechanical characteristics, polymer applications and processing, Ceramic materials and their structure, application and processing of ceramics, glasses, clay products, refractoriness and abrasives, composite materials, introduction to particle and fiber reinforced composites and structural composites.

UNIT – IV (9+3)

Powder metallurgy processes: preparation, characteristics and processing of metal powders into friction, anti-friction and filter components, applications of powder metallurgy; Brief introduction of extractive metallurgy, Blast furnace, Bessemer process, Cupola furnace and corex process.

Metallurgical instrumentation, Non destructive testing methods – Fluorescent penetrant test, magnetic particle inspection, X - ray and gamma ray radiography, Eddy current techniques.

Text Books:

1. V. Raghavan, "Material Science and Engineering", 6th edn., *Prentice-Hall of India Pvt. Ltd*., 2015. (Chapters 1,3,5,-12 and 18)
2. Sydney, H. Avener, "Introduction to Physical Metallurgy", 26th edn., *McGraw-Hill,* New York, 2009. (Chapters 1-8,11,12,16 and 17)

Reference Books:

1. Smith Hashemi Prakesh, "Material Science and Engineering", 5th edn., *Tata McGraw-Hill*, 2013.
2. John, D. Sharp, Elements of steel Making Practice*, Pergamon Press,* New York. 1st edn., 1996.
3. Kenneth G.Budinski and Michael K.Budinski "Engineering Materials" 7th edn., *Prentice-Hall of India Pvt. Ltd*., 2002.
4. T.V. Rajan C.P. Sharma, "Heat Treatments Principles and Practices", 2nd edn., *Prentice Hall of India Pvt. Lt.d,* 2011.
5. A.G. Guy, "Elements of Physical Metallurgy", 3rd edn., *Addison and Wesley*, New York. 1974.

Course Learning Outcomes(CO):

Upon completion of this course, students will be able to….

CO1: achieve and understand concepts of crystallography, planes and directions.
CO2: understand behaviors of materials
CO3: construct and interpret phase diagrams
CO4: categorize surface hardening methods
CO5: applications and processing of polymers, ceramic and composites
CO6: attain knowledge on powder metallurgy processes.

U14ME303 **MECHANICS OF SOLIDS**

Class: B. Tech., III-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LO):
This course will develop students' knowledge in/on
LO1: fundamental concepts of stress and strain by analysis of solids and structures.
LO2: development of shear force & bending moment diagrams of statically determinate beams; determination of bending stress in beams of various cross-sections.
LO3: determination of slope & deflections of statically determinate beams; determination of shear stress in beams of various cross-sections.
LO4: theory of pure torsion, stability in static equilibrium and analysis of thin & thick cylinders.

UNIT – I (9+3)

Simple Stress and Strain: Types of Loads, Stress, Strain, Stress-Strain diagrams for ductile and brittle materials, Hooke's Law, Poisson's ratio, Moduli of elasticity, Relation between Elastic Constants, Principle of superposition, Bars of Varying Sections, Bars of Uniform Strength, Compound Bars, Thermal Stresses, Factor of safety, Strain Energy, Resilience, Proof Resilience, Modulus of Resilience.

UNIT – II (9+3)

Shear Force and Bending Moment: Types of supports and beams, Shear Force, Bending Moment, Relation between Intensity of Loading, Shear Force and Bending Moment, Shear force and Bending Moment Diagrams for Cantilever and Simply Supported beams.
Theory of Simple Bending: Assumptions, Derivation of basic equation, Flexure formula, Modulus of section, Moment of resistance, Determination of Bending Stresses in beams, Discussion of Efficiency of various cross sections-rectangular, solid and hollow circular, C and I sections.

UNIT – III (9+3)

Deflections of Beams: Slope and Deflection of Cantilever and Simply Supported beams for Point Loads and Uniformly Distributed Loads by Double Integration method and Macaulay's method.
Shear Stresses in Beams: Equation of Shear Stress, Shear Stress Distribution across Rectangular, Circular, I, T and C cross-sections.

UNIT – IV (9+3)

Torsion of Circular Shafts: Theory of Pure Torsion, Derivation of Basic Equation, Solid and Hollow Circular Shafts, Torsional Shear Stresses and Angle of Twist, Power Transmission, Combined Bending and Torsion.
Columns and Struts: Column and Strut, Euler's column Theory, Equivalent Length, Limitations of Euler's Theory, Rankine's formula.
Thin and Thick Cylinders: Cylindrical shells, Thin Cylinder, Thin Spherical Shell, Thick Cylinder, Design of Thick Cylindrical Shell.

Text Books:

1. S.S.Rattan, "Strength of Materials", 1st edn., *Tata McGraw-Hill*, New Delhi, 2008.

Reference Books:

1. Egor P.Popov, "Engineering Mechanics of Solids", 2nd edn., *Prentice Hall, USA*, 1998.
2. James M.Gere & S.P.Timoshenko, "Mechanics of Materials", 2nd edn., *CBS Publishers*, 2004.
3. F.P.Beer and E.R.Johnston,Jr., "Mechanics of Materials", 2edn., *McGraw-Hill*,1992.
4. I.H.Shames and J.M.Pitarrew, "Introduction to Solid Mechanics", 3rd edn., *Prentice-Hall of India,* New Delhi, 2000.
5. W.F.Riley and L.W. Zachary, "Introduction to Mechanics of Materials", 1st edn., *John Wiley & Sons,* New York, 1989.
6. S.Ramamrutham, "Strength of Materials", 14th edn., *Dhanpat Rai Publications*, New Delhi, 2011.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: assess the fundamental concepts of stress and strain; and apply fundamental principles of equilibrium, compatibility, and principle of superposition in linear solids and structures..

CO2: construct shear force and bending moment diagrams of statically determinate beams subjected to different loading conditions; determine, analyze and compare the bending stresses in beams of various cross- sections.

CO3: determine slope and deflections of statically determinate beams subjected to different loading conditions; determine, analyze and compare the shear stress distribution in beams of various cross-sections..

CO4: state, derive and apply:

- *torsion equation for design of shafts;*
- *euler's and rankine's theory for columns;*
- *lame's theory for design of thin and thick cylinders for resisting fluid pressures.*

U14ME304 **MANUFACTURING PROCESSES**

Class: B. Tech., III-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LO):
This course will develop students' knowledge in/on
LO1: fundamentals of metal casting processes and their applications
LO2: principles and operation of metal forming and sheet metal operations
LO3: analysis of rolling, extrusion and drawing processes
LO4: types of welding and their applications

UNIT – I (9+3)

Metal casting process: Introduction, Pattern-materials, types and allowances; Molding Materials-sand composition, types, sand properties and sand testing; Cores-types of cores and core prints. Gating System- elements of a gating system, types of gates, Riser-types of risers, design of riser. Casting Process- Machine molding, Shell molding, Investment casting, Die casting and Centrifugal casting; casting defects.

UNIT – II (9+3)

Metal Forming Processes: Nature of plastic deformation, cold working and hot working; Rolling-principle and operation, rolling load and roll pass design. Forging- Smith forging, Drop forging, Press forging and Machine forging; Extrusion- hot extrusion, cold extrusion and hydrostatic extrusion, Extrusion of tubes, wire drawing, rod drawing and tube drawing.

UNIT – III (9+3)

Sheet Metal Operations: Press tool operations, Shearing action, Shearing operations-Blanking, Piercing; Calculation of punching force and shear; Drawing-principle and operation, Drawing die design- drawing force calculations; Bending, Stretch forming, Metal spinning, Embossing and Coining, Explosive forming and Electro hydraulic forming.

UNIT – IV (9+3)

Metal Fabrication Processes: Classification, Gas welding-principle of oxy-acetylene welding, types of flames, welding techniques; Gas cutting-principle and operation; Electric Arc welding-Principle, Arc welding equipment, TIG and MIG welding processes; Resistance welding-principle and types, Solid state welding-principle and types, Brazing and Soldering-principle and types; Other welding processes-Thermit welding, Electro slag welding and Laser Beam welding; Welding defects.

Text Books:

1. P.N.Rao, "Manufacturing Technology", 3rd edn., *Tata McGraw-Hill,* New Delhi, 2015.

Reference Books:

1. Amitabha Ghosh and A K Mallik, "Manufacturing Science", 4th edn., *Associated East West Press Pvt. Ltd.*, 1988.
2. Little, RL, "Welding and Welding Technology", 2nd edn., *McGraw- Hill*, New York, 1973.

3. Roy, A. Lindberg, "Processes and Materials of Manufacture", 5th edn., *Prentice Hall of India*, New Delhi., 1998.
4. Serope Kalpakjain, Steuen.R.Sechmid, "Manufacturing Technology", 5th edn. *Pearson Education* Asia, 2006.

Course Learning Outcomes (CO):
Upon completion of this course, students will be able to….
CO1: describe various casting processes with their applications
CO2: explain principles and operation of various metal forming and sheet metal operations
CO3: calculate material deformation energy in plane rolling, extrusion and sheet metal operations
CO4: describe different methods of welding with their applications

U14ME305 **MACHINE DRAWING**

Class: B. Tech., III-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
2	4	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: BIS standards and conventions used in Engineering Drawing
LO2: drawing of sectional views of various machine components
LO3: part drawings of fast and loose pulley, drill jig, double action press, revolving center, steam stop valve, fuel injection pump
LO4: assembly drawings of stuffing box, eccentric, screw jack, swivel bearing, lathe tail-stock, three-way stop valve

UNIT – I (6+12)

Introduction: Classification of drawings, Conventional representation of gears, Bearings, Springs, Welded Joints and Materials; Sectional views, Screw threads, Single and Multi-Start Threads, Different types of Bolts and Nuts, Different types of Keys and Riveted joints.

UNIT – II (6+12)

Machine components: Muff-Coupling, Split-Muff Coupling, Rigid and Flexible Flange Couplings, Universal Coupling, Oldham Coupling, Cotter and Knuckle Joints, Journal and Pivot Bearings, Introduction to Limits, Fits and Tolerances; Surface Roughness.

UNIT – III (6+12)

Part Drawings:

Part drawing of

Fast and Loose Pulley	Drill Jig
Double Action Press	Revolving Center
Steam Stop Valve	Fuel Injection Pump

UNIT – IV (6+12)

Assembly drawings:

Assembly drawing of

Stuffing Box	Eccentric
Screw Jack	Swivel Bearing
Lathe Tail-Stock	Three-way Stop Valve

Text Books:

1. Siddheshwar, Kannaiah and Sastry, "Machine Drawing", 48th reprint edition, *McGraw-Hill Education (India) Pvt. Ltd.*, 2014.

Reference Books:

1. Narayana, Venkat Reddy, Kannaiah, "Machine Drawing, 3rd edition, *New Age International*, 2009.
2. N D Bhatt and V M Panchal, "Machine Drawing", 46th edition, *Charotar Publishing House*, 2011.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: demonstrate the importance of BIS standards and conventions used in machine drawing

CO2: draw sectional views of machine components like couplings and bearings; interpret geometric dimensioning and tolerances

CO3: develop part drawings with appropriate fits and tolerances of fast and loose pulley, drill jig, double action press, revolving center, steam stop valve, fuel injection pump

CO4: develop assembly drawings of stuffing box eccentric, screw jack, swivel bearing, lathe tail-stock, three-way stop valve

U14ME306 MATERIAL SCIENCE AND METALLURGY LABORATORY

Class: B. Tech., III-Semester **Branch:** Mechanical Engineering

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives(LO):

This Laboratory course will develop students' knowledge in/on

LO1: the study of crystal models
LO2: the microstructures of different samples
LO3: various materials to assess their behavior/limitations
LO4: the brittle and ductile material failure patterns etc., by conducting experiments
LO5: the hardness of materials, strain hardening index and strength coefficient by conducting the various harness tests
LO6: the stiffness and rigidity modulus by conducting compression test on spring

LIST OF EXPERIMENTS

1. Preparation and study of crystal models.
2. Observation of microstructure of ferrous and Non-Ferrous sample.
3. Observation of microstructure of pure metals and single-phase alloys.
4. Observation of microstructure of Steels-Low carbon steel, medium carbon steel and high carbon steel.
5. Observation of microstructure of Cast Irons-White Cast Iron, Gray Cast Iron and Ductile Cast Iron.
6. Measurement of Rockwell hardness and the effect of grain size and prior history of the material on the hardness.
7. Tension test- Determination of Tensile properties and young's modulus on materials-Mild Steel, Aluminum and Tor Steel.
8. Impact test- Determination of impact properties of materials-Charpy and Izod Impact test.
9. Hardness test- Determination of hardness of materials-Brinnell hardness test.
10. Determination of strain Hardening Index and Strength Coefficient-Mayer's analysis

Text Books:

1. V.D. Kodgire, "Material Science and Metallurgy", 36th edn., *Everest Publication, Pune, 2015.*
2. E.C. Subba Rao, "Testing and Inspection of Engineering Materials", Tata McGraw-Hill, *New Delhi, 1998.*

Course Learning Outcomes(CO):

Upon completion of this laboratory course, students will be able to…

CO1: understand and identify the crystal models
CO2: distinguish the microstructures of different samples
CO3: know the behavior/limitations on various materials
CO4: identify the brittle and ductile material failure patterns etc., by conducting experiments
CO5: know the hardness of materials, strain hardening index and strength coefficient by conducting various hardness tests
CO6: know the stiffness and rigidity modulus by conducting compression test on spring

U14CE311 **MECHANICS OF FLUIDS LABORATORY**

Class: B.Tech. III-Semester **Branch:** Mechanical Engineering

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):
This laboratory course will develop students' knowledge in/on
LO1: flow measuring devices
LO2: implementation of Bernoulli's equation
LO3: major and minor losses in a pipe flow
LO4: Reynolds experiment to verify different types of flows in a pipe

LIST OF EXPERIMENTS

1. Calibration of Triangular Notch
2. Calibration of Rectangular Notch
3. Calibration of sharp edged circular Orifice (Both steady and unsteady flows)
4. Calibration of external Mouthpiece (Both steady and unsteady flows)
5. Verification of Bernoulli's theorem
6. Performance of Venturimeter and Orifice meter
7. Losses in pipe lines due to sudden enlargements and sudden contractions
8. Losses in pipe lines due to bends and elbows
9. Determination of friction factor in Pipes
10. Performance of Nozzle meter and Rotameter
11. Broad crested weir – discharge measurement
12. Study of flow through a Reynold's apparatus

Laboratory manual:

1. "*Fluid Mechanics Laboratory Manual*", prepared by the faculty of Department of Civil Engineering.

Text Books:

1. N. Kumara Swamy, "*Fluid Mechanics and Machinery Laboratory Manual*", Charotar Publishing House Pvt., Ltd., 1st edn., 2008.
2. Sarbjit Singh, "*Experiments in Fluid Mechanics*", PHI Learning Private Limited, New Delhi, 2009.

Course Learning Outcomes (CO):
After completion of this laboratory course, students will be able to
CO1: measure discharge through pipes, channels and tanks
CO2: verify Bernoulli's theorem
CO3: measure the energy losses in a pipe flow
CO4: classify the different types of flows in a pipe

U14MH309 SOFT AND INTERPERSONAL SKILLS

Class: B. Tech., III-semester **Branch:** CE, ME and CSE

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme :

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LO):

This course will develop students' knowledge in/on….

LO1: language skills and speaking with logical sequence & confidence

LO2: knowing their skills in public speaking and practice to reveal true qualities of personality & leadership

LO3: knowing their suitable and apt career objectives in-line with the industry expectations

LO4: developing career goals, and strategies for gaining employability skills

LIST OF ACTIVITIES

Activity 1: Team interaction
Activity 2: JAM round
Activity 3: Extempore
Activity 4: Debate
Activity 5: GD
Activity 6: Elocution
Activity 7: Presentations through PPTs
Activity 8: Oral presentations on career planning and "my dream-career"
Activity 9: SWOT analysis presentation
Activity 10: Mock Interview
Activity 11: Hosting and anchoring an event
Activity 12: Story narration

Suggested readings:

- Robert. T. Kiyosaki and Sharon L. Lechter, "Rich Dad Poor Dad", *Warmer Books,*1997.
- Shiv Khera, "You can Win" *New Dawn Press, 2004.*
- APJ Abdul Kalam, "Wings of Fire: An Autobiography of APJ Abdul Kalam**",** *University Press, 1999.*
- David Joseph Schwartz, "The magic of thinking big", *Simon & Schuster Inc.,* 1/e, 1987.
- Stephen Covey, "The 7 Habits of Highly Effective People", *Free Press,* 1989.

Course Learning Outcomes (CO):

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

CO1: exhibit their verbal skills and non verbal skills

CO2: identify clearly defined career objective and apply skills to achieve excellence in their career

CO3: analyze and relate their competencies as per the industry requirements

CO4: excel in interviews to attain better opportunities.

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University)

SCHEME OF INSTRUCTION AND EVALUATION

IV SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAMME

MECHANICAL ENGINEERING

S. No.	Course Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	BS	U14MH401	Engineering Mathematics-IV	3	1	-	4	15	25	40	60	100
2	ES	U14ME402	Thermodynamics	3	1	-	4	15	25	40	60	100
3	PC	U14ME403	Design of Machine Elements -I	3	1	-	4	15	25	40	60	100
4	PC	U14ME404	Machine Tool Technology	3	1	-	4	15	25	40	60	100
5	PC	U14ME405	Computer Aided Design and Graphics	3	1	-	4	15	25	40	60	100
6	ES	U14EE412	Basic Electrical and Electronics Engineering Laboratory	-	-	3	2	40	-	40	60	100
7	PC	U14ME406	Manufacturing Technology Laboratory	-	-	3	2	40	-	40	60	100
8	PC	U14ME407	Computer Aided Design and Graphics Laboratory	-	-	3	2	40	-	40	60	100
			Total	**15**	**5**	**9**	**26**	**195**	**125**	**320**	**480**	**800**
9	MC	U14MH409	Compliance with Current English	-	-	2	1	100	-	100	-	100
10	MC#	U14CH209	Environmental Studies	2	-	-	2	15	25	40	60	100

Student Contact Hours / Week : 31+2#

Total Credits : 26

 # For lateral entry students only

U14MH401 ENGINEERING MATHEMATICS- IV

Class: B. Tech., IV-Semester **Branch:** Common to all

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):
This course will develop student's knowledge in/on….
LO1: various methods of solving system of linear equations and eigen value problem
LO2: methods of fitting curves by the method of least squares
LO3: probability distributions and applications to engineering disciplines
LO4: numerical methods to solve various problems

UNIT-I (9+3)

Matrices: Elementary transformations on a matrix to find inverse of a matrix, Rank of matrix, Normal form of a matrix, Solution of system of homogenous and non homogeneous linear equations, Linear dependence and independence of vectors.
Eigen values and eigen vectors of a matrix - Cayley Hamilton theorem, Reduction of a matrix to diagonal form, Reduction of a quadratic form to canonical form.

UNIT-II (9+3)

Probability & Statistics: Statistical data: Review of measures of central tendency and measures of dispersion, Correlation coefficient, Rank correlation, Regression – Linear regression equations.
Curve fitting: Method of least squares –Fitting of (i) Straight line (ii) Second degree parabola (iii) Exponential curves, Most plausible solution of a system of linear algebraic equations.
Review of the concepts of probability, Random variables, Discrete and continuous probability distributions, Mean and variance of a distribution, Binomial distribution, Poisson distribution and normal distribution, Fitting of these probability distributions to the given data.

UNIT-III (9+3)

Numerical Analysis: Finite differences and difference operators.
Interpolation: Lagrange interpolation, Newton's forward and backward interpolation formulae.
Numerical differentiation: First and second derivatives using forward and backward interpolation polynomials at the tabulated points.
Numerical integration: Gaussian quadrature formula, Trapezoidal rule, Simpson's $1/3^{rd}$ rule and Simpson's $3/8^{th}$ rule.

UNIT-IV (9+3)

Solution to system of linear equations: Gaussian elimination method, Jacobi and Guass-Siedel iteration methods.
Numerical Solution of algebraic and transcendental equations: Bisection method, Regula-Falsi method and Newton Raphson's method.

Numerical solution of ordinary differential equations: Taylor's method, Picard's method, Euler's method and Runge - Kutta methods of second and fourth order**.**

Text Books:

1. Grewal. B.S., "Higher Engineering Mathematics", *Khanna Publishers,* New Delhi, 43rd edn. 2014.

Reference Books:

1. Gupta and Kapoor, "Fundamentals of Mathematical Statistics", *Sulthan Chand and & sons,* New Delhi, 11th edn. , 2010.
2. Kreyszig E., "Advanced Engineering Mathematics", *John Wiley & Sons, Inc.,* U.K., 9th edn., 2013.

Course Learning Outcomes (CO):

Upon completion of this course, the students will be able to…

CO1: compute rank of a matrix to solve a system of linear algebraic equations, eigen values, eigen vectors of a given square matrix and reduce a given quadratic form to canonical form

CO2: fitting various types of curves arising in the analysis of engineering problems, find correlation regression coefficients of given data and apply theoretical probability distributions in decision making

CO3: find the polynomial for the given set of data & its derivative and evaluate definite integrals using numerical methods

CO4: compute the solution of system of linear equations, algebraic, transcendental and ordinary differential equations

U14ME402 **THERMODYNAMICS**

Class: B. Tech., IV-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LO):
This course will develop students' knowledge in/on
LO1: the basic concepts of steady flow energy equation, its applications and the performance of heat engine, heat pump and refrigerator
LO2: the concepts of entropy, availability and irreversibility
LO3: thermodynamic relations, working principle and applications of reciprocating compressors
LO4: the working principles of various gas power cycles and gas turbine power plant

UNIT – I (9+3)

First Law of Thermodynamics: Introduction, P-V-T relations in various non-flow processes, Steady flow energy equation and its applications- Nozzle, Compressors, Boiler, Turbines, Pumps, Heat Exchangers, Throttling valve; Joule Thomson co-efficient and its applications, Inversion curve, Work transfer in flow process, Vander walls equation of state.
Second Law of Thermodynamics: Introduction, Heat engine, Heat pump, Refrigerator, Reversibility, Irreversibility, Causes of irreversibility, Conditions for reversibility.

UNIT – II (9+3)

Entropy: Concept of Entropy, Clausius inequality, Entropy principle and its applications, Entropy and Disorder, Entropy change in various processes, Third law of Thermodynamics.
Availability: Available energy, Un-Available energy, Available energy referred to a cycle, Useful work, Dead state, Availability, Availability in a steady flow process, Gibbs function, Helmholtz function, Irreversibility, Second law efficiency.

UNIT – III (9+3)

Thermodynamic Relations: Maxwell's equations, TDS equations, Difference in heat capacities, Ratio of heat capacities, Energy equation, Enthalpy equation.
Reciprocating Air Compressors: Classification, Applications of compressed air, Single stage reciprocating air compressor- Indicated work without and with clearance, Effects of clearance volume, Minimizing compression work, Volumetric efficiency, Indicator diagram, Free air delivery, Limitations of single stage compression, Advantages of Multistage compression.

UNIT – IV (9+3)

Gas power cycles: Otto cycle, Diesel cycle, Dual cycles-Calculation of air standard efficiency and mean effective pressure, Comparison of Otto cycle, Diesel cycle, Dual cycle for same compression ratio, heat rejection and same maximum Temperature, heat rejection; Representation of stirling, Ericsson and Atkinson cycles on P-V and T-S diagrams.
Gas Turbines: Introduction, Classification- open and closed cycles, comparison between open and closed cycle gas turbine, Deviation of actual gas turbine cycle from Brayton cycle-Isentropic efficiencies of compressor and gas turbine, Methods for improvement of thermal efficiencies of gas turbine power plant---reheating, regeneration, inter cooling and applications of Gas Turbines.

Text Books:

1. Nag, P. K., "Engineering Thermodynamics", *Tata Mc Graw Hill* , 3rd edn., New Delhi, 2005. (Chapters 5-8, 10, 11 and 13)
2. Mahesh, M. Rathore., "Thermal Engineering", Tata Mc Graw Hill, 1st edn., New Delhi, 2010. (Chapters 25 and 27)

Reference Books:

1. Van Wylen., "Fundamentals of classical Thermodynamics", 4th edn., John Wiley, New York, 1994.
2. Jones & Dugan, "Engineering Thermodynamics", 1st edn., Prentice Hall India, New Delhi, 2013.
3. Rathakrishnan, "Fundamentals of Engineering Thermodynamics", Prentice Hall India, 2nd edn., New Delhi, 2011.
4. P. Chattopadhyay, "Engineering Thermodynamics", *Oxford University press*, 1st edn., New Delhi, 2011.
5. Kumar, D. S., "Thermal Science and Engineering", Reprint, S. K. Kataria and sons, New Delhi, 2013.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: apply the laws of thermodynamics to analyze boilers, compressors, nozzles, heat pumps, refrigerators and heat engines

CO2: evaluate the available energy and irreversibility

CO3: derive thermodynamic relations and estimate the performance of reciprocating compressors

CO4: determine the performance of gas power cycles and demonstrate the various methods to improve the efficiency of gas turbine power plant

U14ME403 **DESIGN OF MACHINE ELEMENTS-I**

Class: B. Tech., IV- Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LO):
This course will develop students' knowledge in/on
LO1: design of machine elements by using different theories of elastic failures
LO2: design and analyze shaft, keys and couplings with different geometrical features under various loading conditions
LO3: design and analyze different cotter joints, knuckle joint and welded joints with different geometrical features under various loading conditions
LO4: design and analyze different riveted joints and bolted joints with different geometrical features under various loading conditions

UNIT – I (9+3)

Introduction: Engineering Design, Basic Design procedure, Basic requirements of machine elements, Important Materials for Machine Components. Design Criterion.
Combined Loads: Analysis of Biaxial state of stress at a point, Principle Stresses, Mohr's Circle Representation of stresses; The importance of failure theories in design: Maximum principal stress theory, Maximum shear stress theory, Maximum principal strain theory, Maximum total strain energy theory, Distortion energy theory and applications.
Fatigue Loads: Types of Fatigue loads, phenomenon of Fatigue failure, endurance limit, Stresses concentration and its importance in design, stress concentration factor, notch sensitivity, Gerber's parabola, Goodman line, Soderberg equation, and fatigue design under Combined loading.

UNIT – II (9+3)

Shafts: Introduction, Materials and design Stresses, Design of Axles, Design criterion for shafts, Design of solid and hollow shafts under static loads-combined torsion, axial and bending.
Keys: Types of Keys, Deign of Sunk Keys, and Effect of keyways in sunk keys, feather keys and Splined Shafts.
Couplings: Functions of Couplings, Design of Rigid Couplings, Muff and Flange couplings, Design of bush pin Flexible Couplings.

UNIT – III (9+3)

Cotter Joints: Design of cotter joints, socket & spigot type, sleeve type, Gib type and Knuckle joint.
Welded joints: Conventional representation of welded joints, Butt and fillet welds under static and varying loads, welded joints under eccentric loading.

UNIT – IV (9+3)

Riveted joints: Terminology, different types of riveted joints, failure modes, Design procedure, structural joints-lozenge joint, eccentrically loaded riveted joints.
Bolted joints:-Stresses in screw fastenings, initial stresses, Stresses due to external forces, Stresses due to combined load, Bolts of uniform strength, gasket joints, eccentrically loaded bolted joints, design of a nut, and power transmitting capacity of set screws.

Text Books:

1. N.C.Pandya and C.S.Shah, "Elements of Machine Design", 18th edn., *Charotar Publishing House, Anand*, 2012.

Reference Books:

1. J.E.Shigley and C.R.Mischke, "Mechanical Engineering Design", 5th edn., *McGraw- Hill,* New York, 2014
2. Bhandari, V B., "Design of Machine Elements", 3rd edn., *Tata McGraw Hill Book Company*, New Delhi, 2009.
3. 2. R.C.Juvinall and K.M. Marshek, "Fundamentals of Machine component Design", 3rd edn., *John Wiley &Sons,* Newyork,2000.
4. R.S.Kurmi and J.K.Guptha, "A Text book of Machine Design", 15th edn., *S. Chand & Co.* New Delhi, 2005.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: design of machine elements by using different theories of elastic failures and under fatigue loading conditions

CO2: design shafts, keys and couplings with different geometrical features under various loading conditions

CO3: design different cotter joints, knuckle joint and welded joints with different geometrical features under various loading conditions

CO4: design different bolted joints and riveted joints for different loading conditions

U14ME404 **MACHINE TOOL TECHNOLOGY**

Class: B. Tech., IV-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: classification of machine tools and their motions
LO2: working principles of lathe, drilling, milling, shaper and grinding machines
LO3: mechanisms of feed and speed in machine tools
LO4: jigs and fixtures

UNIT – I (9+3)

Machine Tools: Classification, concepts of generatrix and directrix motion; Lathe-types of lathe, description and functions of lathe parts, speed changing, feed mechanism, lathe accessories and attachments, lathe operations; Capstan and Turret lathes-description and functions, turret indexing.

UNIT – II (9+3)

Shaper: Types, principal parts, shaper mechanism, operations and machining time calculations.
Planning Machine: Types, principal parts, Planner mechanism and Operations.
Slotting Machine: Types, principal parts, slotting mechanism and operations.
Drilling Machine: Types, principal parts, spindle drive and feed mechanisms, work and tool holding devices, drilling operations.
Boring Machine: Types, principal parts and operations.

UNIT – III (9+3)

Milling Machine: Types, principal parts, work and cutter holding devices, milling attachments, Types of milling cutters, milling operations and machining time calculations.
Gear Cutting: Types of gear cutting, generation and copying processes, description of hobbing and gear shaping machines.

UNIT – IV (9+3)

Grinding Machine: Classification of grinding machines-cylindrical, internal, surface, tool and cutter grinders; work holding devices; Grinding wheels-types of abrasives, bonds and specification of a grinding wheel; selection of grinding wheels.
Super Finishing Operations: Introduction to honing, lapping and buffing operations.
Jigs and Fixtures: Advantages, principle of location, methods of location; Clamping-functions, types; Types of jigs and fixtures;

Text Books:

1. Hajra Chowdary, S.K., Bose. S. K and Hajra Chowdary, A.K., "Elements of Workshop Technology", Vol. II, 5th edn., *Asia Publishing House*, Bombay, 1982.

Reference Books:

1. Paul DeGarmo.E, Black.J.T and Ronald A. Kohser, "Materials and Processes in Manufacturing" 3rd edn., PHI Pvt. Ltd., New Delhi, 2001
2. Henrich Gerling, "All About Machine Tools", revised edition *New Age International*, New Delhi, 2007.
3. Kempster, M.H.A., "Principles of Jig and Tool Design", 3rd edn., *English University Press*, London, 2010.
4. Kalpakjian, S. and Steven R. Schmid, "Manufacturing, Engineering & Technology", *3rd edn., Pearso, 1995.*

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: classify various types of machine tools and their operations

CO2: understand features, operations and applications of various machine tools like lathe, drilling, milling, shaper and grinding

CO3: describe various mechanisms of

- *feed and speed changing in lathe*
- *quick return in slotting*
- *quill in drilling*
- *indexing in milling*

CO4: explain various types of jigs and fixtures with applications

U14ME405 COMPUTER AIDED DESIGN AND GRAPHICS

Class: B. Tech., IV-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: various CAD/CAM tools and various algorithms for generation of points, lines and circle
LO2: 2D and 3D transformations
LO3: main concepts of geometric modeling of curves, surfaces and solids
LO4: various data storage management systems

UNIT – I (9+3)

Introduction: CAD/CAM, Definition of CAD Tools, Types of system and CAD/CAM system evaluation criteria.
Graphics Primitives: Monitor pixels and frame buffers, generation of points, lines, and circles, algorithms.

UNIT – II (9+3)

Transformations: 2D and 3D transformations scaling, translation, shearing, Rotation, Reflection, homogeneous transformation, Matrix operations, concatenation, isometric, orthographic and perspective projections.

UNIT – III (9+3)

Geometric Modelling of Curves: Types of mathematical representation of curves, wire frame models wire frame entities parametric representation of synthetic curves, Hermite- cubic splines Bezier curves and B-splines rational curves.
Geometric Modeling of Surfaces: Design of surfaces, Bezier surfaces, B-spline surfaces, COONs surface and Blending surface, Sculptured surface.

UNIT – IV (9+3)

Geometric Modelling of Solids: Solid entities, Boolean operations, B-rep of Solid Modelling, and CSG approach of solid modeling.
Engineering Data Management Systems: Graphic standards, Data exchange standards, Model storage, data structures, Data structure organization, Tree data structures, Network data structures and relationship data structures

Text Books:

1. I. Zeid, "CAD/CAM theory and practice", 2nd edn., *McGraw-Hill*, New Delhi, 2009.

Reference Books:

1. David F.Rogers and J.Alan Adams, "Mathematical Elements for Computer Graphics", 2nd edn., *McGraw-Hill*, New York, 2002.
2. Donald Hearn and M. Pauline Baker, "Computer Graphics", *2nd edn.*, *Prentice-Hall of India*, New Delhi, 2007

3. James D. Foley, Andries Van Dam, et. al., "Computer Graphics: Principles and Practice", *2nd Edn., in C, Pearson Education*, New Delhi, 2005.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: learn the basic principles of computer aided design and algorithms for generation of points, lines, circles

CO2: understand geometric transformation techniques in cad

CO3: develop mathematical models to represent curves and surfaces, characteristics and applications of curves and surfaces

CO4: know the various graphics standards and data base models

U14EE412 BASIC ELECTRICAL & ELECTRONICS ENGINEERING LABORATORY

Class: B. Tech., IV-Semester **Branch:** Common to CSE & ME

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives (LO):
This laboratory course will develop students' knowledge in/on
LO1: performance of diode & zener diode
LO2: self biasing of transistor.
LO3: use of Kirchhoff's laws.
LO4: determination of parameters of a transformer.

LIST OF EXPERIMENTS

1. Static Characteristics of PN-Junction diode
2. Static Characteristics of a Zener diode
3. Input-output Characteristics of a transistor in CE configuration.
4. Static characteristics of JFET.
5. Biasing of a transistor.
6. Verification of Kirchhoff's laws in a given network.
7. Frequency response of a series RLC network.
8. Determination of Parameter of a choke coil.
9. Predetermination of efficiency & regulation of a transformer by O.C & S.C test.
10. Determination of efficiency & regulation of a transformer by direct load test.
11. Determination of Self & Mutual inductance of a coupled coil.

Laboratory Manual:

1. Manual for "Basic Electrical & Electronics Engineering Laboratory" *prepared by the Department of EEE.*

Course Learning Outcomes (CO):
After completion of this laboratory course, students will be able to
CO1: decide the application of diode & zener diode.
CO2: validate Kirchhoff's laws.
CO3: determine parameters of a coil,
CO4: distinguish the predetermination & determination of efficiency &regulation of transformer.

U14ME406 MANUFACTURING TECHNOLOGY LABORATORY

Class: B. Tech., IV-Semester **Branch:** Mechanical Engineering

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives(LO):
This laboratory course will develop students' knowledge in/on
LO1: preparation of moulding sand and sand testing methods
LO2: moulding methods and mould preparation
LO3: arc and gas welding
LO4: machining operations on lathe, slotter, shaper and milling machine

LIST OF EXPERIMENTS

Foundry Trade

1. Preparation of sand specimen and conduction of compression, Shear and Tensile tests on Universal Sand Testing Machine.
2. Preparation of sand specimen and conduction of Grain Fineness Number Test on Sieve shaker.
3. Preparation of sand specimen and conduction of Permeability Test and Shatter Index test.
4. Preparation of sand specimen and conduction of Moisture Content and Clay Content test.
5. Preparation of sand mould using dumbbell pattern.
6. Demonstration on casting for production of aluminium metal dumbbell.

Welding Trade

7. Pprepare a corner joint using D.C. arc welding.
8. Prepare a single V-butt joint using AC Arc welding and perform bend test on it.
9. Prepare a Pipe joint using Gas Welding.
10. Prepare a lap joint using resistance spot welding.

Machining Trade

11. Perform taper turning and thread cutting operations on lathe.
12. Perform a key way slot using slotter.
13. Generate plain and inclined surfaces using shaper.
14. Perform a rectangular slot using milling machine.

Note*: Any 12 Experiments may be conducted from the above list of experiments.*

Text Books:

1. P.N.Rao, "Manufacturing Technology Vol-I", 3rd edn., *Tata McGraw-Hill*, New Delhi, 2015.
2. Henrich Gerling, "All About Machine Tools", revised edition *New Age International,* New Delhi, 2007

Course Learning Outcomes(CO):
Upon completion of this laboratory course, students will be able to…
CO1: conduct various sand testing methods
CO2: prepare moulds for casting of various components
CO3: acquire skills on welding metal plates using arc and gas welding equipments
CO4: perform various machining operations like turning, thread cutting, slotting and keyways

U14ME407 COMPUTER AIDED DESIGN AND GRAPHICS LABORATORY

Class: B. Tech., IV-Semester **Branch:** Mechanical Engineering

Teaching Scheme :

L	T	P	C
-	-	3	2

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives(LO):

This laboratory course will develop students' knowledge in/on

LO1: using the software packages for drafting and modeling

LO2: creating 2D models with dimensions from pictorial views using AutoCAD

LO3: creating models of universal coupling, knuckle joint, flange coupling, screw jack, etc., using AutoCAD

LO4: handling high end softwares in creating 3d drawings, surface models and assembly drawings

LIST OF EXPERIMENTS

1. Design and implementation of program for line drawing using Bresenham's Integer line algorithm.
2. Curve generation and manipulation program for cubic spline and Bezier curve.
3. Study of capabilities of software for Drafting and Modeling – coordinate systems– Creation of simple figures like polygon and general multi-line figures- Drawing of curves like parabola, spiral, involute using B-spline or cubic spline.
4. Drawing front view, top view and side view of objects from the given pictorial views and dimensioning.
5. Assembly of UNIVERSAL COUPLING.
6. Assembly of KNUCKLE JOINT.
7. Assembly of FLANGE COUPLING.
8. Assembly of PLUMMER BLOCK.
9. Assembly of BUSHED BEARING.
10. Assembly of SCREW JACK.
11. Creation of 3-D models of simple objects using a high end modeling software.
12. Assembly Modeling using a high end modeling software.

Text Books:

1. Vishal Sharma, *Auto CAD*, 1st edition, Dhanpatrai Publishing Company (P) Ltd., 2002.
2. Sham Tickoo, "*AutoCAD" 2007: A Problem-Solving Approach,* 4th edition, Delmar Cengage Learning, 2006.
3. Sham Tickoo, *Pro/ENGINEER Wildfire 5.0 for Engineers and Designers,* 1st edition, Dreamtech Press, 2010.
4. Creo-Elements 1.0 Tutorial Manual.

Course Learning Outcomes (CO):

Upon completion of this laboratory course, students will be able to…

CO1: operate a CAD Workstation; Understand and apply basic AutoCAD commands

CO2: organize & manage AutoCAD related files for 2D and 3D drawings; Create 2D and 3D models using AutoCAD

CO3: use modification techniques to edit and modify drawings for presentation and accuracy

CO4: use CAD technology, available to CAD professionals consistent with current methods of drafting, design or engineering

U14MH409 COMPLIANCE WITH CURRENT ENGLISH

Class: B. Tech., IV-Semester **Branch:** CE, ME and CSE

Teaching Scheme :

L	T	P	C
-	-	2	1

Examination Scheme:

Continuous Internal Evaluation	100 marks
End Semester Examination	--

Course Learning Objectives (LO):

This course will develop students' knowledge in/on….

LO1: rudiments of grammar and accuracy in spoken English

LO2: introducing themselves, making new introductions, preparing scripts of simple dialogues, playing the assigned roles and speaking extempore and making public discourses

LO3: vocabulary to attribute quality to language

LO4: correct use of language and techniques to write an essay, a report, an official letter, to precise the given text and to prepare CV/resume

LIST OF ACTIVITIES

Activity-1: Identifying sub- tenses, structures and examples
Activity-2: Using tenses in different situations and detecting the errors
Activity-3: Matching the sentences with subject and verb
Activity-4: Making statements and questions using correct verb form that would go with the subject
Activity-5: Introducing oneself and introducing others
Activity-6: Developing dialogues on the given situations and playing the assigned roles
Activity-7: Predicting the meanings of different words, making sentences substituting a group of words, identifying the ambiguity in sentences and using foreign phrases in sentences
Activity-8: Speaking extempore on the given topic, making speeches and giving seminars
Activity-9: Preparing CV/resume and writing an official letter
Activity-10: Writing a report and an essay
Activity-11: Précising the given text
Activity-12: Correcting the errors in a sentence

Reference Book:

1. John Sinclair, "Collins Cobuld English Grammar," *Collins Cobuild*,1990

Course Learning Outcomes(CO):

Upon completion of this course, students will be able to

CO1: use appropriate tense in proper situations and produce grammatically acceptable sentences in speech and writing

CO: develop dialogues and conversations in English and make oral presentations effectively

CO: use sound vocabulary in communication

CO4: write a report, an official letter, an essay, prepare CV / Resume and precise the given passage.

U14CH209 **ENVIRONMENTAL STUDIES**

Class: B. Tech., IV-Semester **Branch:** Common to all branches

Teaching Scheme :

L	T	P	C
2	-	-	2

Examination Scheme :

Continuous Internal Evaluation :	40 marks
End Semester Exam :	60 marks

Course Learning Objectives(LO):
This course will develop student's knowledge in/on….
LO1: To incorporate the basic knowledge of the environmental studies
LO2: To understand the need to use resources more equitably
LO3: To understand the knowledge of conversation of biodiversity
LO4: To introduce the causes, effects and control measures of environmental pollution
LO5: To know the issues involved in enforcement of environmental legislation

UNIT-I (6)

Introduction:
The Multidisciplinary Nature of Environmental Studies: Definition, Scope and Importance.

Natural Resources:
Forest Resources: Use and over – exploitation of forests, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.
Water Resources: Use and over- utilization of surface and ground water, floods; drought; conflicts over water.
Mineral Resources: Environmental effects of extracting and using mineral resources.
Agricultural Land: Land as a resource, land degradation, soil erosion and desertification.
Food Resources :World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
Energy Resources: Renewable and non-renewable energy sources, use of alternate energy sources.

UNIT-II (6)

Ecosystem and Biodiversity:
Ecosystem: Concepts of an ecosystem: Food chain, food webs and ecological pyramids: Energy flow in the ecosystem: ecological succession.
Biodiversity and its conservation: Introduction: Definition. genetic, species and ecosystem diversity; value of biodiversity. Biodiversity in India, Hot spots of biodiversity, Man- wildlife conflicts, Endangered and endemic species of India, In-situ and Ex-situ conservation

UNIT-III (6)

Environmental Pollution:
Global climatic change, Green house gases, Acid rain.
Causes and effects of Air, Water, Soil, Marine and Noise pollution with case studies.
Solid and Hazardous waste management, effects of urban, industrial and nuclear waste.
Natural disaster management: flood, earthquake, cyclone and landslides.

UNIT-IV (6)

Environment Protection and Society:

Role of Individual and Society: Role of individual in prevention of pollution, Water conservation, Rain water harvesting, Watershed management, wasteland reclamation.

Environmental Protection / Control Acts: Environmental legislation with respect to Air, Water, Forest and Wildlife, Enforcement of environmental legislations, Population growth, Role of Information Technology in Environment and Human Health.

Text Books:

1. Erach Bharucha, "Text Book of Environmental Studies for Under Graduate Courses – 2nd edn., *Universities Press (India) Private Limited*
2. Anjaneyulu Y., "Environmental Studies", *B.S. Publications*.

Reference Books:

1. Bharucha Erach, "The Biodiversity of India" *Mapin Publishing Pvt. Ltd.*
2. Odum, E.P. 1971, "Fundamental of Ecology", *W.B. Saunders Co.,* USA, 574p.
3. Trivedi R.K. and P.K. Goel, "Introduction to Air Pollution", *Technoscience Publications.*
4. Gilbert M. Masters, **"Introduction to Environmental Engineering & Science",** 1991, *PHI*
5. A.S. Chauhan, "Environmental Studies", *Jain Brothers* (New Delhi) 3rd revised and enlarged edition
6. R.Rajagopalan, "Environmental Studies from crisis to cure", *Oxford University Press*

Course Learning Outcomes (CO):

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

CO1: understand human interaction with the environment
CO2: understand utmost importance of the sustainable use of natural resources
CO3: get acquainted with ecosystem and conservation of biodiversity
CO4: gain the knowledge of control measures of environmental pollution and natural disaster management
CO5: understand the conflict between the existing development strategies and need for environmental conservation
CO6: understand various environmental protection / control acts
CO7: understand the role of individual in the environment protection

*** ***Note: For Lateral Entry students only***

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University)

SCHEME OF INSTRUCTION AND EVALUATION

V SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAMME

MECHANICAL ENGINEERING

S. No.	Course Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	PC	U14ME501	Internal Combustion Engines	3	1	-	4	15	25	40	60	100
2	PC	U14ME502	Design of Machine Elements -II	3	1	-	4	15	25	40	60	100
3	PC	U14ME503	Production and Operation Management	3	1	-	4	15	25	40	60	100
4	PC	U14ME504	Metrology and Instrumentation	3	1	-	4	15	25	40	60	100
5	PC	U14ME505	Kinematics of Machinery	3	2	-	4	15	25	40	60	100
6	PC	U14ME506	Applied Thermodynamics	3	1	-	4	15	25	40	60	100
7	PC	U14ME507	Fuels and Internal Combustion Engines Laboratory	-	-	3	2	40	-	40	60	100
8	PC	U14ME508	Metrology and Instrumentation Laboratory	-	-	3	2	40	-	40	60	100
9	PR	U14ME509	Seminar	-	-	-	1	100	-	100	-	100
			Total	**18**	**7**	**6**	**29**	**270**	**150**	**420**	**480**	**900**

Student Contact Hours / Week : 31

Total Credits : 29

U14ME501 INTERNAL COMBUSTION ENGINES

Class: B. Tech., V-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):

This course will develop students' knowledge in/on

LO1: different types of internal combustion engines and their applications

LO2: classification of the fuels and working of fuel supply systems used in conventional engines

LO3: various ignition systems and combustion phenomenon in spark ignition and compression ignition engines

LO4: need of lubrication & cooling, relevance of environmental and social issues on the design process of internal combustion engines

UNIT-I (9+3)

Introduction: Review of IC Engines- working principles, valve-time diagram and Port timing diagram.

Fuel-Air Cycles and Their Analysis: Fuel-Air cycles and their significance; Composition of cylinder gases and variable specific heats, dissociation, comparison of Air-Standard and Fuel-Air cycles; Effect of operating variables -compression ratio and fuel-air ratio.

Testing of IC Engines: Measurement of brake power, friction power, fuel and air consumption, Indicator diagram, mean effective pressure, indicated power, specific fuel consumption, air-fuel ratio, excess air ratio, equivalence ratio; Mechanical, volumetric, thermal efficiencies and heat balance.

UNIT-II (9+3)

Fuels and Combustion: Solid, liquid and gaseous fuels-their characteristics, structure of hydrocarbon fuels, flash and fire points, calorific value of fuels, stoichiometric air-fuel ratio, air-fuel ratio from analysis of products of combustion, conversion of volumetric analysis to mass analysis, mass of dry flue gases per kg of fuel burnt, mass of excess air supplied, important qualities of SI and CI engine fuels, Rating of fuels.

Fuel Supply Systems: Spark Ignition Engines-carburetion, mixture requirements. Calculation of air fuel ratio, types of carburetors. Compression Ignition Engines-Functional requirements of an injection system, injection pump, injector nozzle.

UNIT-III (9+3)

Ignition: Requirements of an ignition system, Types of ignition systems-battery ignition system, magneto ignition system, transistorized coil ignition system and capacitance discharge ignition system.

Combustion Process in I.C. Engines: S.I. Engines-Normal combustion and flame front propagation, factors affecting flame speed, rate of pressure rise, abnormal combustion, combustion chambers for S.I. Engines. C.I. Engines- Stages of combustion, ignition delay, factors affecting delay period, combustion knock and combustion chambers for C.I. Engines.

UNIT-IV (9+3)

Engine Lubrication and Cooling: Lubrication, Function of lubrication, Lubricating systems-Mist Lubrication, Wet sump Lubrication, Dry sump lubrication; Cooling systems-Need for Cooling System, Characteristics of Cooling System. Air cooled system-Cooling fins and baffles. Liquid cooled system-Direct or Non-return System, Thermosyphon cooling, Forced Circulation system, Evaporative cooling, Pressure cooling; Cooling additives, Comparison of Liquid and Air cooling Systems.

Special Topics: Scavenging, supercharging, exhaust emissions, pollutants from SI engines and control, CI engine emissions and control, Wankel rotary piston engine.

Alternate Fuels: Straight Vegetable Oil (SVO)-SVO as Diesel engine fuel, Properties of SVO, Advantages and disadvantages of SVO, Biodiesel-Introduction, Biodiesel production, Properties of Biodiesel, Advantages and disadvantages of biodiesel**,** Biodiesel emissions.

Text Books:

1. Ganesan V., "Internal Combustion Engines", *4th Edition, Tata McGraw-Hill*, New Delhi, 2013. (Chapter 1,3,7,8,10,11,12,13,15,18,19 & 20)
2. Mahesh M Rathore, "Thermal Engineering", *Mc Graw Hill,* 1st edn., 2010. (Chapter 16)

Reference Books:

1. Heywood, J.B., "Internal Combustion Engine Fundamentals", revised edn., *McGraw-Hill*, 1988.
2. Colin R. Ferguson, Allan T. Kirkpatrick of "Internal Combustion Engines: Applied Thermosciences", 2nd Edn., *Wiley*, 2001.
3. H.N. Gupta, "Fundamentals of Internal Combustion Engines", *PHI Pvt. Ltd*., 2nd edn., New Delhi, 2012.
4. Gill P. W. & Smith J. H., "Fundamentals of I. C. Engines", *Oxford & IBH*, 1st edn., New Delhi, 1972.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: apply thermodynamic analysis to ic engines and summarize the methods used to improve engine performance and estimate engine performance parameters

CO2: describe the different fuels and working of fuel supply systems used in conventional engines

CO3: summarize various ignition systems and combustion phenomena in spark ignition and compression ignition engines

CO4: describe various engine lubrication & cooling systems and engine emissions

U14ME502 **DESIGN OF MACHINE ELEMENTS-II**

Class: B. Tech., V-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: design of transmission elements like belt drives, gears.
LO2: design of clutches , brakes and springs
LO3: design of connecting rod
LO4: design of rolling and sliding contact

UNIT-I (9+3)

Belts: Design of belts, Design procedure for flat belts, V-belts Drives.
Flywheels: Principle of Flywheel, Design of flywheel rim, Stresses in flywheel rim, Design of hub, arms and Pulley design.
Springs: Closed coiled helical springs subjected to Axial loading, deflection and stresses in helical springs, concentric springs, and springs under variable loads.

UNIT-II (9+3)

Gears: Classification of gears, gear terminology, Cycloidal and Involute profiles, basic rack standard system, Design of spur, helical gears, Lewis strength equation, Buckingham dynamic load equation, Wear Strength equation, Design of gear wheels hub, rim and arms.

UNIT-III (9+3)

Sliding Bearings: Lubricants, types of lubrication, hydrodynamic and Hydro static lubrication, friction circle, Bearing Characteristic number, McKee's equation, Sommerfeld number, torque and power losses in journal bearings, and design of journal and thrust bearings
Rolling Element Bearings: Types of rolling element bearings, basic dynamic load rating, Nominal life, Average life, Basic static load rating, combined radial and thrust loads, Equivalent load, Selection of bearings.

UNIT-IV (9+3)

Clutches: Necessity of a clutch in an automobile; Design procedure for Disc clutch, Design procedure for Cone clutch
Brakes: Introduction, Design procedure for Block brakes, Band Brakes, Internal Expanding Shoe Brakes, Band and Block Brake.
Engine parts: Design of Connecting rod.

Text Books:

1. N.C.Pandya and C.S.Shah, "Elements of Machine Design", 18th *Charotar P3ublishing House, Anand*, 2012.

Reference Books:

1. Shigley, J.E and Mischke, C. R. "Mechanical Engineering Design", 6th Edn., *Tata McGraw Hill,* 2014.
2. Norton, R. L., "Machine Design: An Integrated Approach", 3rd Edn., *Pearson*, 2004.
3. Bhandari, V B., "Design of Machine Elements", 3rd edn., *Tata McGraw Hill Book Company,* New Delhi, 2009.
4. R.S.Kurmi & Guptha, "A Text Book of Machine Design", *S.Chand & Co*., New Delhi,2005
5. Kannaiah, P., "Machine Design", 15th edn., *Scitech Publication Pvt. Ltd.,* 2009.
6. PSG Design Data book for Machine Elements, 3rd edn., 2003.

Note: Design Data book for Machine Elements is permitted in the Examination

Course Learning Outcomes(CO):

Upon completion of this course, students will be able to….

CO1: design the transmission elements like gears belt drives for practical applications

CO2: design the clutches , brakes and springs

CO3: design the connecting rod

CO4: design the rolling and sliding contact

U14ME503 PRODUCTION AND OPERATION MANAGEMENT

Class: B. Tech., V-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: forecasting techniques and inventory model.
LO2: production management problem solving techniques
LO3: work study and method study techniques
LO4: job evaluation and merit rating
LO5: statistical quality control

UNIT-I (9+3)

Introduction: Introduction, objectives and areas of production and operation management.
Forecasting: Qualitative techniques- Delphi, Market Survey, Life cycle analogy; Quantitative techniques-Time series methods, Moving average, Exponential smoothing, Regression and econometric forecasting; Forecasting Errors
Inventory Management: Classification, Quantitative Inventory control-EOQ models-purchase model, manufacturing model and quantity discount models; Qualitative inventory-ABC analysis

UNIT-II (9+3)

Production Planning and Control: Objectives, components and functions of production planning and control.
Material Requirement Planning: System Inputs and Outputs, MRP logic.
Aggregate Planning: Characteristics, decision options- modification of demand and supply; Strategies- Pure and Mixed strategies.
Sequencing and Scheduling: Priority rules in sequencing, sequencing of 'n' jobs on '1' machine problem; Johnson's algorithm for sequencing of 'n' jobs on 2 and 3 machine problems.
Decision Analysis: CPM and PERT, Simple waiting line models, Break even analysis.

UNIT-III (9+3)

Work Study: Introduction, techniques of Work Study, Method study-tools and techniques, process charts; Motion Study- principles of motion economy, Micro motion study, Therbligs.
Work Measurement: Introduction, elements of time study, time study procedure, data collection, PMTS, MTM, Work sampling, Standard time calculations, Performance rating and Systems of rating.

UNIT-IV (9+3)

Job Evaluation and Merit rating: Introduction, objectives of Job evaluation, methods of job evaluation, Wage structures, Methods of merit rating, Wage Incentive Plans.
Statistical Quality Control (SQC): Introduction, Control Charts-types and applications; Acceptance Sampling, OC-Curve.
Value Engineering: Introduction, Value analysis for cost/value

Text Books:

1. Hajra Chowdary "Production Management-Integrated with Industrial Engineering Approach", *Media Promoters and Publishers,* Bombay, 2nd edition, 1993.

Reference Books:

1. Shailendra Kale, "Production and Operations Management", 1st edn., *McGraw-Hill*, New Delhi, 2013.
2. Basu,.S.K,sahu.K.C and Datta.N.K., "Works Organization and Management", *Oxford & IBH*, New Delhi, 2nd edition,1983
3. Buffa, "Modern Production and Operations Management", 8th edn., *Wiley Eastern*, New Delhi, 2009.

Course Learning Outcomes(CO):

Upon completion of this course, students will be able to….

CO1: describe various forecasting techniques and derive equations for inventory EOQ models

CO2: solve various production management problems on

- *sequencing and scheduling*
- *material requirement planning*
- *CPM and PERT*
- *waiting line*

CO3: explain various work study and method study techniques

CO4: describe the importance of job evaluation and merit rating

CO5: analyze and construct various process charts in SQC

U14ME504 METROLOGY AND INSTRUMENTATION

Class: B. Tech., V-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: generalized measurement system and its performance characteristics
LO2: sensors and transducers
LO3: alignment testing, limits, fits and tolerances
LO4: comparators and metrology
LO5: metrology of surface finish

UNIT-I (9+3)

Introduction to Measurement systems: Definition and significance of measurement, Methods of measurement, Classification of measuring instruments; generalized measurement system, functional elements; Measurement scheme for weighing machine.

Performance characteristics of measuring devices- static characteristics- accuracy, precision, repeatability, sensitivity, reproducibility, drift, dead zone, linearity, resolution, hysteresis, threshold, calibration, range and span. Dynamics characteristics - speed of response and measuring lag, fidelity and dynamic error, overshoot, frequency response; Types of errors.

Line and end standards: Linear measurements – Vernier caliper, micrometer, height gauge and slip gauges; Angular Measurement: Bevel protractor, Sine bar, Angle gauges, spirit level, clinometers, Angle Dekkor and autocollimator.

UNIT-II (9+3)

Sensors and Transducers – Definition of sensors and transducer, classification, criteria for selection of a sensor and transducer, calibration, Force measurement – load cells; strain measurement- strain gauges, strain gauge circuits design of gauges; Displacement measurement- linear variable differential transformer (LVDT), Hall Effect sensor and capacitive sensors; Acceleration measurement– Piezoelectric transducers; Pressure measurement– Bourdon tube, diaphragm pressure gauge and U- tube manometer; Temperature measurement– thermocouple, resistance temperature detectors(RTD), Thermister and bimetallic strips.

UNIT-III (9+3)

Measurement of geometrical tolerances –straightness, flatness, squareness, parallelism, roundness and cylindricity; Industrial applications – piston profile tester, roundness tester, co-ordinate measuring machine

Metrology of machine tools – Equipment required for alignment tests, alignment testing of lathe, alignment testing of radial drilling machine.

Limits, fits and tolerances –systems of limits and fits, interchangeability and selective assembly, tolerance, allowance, examples. Taylor's principles for limit gauges, design of gauges and wear allowance. Classification of limit gauges - ring, plug, snaps gauges.

UNIT-IV (9+3)

Comparators – Introduction, Mechanical comparators -Johansson Mikrokater, Sigma comparator; optical comparator-principle, profile projector; pneumatic comparator-Differential back pressure type comparator.

Metrology of Surface roughness: terminology and importance, Measurement of surface roughness- center line average (CLA) roughness, root mean square (RMS) roughness, highest peak to lowest valley height; surface roughness equipment- Stylus probe instrument, Tomlinson surface meter, Taylor-Hobson Talysurf.

Metrology of screw threads: terminology, measurement of effective diameter by 2-wire and 3-wire methods, best wire size.

Metrology of gears – Spur gear tooth profile measurement - profile projector, involute measuring machine; Gear tooth thickness measurement – gear tooth vernier.

Text Books:

1. Anand K Bewoor and Vinay A Kulkarni, "Metrology and Measurement", 1st edn., *McGraw Hill Ltd.*, New Delhi, 2015.(Chapters 1-12 and 15-21)
2. I. C. Gupta, "Engineering Metrology", 7th edn., *Dhanpat Rai and Sons,* New Delhi, 2008. (Chapters 1,2,4,5 and 8-13)

Reference Books:

1. T. G. Beckwith and Buck, N. L. "Mechanical Measurements", 2nd edn., *Addison Wesley*, 1969.
2. R. K. Jain, "Engineering Metrology", 20th edn., *Khanna Publishers*, New Delhi, 2007
3. R. L. Murty, "Precision Engineering in Manufacturing", 1st edn., *New Age International*, New Delhi, 2005.

Course Learning Outcomes(CO):

Upon completion of this course, students will be able to….

CO1: explain generalized measurement system and characteristics of measuring devices

CO2: perform the measurement of an industrial parameter using sensors and transducers and analyze the results

CO3: plan alignment testing of a given machine tool and design the limit gauges for inspection of given dimension

CO4: select a suitable comparator and gauge for an engineering applications

CO5: explain metrology of surface roughness, screw threads and gears

U14ME505 **KINEMATICS OF MACHINERY**

Class: B. Tech., V-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):

This course will develop students' knowledge in/on

LO1: comprehend the fundamentals of kinematics, to understand the concept of machines, mechanisms and related terminologies. Discriminate mobility (number of degrees-of-freedom). Enumeration of rigid links and types of joints within mechanisms. to make the students become familiar and understand the most commonly used mechanisms (4-bar, 6-bar linkages)

LO2: to study the velocity and acceleration polygon for different mechanism and to find out the velocity and acceleration of various links and formulate the concept of synthesis and analysis of different mechanisms

LO3: learn the concept of the theory of cams

LO4: learn the concept gears and gear trains

UNIT-I (9+6)

Basic Concepts: Element, Link, kinematic pair, kinematic chain, mechanism, inversion, structure, machine, constrained motion, Grubbler's criterion, quadric chain, Grashoff's criterion, Inversions of four bar, single slider and double slider crank chains, steering gear mechanism.

Velocity Analysis: Relative Velocity Method, Instantaneous center Method, the Aronhold-Kennedy Theorem of Three centers, Velocity Diagrams.

UNIT-II (9+6)

Acceleration Analysis: Radial and Transverse Components of Acceleration, The Coriolis Component of Acceleration, Acceleration Diagrams, and Klein's construction.

Synthesis of Planar Mechanisms Synthesis of four-link mechanism and single slider-crank mechanism: Graphical Method: relative pole method and inversion method, Analytical Method: Frudenstein method, Chebyshev spacing for three precision points.

UNIT-III (9+6)

Cams: Classification of cams and followers. Displacement, velocity and acceleration diagrams for specified follower motion: uniform velocity, SHM, uniform acceleration and retardation, cycloidal motion. Generation of cam profiles with different types of followers: knife-edge, roller, and flat foot. Reciprocating and oscillating types-radial and offset types. Analysis of motions the follower for cams with specified contours-Roller follower on tangent cam, roller follower on convex sided cam, flat-faced follower on convex sided cam.

UNIT-IV (9+6)

Toothed Gearing: Law of gearing, velocity of sliding, involute profile, path of contact, arc of contact, interference, methods to avoid interference, minimum number of teeth on pinion to avoid interference, involute and cycloidal tooth profiles, comparison.

Gear Trains: Simple, compound, reverted, epicyclic gear trains, Analysis of epicyclic gear train, torques in epicyclic gear trains, sun and planet gear, compound epicyclic gear trains, Bevel-epicyclic gear train, Wilson four speed gear box and differential gear box of an automobile.

Text Books:

1. S.S.Rattan, "Theroy of Machines", *Tata McGraw-Hill*, New Delhi. 3rd edition, 2009

Reference Books:

1. Amitabha Ghosh and Ashok Kumar Mallik, "Theory of Mechanisms and Machines", *East West Press Pvt. Ltd.,* New Delhi. 3rd edition 2006
2. Shigley J. E. and John Joseph Uicker, "Theory of Machines and Mechanisms", 2nd edition *McGraw-Hill international edition* (2003)
3. Ambekar, "Theory of Mechanisms and Machines", *Jain Brothers*, New Delhi. First edition,2009
4. Thomas Bevan , "Theory of Machines", *Pearson-India*, 3rd edition,2009
5. J.S.Rao and R.V.Dukkipati, "Mechanisms and Machine Theory", *New Age International,* New Delhi.2nd edition,1992
6. R.S.Kurmi & J.K.Guptha, "Theory of Machines", *S.Chand & Co.,* New Delhi, 14th edition,2005

Course Learning Outcomes(CO):

Upon completion of this course, students will be able to….

CO1: recognize the types and functions of mechanisms, will acquire a clear understanding of degree of freedom of mechanisms in relation to their topological characteristics.

CO2: analyze the acceleration of various links of different mechanisms and perform kinematic analysis and synthesis of planar mechanisms.

CO3: identify different types of cams and followers, draw the cam profiles for various follower motions and evaluate follower velocity and acceleration.

CO4: identify simple and planetary gear trains, differential and determine their speed ratio

U14ME506 **APPLIED THERMODYNAMICS**

Class: B. Tech., V-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: properties of steam and methods of improving the rankine cycle efficiency
LO2: working of low & high pressure boilers and concept of draught
LO3: steam nozzle design and applications of condensers in thermal power plants
LO4: steam turbines working principles and their performance

UNIT –I (9+3)

Properties of Steam: Steam properties, use of property diagram, Mollier diagram, Properties of various processes- Isobaric, Isochoric, Isothermal, Adiabatic, Hyperbolic and Polytropic processes; Measurement of dryness fraction of steam using various calorimeters.
Vapor Power Cycles: Components of Steam cycle, Rankine Cycle, Modified Rankine Cycle, P-V, h-s and T-s diagrams, Rankine cycle with superheat, reheat and regeneration, Binary vapor cycle.

UNIT –II (9+3)

Steam Generators: Purpose, Classification of boilers, low pressure boilers–working principles of Lancashire, Babcock and Wilcox & Stirling boilers; High pressure boilers–Lamont and Benson boilers; Criteria for selection of a boiler, Boiler Mountings, Accessories and their significance;
Performance of Boilers: Equivalent evaporation, Boiler efficiency, boiler trial and heat balance.

Boiler Draught: Classification of draught, comparison of natural and artificial draught, determination of height and diameter of the chimney, Condition for maximum discharge, efficiency of the chimney, draught losses.

UNIT-III (9+3)

Steam Nozzles: Types of Nozzles, flow through nozzles, velocity of steam , equation of continuity, condition for maximum discharge, expansion of steam considering friction, super saturated flow through nozzles –Wilson's line, degree of under cooling and degree of super saturation, area- velocity and pressure relationship.
Steam Condensers: Elements of a condensing plant, types of condensers, working and comparison of jet and surface condensers, Condenser vacuum, sources of air leakage & its disadvantages, vacuum efficiency and condenser efficiency, Circulating cooling water requirements.

UNIT –IV (9+3)

Steam Turbines: Classification, Impulse and reaction turbine-velocity diagrams, power output , axial thrust , maximum blade efficiency of a single stage impulse turbine, blade friction, compounding of impulse turbine. Reaction Turbine-Flow through impulse-reaction blades, degree of reaction, velocity diagrams, power output, efficiency, blade height, stage efficiency, overall efficiency and reheat factor; Comparison of impulse and impulse-reaction turbines, losses in steam turbines; Governing of steam turbines.

Text Books:

1. Mahesh Rathore, "Thermal Engineering", 1st Edn., *Tata Mc Graw-Hill publications*, New Delhi, 2010.

Reference Books:

1. M.L.Mathur, F.S.Mehta, "Thermal Engineering", Jain Brothers, 3rd edn., 2009. New Delhi.
2. P.K. Nag., "Basic and Applied Thermodynamics", *Tata McGraw Hill, 8th edn.*, 2006.
3. R. Yadav, "Thermodynamics and Heat Engines", *Central Publishing House*, 6th edn., 2012.
4. V. P. Vasandani and D. S. Kumar, "Heat Engineering", *Metropolitan Book Co Pvt. Ltd.*, 3rd edn., 1979.
5. P. Chattopadhyay, "Engineering Thermodynamics", *Oxford University press*, 1st edn., New Delhi, 2011.

Course Learning Outcomes(CO):

Upon completion of this course, students will be able to….

CO1: compute the properties of steam and efficiency of rankine cycle with reheat and regeneration
CO2: categorize the boilers, their working principle and design of chimney
CO3: explain the need of nozzle and condensers in power plants
CO4: analyze the operation of steam turbines and compare their performance characteristics

U14ME507 FUELS AND INTERNAL COMBUSTION ENGINES LABORATORY

Class: B. Tech., V-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives(LO):
This laboratory course will develop students' knowledge in/on
LO1: flash, fire points and carbon residue of a fuel
LO2: kinematic and dynamic viscosity of a fuel
LO3: testing methods used to measure the performance parameters of an engine
LO4: comparison of performance of computer aided and conventional IC engines

LIST OF EXPERIMENTS:

1. Flash and fire points of a given fuel using Cleveland's apparatus.
2. Fire point of a given fuel by using Abel's apparatus.
3. Kinematic and dynamic viscosity measurement of a given fuel/lubricating oil using Redwood viscometer apparatus.
4. Carbon residue of a given fuel using Rams bottom apparatus.
5. Performance test and heat balance test on conventional single cylinder four stroke, Compression Ignition Engine with Brake Drum Dynamometer.
6. Performance test on and heat balance test conventional twin cylinder, four stroke, Compression Ignition engine with hydraulic dynamometer
7. Performance test and heat balance test on three cylinder, four stroke, Spark Ignition engine with eddy current dynamometer
8. Performance test on single cylinder, four stroke, Compression Ignition engine with eddy current dynamometer with Variable Compression Ratio.
9. Valve Timing Diagram of a single cylinder four stroke, Compression Ignition Engine.
10. Morse test on four stroke, four cylinder Spark Ignition Engine.
11. Exhaust gas analysis on three cylinder, four stroke, Spark Ignition engine with eddy current dynamometer.
12. Smoke analysis on conventional single cylinder four stroke, Compression Ignition Engine with Brake Drum Dynamometer.
13. Performance test and heat balance test on computer aided single cylinder four stroke, Compression Ignition Engine with eddy current Dynamometer.
14. Assembly and Disassembly of an IC engine.

Note*: Any 12 Experiments may be conducted from the above list of experiments.*

Text Books:

1. Ganesan V., "Internal Combustion Engines", *4th Edition, Tata McGraw-Hill*, New Delhi, 2013.

Course Learning Outcomes(CO):
Upon completion of this laboratory course, students will be able to…
CO1: compare the flash, fire points and carbon residue of different fuels
CO2: find the absolute and kinematic viscosity of different fuels
CO3: conduct constant and variable speed tests on IC engines and predict their performance
CO4:compare the performance parameters of conventional and computer aided CI engines

U14ME508 METROLOGY AND INSTRUMENTATION LABORATORY

Class: B. Tech., V-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives(LO):
This laboratory course will develop students' knowledge in/on
LO1: various principles and techniques used for the measurement of industrial parameters
LO2: various types of instruments and gauges
LO3: performance and calibration of instruments
LO4: statistical quality control

LIST OF EXPERIMENTS:

1. Measurement of linear dimensions using Vernier calipers, Vernier height gauge and Gear tooth caliper.
2. Measurement of angular dimensions using bevel protractor and sine bar.
3. Measurement of screw thread characteristics using screw thread micrometer and 3-wire set.
4. Construction of X-bar and R-bar variable charts (SQC)
5. Measurement of bore diameter, taperness and ovality using bore gauge.
6. Alignment tests for machine tools (a) Straightness of shaper tool motion.
   (b) Flatness of lathe bed.
7. Measurement of strain and force using strain gauge transducer.
8. Measurement of displacement using LVDT type transducer and Hall effect transducer.
9. (a) Measurement of angular displacement using variable area capacitive transducer.
   (b) Measurement of level using variable dielectric type capacitive transducer.
10. Measurement of temperature using thermocouple and resistance temperature detectors.
11. (a) Measurement of pressure using Bourdon tube transducer
    (b) Calibration of pressure transmitter using U-tube manometer
12. Measurement of acceleration using piezoelectric accelerometer

Text books:

1. Anand K Bewoor and Vinay A Kulkarni, "Metrology and Measurement", 1st edn., *McGraw Hill Ltd.*, New Delhi, 2015.
2. I. C. Gupta, "Engineering Metrology", 7th edn., *Dhanpat Rai and Sons*, New Delhi, 2008.

Course Learning Outcomes(CO):
Upon completion of this laboratory course, students will be able to…
CO1: explain working principles and use of instruments
CO2: adopt the appropriate instrument/gauge for the measurement of a given dimension
CO3: measure the given parameter/dimension with precision and skill
CO4: analyze and draw the various control charts

U14ME509 **SEMINAR**

Class: B. Tech., V-Semester **Branch:** Mechanical Engineering

Teaching Scheme :

L	T	P	C
-	-	-	1

Examination Scheme :

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LO):
This course will develop students' knowledge in/on…..
LO1: literature review and report writing
LO2: presentation skills and speaking with logical sequence & confidence
LO3: latest and current trends in technologies
LO4: critical thinking

Student has to give independent seminar on the state-of-the-art technical topics relevant to their program of study, which would supplement and complement the program assigned to each student.

Guidelines:

1. The HoD shall constitute a *Department Seminar Evaluation Committee (DSEC)*
2. *DSEC* shall allot a faculty supervisor to each student for guiding on (i) selection of topic (ii) literature survey and work to be carried out (iii) preparing a report in proper format and (iv) effective seminar presentation
3. There shall be only continuous Internal Evaluation (CIE) for seminar
4. The CIE for seminar is as follows:

Assessment	Weightage
Seminar Supervisor Assessment	20%
Seminar Report	30%
DSEC Assessment: *Oral presentation (PPT) and viva-voce*	50%
Total Weightage:	100%

(a) **Report:** Students are required to submit a well-documented report on the chosen seminar topic as per the prescribed format as per the dates specified by *DSEC*
(b) **Presentation:** The students are required to deliver the seminar before the *DSEC* as per the schedule notified by the department
(c) *DSEC* shall decide the course of action on the students, who fail to submit the seminar report and give oral presentation

Course Learning Outcomes (CO):
Upon completion of this course, the students will be able to
CO1: analyze the technical content and prepare a well-documented report
CO2: make effective seminar presentation by exhibiting the presentation skills with confidence in a logical sequence
CO3: explain the current and upcoming technologies
CO4: propose and defend opinions and technical ideas with conviction (not as mere recipient of ideas)

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University)

SCHEME OF INSTRUCTION AND EVALUATION

VI SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAMME

MECHANICAL ENGINEERING

S. No.	Course Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U14OE601	Open Elective-I	4	-	-	4	15	25	40	60	100
2	PC	U14ME602	Heat Transfer	3	1	-	4	15	25	40	60	100
3	PC	U14ME603	Principles of Metal Cutting	3	1	-	4	15	25	40	60	100
4	PC	U14ME604	Dynamics of Machinery	3	1	-	4	15	25	40	60	100
5	PE	U14ME605	Professional Elective-I	4	-	-	4	15	25	40	60	100
6	PC	U14ME606	Heat Transfer Laboratory	-	-	3	2	40	-	40	60	100
7	PC	U14ME607	Principles of Metal Cutting Laboratory	-	-	3	2	40	-	40	60	100
8	PC	U14ME608	Computer Aided Analysis Laboratory	-	-	3	2	40	-	40	60	100
9	PR	U14ME609	Mini Project	-	-	-	2	100	-	100	-	100
			Total	**17**	**3**	**9**	**28**	**295**	**125**	**420**	**480**	**900**

Student Contact Hours / Week : 29
Total Credits : 28

Open Elective-I

OE 601 A – Disaster Management
OE 601 B – Project Management
OE 601 C – Professional Ethics in Engineering
OE 601 D – Rural Technology and Community Development

Professional Elective- I (Design Engineering Stream)

ME 605 A :Finite Element Methods
ME 605 B :Mechanical Vibrations and Condition Monitoring
ME 605 C :Composite Materials

U14OE601A **DISASTER MANAGEMENT**

Class: B.Tech.VI-Semester **Branch:** Common to All

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):
This course will develop students' knowledge in/on
LO1: nature of disaster and types of disasters
LO2: prevention, preparedness and mitigation measures for Earth Quake, floods, fire, landslides, cyclones, tsunamis, nuclear & chemical disasters
LO3: financial management of disaster and related losses
LO4: information and communication technology in disaster management and training

UNIT – I (12)

Introduction & principles of disaster management: Nature - Development, Hazards and disasters; Natural disasters - Earth quakes, Floods, Fire, Landslides, Cyclones, Tsunamis, Nuclear; Chemical dimensions and Typology of disasters - Public health disasters, National policy on disaster management.

UNIT –II (12)

Prevention and mitigation measures: Prevention, Preparedness and mitigation measures for various disasters, Post disaster reliefs and Logistics management, Emergency support functions and their coordination mechanism, Resources and material management, Management of relief camp.

UNIT– III (12)

Risk and vulnerability: Building codes and Land use planning, social vulnerability Environmental vulnerability, Macroeconomic management and sustainable development, Climate change, risk rendition, Financial management of disaster and related losses.

UNIT - IV (12)

Role of technology in disaster management: Disaster Management for Infrastructures, Taxonomy of infrastructure, Treatment plants and process facilities, electrical sub stations, roads and bridges, geo spatial information in agriculture, drought assessment, multimedia technology in disaster risk management and training.

Text Books:

1. Rajib shah and R.R Krishnamurthy, "*Disaster management – Global Challenges and local solutions*" University Press,1st edn,2009.
2. Satish Modh, "*Introduction to Disaster management*", Macmillan Publishers, India, 1st edn., 2010.

References:

1. Jagbir Singh, "*Disaster Management-Future Challenges and Opportunities",* I.K Publishers, 1st edn., 2007.
2. H.K Gupta, "*Disaster management*", Universities Press, India,1st, edn.,2003.
3. G.K. Ghosh, "*Disaster management*", A.P.H. Publishing Corporation, 1st, edn., 2012.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: describe & differentiate types of disasters

CO2: identify prevention & mitigation measures in case of earthquakes, floods, fire, landslides, Cyclones and tsunamis, nuclear & chemical disasters and plan preparedness & execute

CO3: assess financial management of disaster and related losses

CO4: apply information & communication technology for disaster risk management and training the affected

U14OE601B **PROJECT MANAGEMENT**

Class: B. Tech., VI Semester **Branch**: Common to all

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop student's knowledge in/on…
LO1: role of project manager, organization and management functions
LO2: effective time and conflict management
LO3: project planning, scheduling and budgeting
LO4: cost control, risk management and quality control techniques

UNIT – I (12)

Project Management: Understanding project management, Role of project manager, Classification of projects; Project management growth - Definitions and Concepts; Organizational structures - Organizing and staffing the project management office and team; Management functions.

UNIT – II (12)

Time and Conflict management: Understanding time management, Time management forms, Effective time management, Stress and burnout; The conflict environment, Conflict resolution, The management of conflicts, Conflict resolution modes; Performance measurement, Financial compensation and rewards, Morality, ethics, and corporate culture, Professional responsibilities, Success variables, Working with executives.

UNIT – III (12)

Project planning: General planning, Life-cycle phases, Proposal preparation, Project planning, The statement of work, Project specifications, Milestone schedules, Work breakdown structure, Executive role in planning, The planning cycle, Handling project phase outs and transfers, Stopping projects, Scheduling techniques - CPM and PERT, Pricing and estimating.

UNIT – IV (12)

Cost and quality control: Understanding cost control, Earned value measurement system, Cost control problems, Methodology for trade-off analysis; Risk management process, Risk analysis, Risk responses, Monitoring and control of risks, Contract management; Quality management concepts, Cost of quality, Quality control techniques.

Text Books:

1 Harold Kerzner, "Project Management: A Systems Approach to Planning, Scheduling and Controlling", *John Wiley & Sons Inc.,* 10th edn., 2009.

Reference Books:

1 Jack R Meredith & Samuel J mantel Jr, "Project Management : A Managerial Approach" , *John Wiley & Sons Inc.*, 8th edn., 2012.

2 John M Nicholas & Herman Steyn, "Project Management for Business, Engineering and Technology", *Taylor & Francis*, 4th edn., 2012.

3 Adedeji B. Badiru, "Project Management: Systems, Principles and Applications", *CRC Press*, 2012.

Course Learning Outcomes(CO):

Upon completion of the course, the student will be able to…

CO1: identify desirable characteristics of effective project managers

CO2: manage executives, use success factors and resolve conflicting environments

CO3: apply appropriate approaches to plan a new project in-line with project schedule and suitable budget

CO4: identify & explain important risks expected to be encountered in a new project and apply appropriate techniques to assess & improve ongoing project performance

U14OE 601C PROFESSIONAL ETHICS IN ENGINEERING

Class: B. Tech., VI-Semester **Branch:** Common to all

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: human values and engineering ethics
LO2: professionalism and theory of virtues
LO3: safety & risk benefit analysis, professional and intellectual property rights
LO4: environmental & computer ethics and various roles of engineers in a company

UNIT – I (12)

Human Values: Morals, values & ethics , Integrity, Work ethic, Service learning, Civic virtue, Respect for others , Living peacefully ,caring , Sharing , Honesty , Courage ,Valuing time , Co-operation , Commitment , Empathy , Self-confidence , Character , Spirituality.
Engineering Ethics: Senses of "Engineering Ethics", Variety of moral issues, Types of inquiry, Moral dilemmas, Moral autonomy, Kohlberg's theory, Gilligan's theory - Consensus and Controversy.

UNIT – II (12)

Profession and professionalism: Profession and its attributes, models of Professional roles
Theory of Virtues: Definition of virtue and theories of virtues, self-respect, responsibility and senses, modern theories of Virtues, uses of ethical theories
Engineering as social experimentation: Engineering as experimentation, engineers as responsible experimenters, codes of ethics, a balanced outlook on law, the challenger case study

UNIT –III (12)

Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - Three Mile Island and Chernobyl case studies, collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT – IV (12)

Global Issues: Multinational corporations - environmental ethics, computer ethics, weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample Code of Ethics (specific to a particular Engineering Discipline).

Text Books:

1. D R Kiran, "Professional Ethics and Human Values", McGraw-Hill Education (India) Pvt. Ltd., 1/e, 2013.

Reference Books:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Professional Ethics and Human Values", *Prentice Hall of India*, 1/e, 2013.
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", *McGraw-Hill*, 4/e, 2014.
3. Charles D. Fleddermann, "Engineering Ethics", *Prentice Hall,* 4/e, 2004

Course Learning Outcomes(CO):

After completion of this course, students will be able to….

CO1: summarize the need of human values and professional ethics

CO2: explain the concept of professionalism and theory of virtues

CO3: perform risk benefit analysis and describe professional rights & IPR

CO4:describe the various roles of engineer in a company and analyze code of ethics specific to a particular engineering discipline

U14 OE601D RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT

Class: B.Tech.VI-Semester **Branch:** Common to all

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):
This course will develop students' knowledge in/on
LO1: wide spectrum of technologies and processes for implementation in rural and tribal areas
LO2: medicinal and aromatic plants to fulfill the needs of pharmaceuticals industries and rural energy for eradication of drudgery
LO3: purification of drinking water, rain water harvesting and employment generating technologies
LO4: concepts of community organization and development and other related issues in an accessible manner

UNIT – I (12)

Technologies and Process: Building materials and components – Micro concrete roofing tiles, water & fire proof mud walls and thatch, red mud/rice husk cement, types of bricks, ferro-cement water tanks and other products, Cement blocks, Preservation of mud walls; Agricultural implements - Naveen sickle, Animal drawn digger, Grubber weeder, Self propelled reaper, Seed drill, Improved bakhar.
Food Processing: Introduction; Fruit and vegetable preservation – Process flow sheet, Scale of operation, Economic feasibility, Source of technology; Soya milk – Process, Economics; Dehydration of fruits and vegetables; Cultivation of oyster mushroom – Preparation of beds, Spawning, Removal of bags for production of mushrooms, Harvesting and marketing, Economics, Process flow sheet, Source of technology.

UNIT – II (12)

Medicinal and Aromatic plants: Introduction, Plants and its use, Aromatic plants, Cymbopogons, Geranium, Manufacturing of juice, Gel and powder; Rural energy – Cultivation of jatropha curcus and production of biodiesel, Low cost briquetted fuel, Solar cookers and oven, Solar drier, Biomass gasifier.
Bio-fertilizers: Introduction, Vermicompost, Improvement over tradional technology/process, Techno economics, Cost of production, Utilization of fly ash for wasteland development and agriculture.

UNIT – III (12)

Purification of Drinking water: Slow sand filtration unit, Iron removal, Iron removal plant connected to hand pump, Chlorine tablets, Pot chlorination of wells, Solar still, Fluoride removal; Rain water harvesting – Availability of rain water through roof top rain water harvesting, Through percolation tank, Check dams recharging of dug wells.
Employment Generating Technologies: Detergent powder and cake – Process, Process for liquid detergent; Carcass utilization – Improvement over traditional technology, Flow chart, Process, Capital investment; Indigo blue - Dye, Organic plant production, Dye extraction techniques, Aspects of indigo market, Economics; Modernization of bamboo based industries - Introduction, Process for bamboo mat making, Machinery, Products; Agarbatti manufacturing; Vegetable tanning of leathers - Raw material, Soaking, Liming, Reliming, Deliming, Pretanning, Malani, Setting, Yield.

UNIT – IV (12)

Community development: Community organization – Concept, Definition, Need, Functions, Principles, Stages; Community development – Introduction, Concept, Definition, Need, Objectives, Characteristics, Elements, Indicators; Distinguish between community organization and community development;

Community Mobilization: Need, Benefits, Preparing, Initial contact with community, Coordinating, Functions of the community, Challenges, Techniques for mobilizing community, Community contributions, Leadership and capacity building, Community participation, Role of community worker in community mobilization; Models of community organization practice – Local development model, Social planning model, Social action model, Approaches to community organization.

Text Books:

1. M.S. Virdi, "Sustainable Rural Technology", *Daya Publishing House*, ISBN: 8170355656, 2009.
2. Asha Ramagonda Patil, "Community Organization and Development: An Indian Perspective", *PHI Learning private ltd*, 2013.

Reference Books:

1. Punia Rd Roy, "Rural Technology", *Satya Prakashan Publishers*,2009
2. S B Verma, S K Jiloka, Kannaki Das, "Rural Education and Technology", *Deep & Deep Publications Pvt. Ltd*. 2006.
3. Edwards, Allen David and Dorothy G. Jones. "Community and Community Development". *The Hague, Netherlands: Mouton*, 1976.
4. Lean, Mary. "Bread, Bricks, and Belief: Communities in Charge of Their Future". *West Hartford, Kumarian Press,* 1995.
5. Heskin, Allen David, "The Struggle for Community", *West View Press*. 1991
6. Clinard, Marshall Barron. "Slums and Community Development: Experiments in Self-Help", *Free Press*, 1970.

Course Learning Outcomes (CO):

After completion of this course, students will be able to…

CO1: describe various technologies and process which can be implemented in rural and tribal areas

CO2: identify the major medicinal plants are required for commercial supply to Pharma companies and alternative fuel that could meet substantial oil need in the country

CO3: analyze several cost effective technologies for purification of water which can adopted in rural areas, various rain water harvesting techniques of collection and storage of rain water

CO4: describes in detail the process of community development, different aspects of community organization and community mobilization covering needs, benefits and challenges related to it

CO5: explains different models of community organization for bringing social change

U14ME602 **HEAT TRANSFER**

Class: B. Tech., VI -Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):

This course will develop students' knowledge in/on

LO1: conduction mode of heat transfer and governing equations to find the temperature distribution and heat transfer rate.

LO2: formulating the governing equations of extended surfaces and convection heat transfer

LO3: theories of thermal radiation and methods to find the heat exchange for different geometries

LO4: boiling, condensation and analysis of heat exchangers

UNIT-I (9+3)

Introduction: Modes of heat transfer, Fourier's law of heat conduction, Newton's law of cooling, Stefan- Boltzmann's law of radiation, thermal conductivity, effect of temperature on thermal conductivity, thermal resistance, thermal conductance, overall heat transfer coefficient.

Conduction: General heat conduction equation in Cartesian, cylindrical and spherical coordinate systems; One dimensional steady state heat conduction in plain walls, cylinders, spheres, composite systems, critical thickness of insulation; One-dimensional steady state heat conduction with internal heat generation in plain walls, cylinders and spheres; Transient heat conduction-lumped heat capacity systems.

UNIT-II (9+3)

Extended Surfaces: Classification, temperature distribution, efficiency and effectiveness of fin of uniform cross section

Convection: Laminar and turbulent flows- External flow - Concepts of velocity and thermal boundary layers, internal flow - fully developed flow in circular tubes; Physical significance of Reynolds, Prandtl, Nusselt, Stanton and Grashoff numbers; Application of dimensional analysis to free and forced convection, problems based on empirical correlations.

UNIT-III (9+3)

Thermal Radiation: Definitions and concepts-monochromatic and total emissive powers; absorptivity, reflectivity and transmissivity; black and gray surfaces; emissivity, Kirchoff's law, Planck's distribution law, Lambert's cosine law; configuration factor. Heat exchange between black surfaces-large parallel plates, equal parallel and opposite squares, rectangular plates perpendicular to each other. Heat exchange between large parallel plates of different emissivities; Gray body radiation- large parallel plates, concentric cylinders and spheres, small body in a large enclosure, concept of shape and surface resistances, re-radiating surfaces, radiation shields.

UNIT-IV (9+3)

Boiling and Condensation: Heat transfer accompanied by phase change. Regimes of pool boiling and flow boiling, film and drop wise condensation.

Heat Exchangers: Classification-Parallel flow, counter flow and cross flow heat exchangers. Condensers and evaporators; Logarithmic mean temperature difference, NTU-effectiveness.

Text Books:

1. Holman, J. P., "Heat Transfer", *Tata Mc Graw Hill,* 9th Edn., 2008.

Reference Books:

1. Sachedeva R. C., "Heat and Mass Transfer", *4th edn., New Age International, 2012*.
2. P.S. Ghoshdastidar, "Heat Transfer" *Oxford university Press*, 2nd edn., New Delhi, 2012.
3. S.K.Som, "Introduction to Heat Transfer", *PHI,* 1st edn., 2008.
4. Incropera, F. P. and De Witt, D. P., "Fundamentals of Heat and Mass Transfer", *John Wiley and Sons,* 7th edn., New York, 2011.
5. M. Necati Ozisik, "Basic Heat Transfer", *McGraw Hill*, 2nd edn., New York, 1987.

Data book:

1. Kothandaraman.C.P, Subramanian's, "Heat and Mass Transfer Data Book", 8th edn., *New age International*, 2014.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: formulate the governing equations of conduction and apply to various geometrical configurations.

CO2: solve the governing equations of extended surfaces and convection heat transfer with appropriate numerical problems.

CO3: explain the theories of thermal radiation and methods to find the heat exchange for different geometries

CO4: advocate the concept of boiling, condensation and design of heat exchangers

U14ME603 **PRINCIPLES OF METAL CUTTING**

Class: B. Tech., VI- Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: geometry of single and multi point cutting tools and various types of tool reference systems
LO2: mechanics of metal cutting and chip formation models in metal cutting.
LO3: measurement of cutting forces and temperatures in metal cutting operations.
LO4: tool wear, tool life, criteria and machinability.
LO5: economics of metal cutting.
LO6: design of single, multi point cutting tools and press tools.

UNIT-I (9+3)

Tool Materials: types of tool materials, properties and general guidelines for selection of tool materials.
Tool Geometry: Geometry of single point cutting tool. Multi-point cutting tools-geometry of peripheral milling cutters and twist drill, Types of reference system–ASA, ORS, NRS and Maximum Rake System; Conversions of tool angles - ASA and ORS system.
Chip Formation: Classification of cutting operation: orthogonal and oblique machining, Mechanism of chip formation, types of chips, Factors affecting the chip formation, shear plane model, slip line model, relationship for chip geometry.

UNIT-II (9+3)

Mechanics of Chip Formation: Forces in chip formation-Cutting force analysis- Ernst and Merchant analysis-theory of Lee and Shaffer; Effect of cutting parameters on cutting forces, strain and strain rate in metal cutting and energy consideration.
Measurement of Cutting Forces and Temperatures: Dynamometer-principle and construction of two, three component lathe dynamometer. Source of heat in metal cutting- temperature zones, Estimation of average cutting temperature, Measurement of cutting temperature- Tool work thermo couple.

UNIT-III (9+3)

Tool Wear and Tool life: different causes, Types of tool wear, tool wear-measurement; Tool life – Tool life criteria, relation between cutting speed and tool life. Variables affecting tool life.
Machinability: defination, criterion for machinability-influence of variables affecting machinability.
Surface finish: effect of machining parameters on surface finish, expression for surface roughness in machining with single point cutting tool.
Cutting Fluids and Economics of Machining: Functions, properties, types and selection; Various types of costs and their estimation, determination of optimum cutting speed for maximum production rate and minimum cost criteria.

UNIT-IV (9+3)

Tool Design: Introduction, classification of press tools; Design of Dies- Die construction, Center of pressure, stock strip layout, press tonnage calculations, Design of piercing die, blanking die, progressive and compound dies.

Design of cutting tools: Design of single point cutting tool, drill bit, milling cutter and form tools.

Text Books:

1. G. K. Lal , "Introduction to Machining Science", 3rd Edn., *New Age International Publishers, 2012. (*Chapters: 2 to 9)
2. P.C.Sharma, "A Text Book Production Engineering", 13th Edn., *S Chand & Company*, New Delhi, 2009. (Chapters: 1,2,11 and 15)

Reference Books:

1. A. Bhattacharya, "Metal Cutting Theory and Practice", *Central Book Publishers*, 1st edn., Calcutta, 1984.
2. Amitabha Ghosh and A K Mallik, "Manufacturing Science", 4th Edn., *Associated East West Press Pvt. Ltd.*,1988 .
3. Geoffrey Boothroyd and Winston A. Knight, "Fundamentals of Machining & Machine Tools", 3rd edn., CRC press, 2005.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: identify the cutting tool geometry, tool material, conditions for formation of different chips and their significance in metal cutting.

CO2: calculate cutting force in orthogonal machining using merchant circle diagram

CO3: measure the cutting forces, temperatures and their importance role in machining.

CO4: evaluate the tool wear, tool life, machinability and proper selection of cutting fluids for economical metal cutting.

CO5: select and design the various cutting and press tools.

U14ME604 **DYNAMICS OF MACHINERY**

Class: B. Tech., VI- Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	--	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):

This course will develop students' knowledge in/on

LO1: to study the function of a governor and different types and properties of governors and their applications.

LO2: to develop the skills for analyzing the effect of gyroscopic couple on different vehicles and to study their stability. to study & estimate the magnitude of the inertia forces for designing slider crank mechanism. to understand turning moment diagrams and principles of flywheels.

LO3: to understand the technique of correcting or eliminating unbalanced inertia forces and moments by introducing additional masses or by removing some mass appropriately.

LO4: to study the concept of vibration .oscillatory behavior of dynamic systems and the importance of damping and its effect on isolation and the various methods of estimating natural frequency of vibration of shafts and to identify critical speeds.

UNIT-I (9+3)

Governors: Function of governor, centrifugal governors, working principles of Watt, Porter, Proel, Hartnell, Wilson-Hartnell governor, sensitiveness, isochronism, hunting, effect of friction, coefficient of insensitiveness, controlling force diagrams, stability criteria, effort and power of a governor.

UNIT-II (9+3)

Gyroscope: Gyroscopic couple, gyroscopic reaction and gyroscopic effect on aeroplanes, ships, two and four wheelers and gyroscopic stabilization.

Static and Dynamic Force Analysis in Mechanisms: Approximate Analytical Method for Velocity and Acceleration of the Piston, Angular Velocity and Acceleration of the Connecting Rod, Piston effort, crank effort, turning moment on crank shaft, inertia forces in reciprocating engines. Turning moment diagrams, fluctuation of speed and energy- Principle of flywheel

UNIT-III (9+3)

Balancing: Effects of unbalance in rotors, static and dynamic balancing, transfer of force to a reference plane, balancing of rotating masses in several planes, partial balancing of reciprocating engines, balancing of multi-cylinder inline engines, analysis of primary and secondary forces and couples, symmetrical engines, balancing of radial engines, V-engines-direct and reverse crank method, working principle of balancing machines

UNIT-IV (9+3)

Vibrations: Free and forced vibrations of a spring mass system with damping, vibration isolation and transmissibility, transverse vibrations of shafts- point load, UDL and several point loads, Dunkerley's method, Energy method, Whirling of shafts, torsional vibrations of rotating shafts-two rotor and three rotor systems and geared system.

Text Books:

1. S.S.Rattan, "Theroy of Machines", *Tata McGraw-Hill*, New Delhi. 3rd edition, 2009

Reference Books:

1. Amitabha Ghosh and Ashok Kumar Mallik, "Theory of Mechanisms and Machines", *East West Press Pvt. Ltd.,* New Delhi. 3rd edition 2006
2. Shigley J. E. and John Joseph Uicker, "Theory of Machines and Mechanisms", 2nd edition *McGraw-Hill international edition* (2003)
3. Ambekar, "Theory of Mechanisms and Machines", *Jain Brothers*, New Delhi. First edition,2009
4. Thomas Bevan , "Theory of Machines", *Pearson-India*, 3rd edition,2009
5. J.S.Rao and R.V.Dukkipati, "Mechanisms and Machine Theory", *New Age International,* New Delhi.2nd edition,1992
6. R.Venkata Chalam, "Mechanical Vibrations", *PHI* 1st edn., 2014.
7. R.S.Kurmi & J.K.Guptha, "Theory of Machines", *S.Chand & Co.,* New Delhi, 14th edition,2005.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: recognize the types and functions of governors & will acquire a clear understanding of their performance characteristics.

CO2: analyze the effect of gyroscopic couple on different vehicles and will be familiar with the principles of their stability. perform inertia force analysis of slider crank mechanism

CO3: perform static and dynamic balance of rotary and reciprocating masses

CO4: know the importance of natural frequency of vibration and damping of systems and to identify critical speeds.

U14ME 605 A **FINITE ELEMENT METHODS**

Class: B. Tech., VI-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Exam	60 marks

Course Learning Objectives(LO):

This course will develop students' knowledge in/on

LO1: fundamental concepts and procedure of finite element method, convergence criteria; one dimensional bar elements-shape functions, stiffness matrices, load vectors and numerical using elimination method of handling boundary conditions.

LO2: truss elements - shape functions, stiffness matrices, load vectors and numerical; beam elements - shape functions, stiffness matrix and numerical problems.

LO3: two dimensional elements-cst elements, shape functions, strain matrix, stiffness matrix; isoparametric formulation - iso, sub and super parametric elements, cst elements, shape functions, strain matrix, stiffness matrix and concept of jacobian matrix.

LO4: steady state heat transfer, one dimensional heat conduction and one dimensional finite element formulation for fins; finite element procedure for structural dynamic analysis; rayleigh ritz's method, galerikin's method procedure of finite element method.

UNIT-I (12)

Introduction: Basic concept and General Description of the Finite Element Method, Comparison of Finite Element Method with other methods of analysis, Engineering Applications of the Finite Element Method, Advantages and Limitations of the Finite Element Method. Discretization of the Domain, Discretization Process, Types of Elements, Element Division, Element Stiffness Matrix, Properties of Stiffness Matrix, Assembly of Global Stiffness Matrix and Load Vector, Formulation of Finite Element Equations, Types of Boundary conditions, Treatment of Boundary Conditions, Convergence of Finite Element Solutions.

One-Dimensional Problems: Bar Elements - Interpolation and Shape functions, Element Stiffness Matrix, Assembly of Global Stiffness Matrix and Load Vector, Application of Boundary Conditions, Solution for Displacements, Reactions, Stresses, Temperature Effects.

UNIT-II (12)

Truss Elements: Interpolation and Shape functions, Plane Truss, Local and Global Coordinate Systems, Element Stiffness Matrix, Stress Calculations, and Temperature Effects.

Beam Elements: Interpolation and Shape functions, Derivation of Element Stiffness Matrix, Finite Element Formulation, Load Vector, Boundary Considerations, Solution for Slope, Deflection, Reactions, and Stresses.

UNIT-III (12)

Two -Dimensional Problems: Derivation of Finite Element Equations using Principle of Virtual Work, Interpolation and Shape functions of Basic Elements - Constant Strain Triangle, Linear Strain Triangle, Four-Node and Eight Node Rectangular Elements.

Isoparametric Formulation: Definition and Concept, Natural Coordinate System, Mapping of Elements, Jacobian Matrix, Four-Node Quadrilateral, Shape Functions, Element Stiffness Matrix, Element Force Vectors, Higher Order Elements, Eight-Node Quadrilateral Elements.

UNIT-IV (12)

Applications in Heat Transfer: Steady State Heat Transfer, One-Dimensional Heat Conduction, One-Dimensional Heat Transfer in Fins.

Structural Dynamics: Dynamic Equations of Motion, Element Mass Matrices, Evaluation of Eigen values and Eigen Vectors.

Weighted Residual and Variational Methods: Principle of Minimum Potential Energy, Galerkin's method and Rayleigh–Ritz's method.

Text Books:

1. Chandrupatla T. R. and Belegundu A. D., *Introduction to Finite Elements in Engineering*, Third Edition, Prentice Hall India, 2002.

Reference Books:

1. Singiresu S. Rao, *The Finite Element Method in Engineering*, Fourth Edition, Elsevier Butterworth–Heinemann, 2005.
2. David V. Hutton, *Fundamentals of Finite Element Analysis*, First Edition, McGraw-Hill, 2004.
3. Robert D. Cook, *Concepts and Applications of Finite Element Analysis*, Fourth edition, John Wiley and Sons Inc., 2002.
4. Chandrupatla T. R., *Finite Element Analysis for Engineering and Technology*, First edition, University Press, 2009.
5. Bathe K. J., *Finite Element Procedures*, Revised edition, Prentice-Hall Inc., USA, 1996.
6. P. Seshu, *Finite Element Analysis,* Tenth edition, Prentice Hall of India, New Delhi, 2012.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: explain the steps involved in fem and concept of convergence criteria; apply the finite element formulation for solving real time one- dimensional bar elements problems.

CO2: solve real time trusses to find displacements, reactions and stresses; identify, formulate and solve different types of beam problems using fem.

CO3: apply the concept of cst element for use in plane stress and plane strain problems; comprehend finite element concepts of quadrilateral elements for use in two dimensional elasticity problems.

CO4: analyze heat transfer problems of conduction and convection and determine temperature distribution within a body; apply finite elements to the analysis of undamped free vibrations of structures; apply rayleigh ritz's and galerikin's method for elasticity problems.

U14ME605B MECHANICAL VIBRATIONS AND CONDITION MONITORING

Class: B. Tech. VI-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: significance of vibrations in design of machine parts that operate in vibratory conditions
LO2: critical speeds, principal modes & vibration absorbers
LO3: analysis of vibration sources causing failure
LO4: the use of vibration signature & vibration severity criteria.

UNIT-I (12)

Single degree of Freedom systems: Introduction, Causes and effects of vibration. Undamped and damped free vibrations, logarithmic decrement, forced vibrations, magnification factor, Vibration isolation and transmissibility; Vibrometers, velocity meters & accelerometers.

UNIT-II (12)

Critical speed: Critical speeds without and with damping, secondary critical speed.

Two degree freedom systems: Differential equations of motion of 2dof system, stiffness and flexibility influence coefficients, Static and Dynamic coupling, Eigen values and Eigen vectors, Principal modes, undamped vibration absorbers, Centrifugal pendulum absorber.

UNIT-III (12)

Condition Monitoring: System failure, component failure, failure decisions, types of failure, failure investigations, causes of failure, various methods of maintenance. Need and importance of condition monitoring, online/off-line monitoring, commonly measured operating characteristics, Typical vibration sources, Spectroscopic oil analysis programme (SOAP), Ferrography .

UNIT-IV (12)

Condition Monitoring techniques: Time domain, frequency domain, FFT analyzers, Fourier analysis, vibration signature, vibration severity criteria, Recognition and Assessment of Defects in Centrifugal machinery, Bladed machinery, Gearing, Reciprocating machines, machine tools, rolling element bearings, Shaft cracks.

Text Books:

1. R.Venkata Chalam, "Mechanical Vibrations", *PHI* 1st edn., 2014. (Chapters 1,2,6,10,11&13)
2. John S. Mitchell, "Introduction to Machinery Analysis and Monitoring", *Pennwell books*, 2nd edn., 1993. (Chapters 1,2,3,5,6,9,15&16)

Reference Books:

1. Groover, "Mechanical Vibrations", 6th edn., *Nemchand and Bros*., 1996.
2. Collacott, R.A., "Mechanical Fault Diagnosis and Condition Monitoring", 1st edn., *Chapman and Hall*, London, 1977.
3. S. Graham Kelly, "Fundamentals of Mechanical Vibrations", *2nd edn., McGraw-Hill, Singapore*, 1993.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: appraise the importance of vibrations in design of machine parts that operate in vibratory conditions.

CO2: evaluate critical speeds, draw principal modes.

CO3: detect the sources of failure by measuring different characteristics of vibration.

CO4: investigate the methods for recognition and assessment of defects in machinery by using vibration severity criteria.

U14ME605C **COMPOSITE MATERIALS**

Class: B. Tech., VI -Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: basics of composite materials and properties and applications of composite materials
LO2: polymer matrix composites, manufacturing and applications
LO3: metal matrix composites, manufacturing and application
LO4: ceramic matrix composites, manufacturing and applications

UNIT- I (12)

INTRODUCTION TO COMPOSITES:
Fundamentals of composites - need for composites, Enhancement of properties; classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC); Reinforcement – Particle reinforced composites, Fibre reinforced composites; Applications of various types of composites.

UNIT-II (12)

POLYMER MATRIX COMPOSITES:
Polymer matrix resins, Thermosetting resins, thermoplastic resins; Reinforcement fibres – Rovings, Woven fabrics, Non woven random mats – different types of fibres; PMC processes - Hand layup processes, Spray up processes, Compression moulding, Reinforced reaction injection moulding, Resin transfer moulding, Pultrusion, Filament winding, Injection moulding; Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP).

UNIT-III (12)

METAL MATRIX COMPOSITES:
Characteristics of MMC, Various types of Metal matrix composites Alloy vs. MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles, fibres; Effect of reinforcement - Volume fraction, Rule of mixtures. Processing of MMC – Powder metallurgy process, diffusion bonding, stir casting, squeeze casting.

UNIT-IV (12)

CERAMIC MATRIX COMPOSITES:
Engineering ceramic materials – properties, advantages, limitations; Monolithic ceramics – Need for CMC, Ceramic matrix - Various types of Ceramic Matrix composites, oxide ceramics, non oxide ceramics, aluminium oxide, silicon nitride; Reinforcements – particles- fibres-whiskers; Sintering - Hot pressing.

ADVANCES IN COMPOSITES:
Carbon /carbon composites – Advantages of carbon matrix, limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform, Sol gel technique; Composites for aerospace applications.

Text Books:

1. Chawla K.K., "Composite materials", 2nd edn., *Springer – Verlag*, 1987

References:

1. Mathews F.L. and Rawlings R.D., "Composite materials: Engineering and Science", Chapman and Hall, London, England, 1st edition, 1994.
2. Clyne T.W. and Withers P.J., "Introduction to Metal Matrix Composites", 1st edn., Cambridge *University Press*, 1993.
3. Strong A.B., "Fundamentals of Composite Manufacturing", 2nd edn. *SME*, 2007.
4. Sharma S.C., "Composite materials", 1st edn., *Narosa Publications*, 2000.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: learn about the different composite materials and their applications in different fields

CO2: understand the importance and manufacturing methods of different composite materials.

CO3: compare the properties of different composite materials and can select a suitable composite material for the particular application

CO4: learn about the carbon/carbon composites, manufacturing methods and applications

U14ME606 **HEAT TRANSFER LABORATORY**

Class: B. Tech. VI-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: thermal conductivity of conductors and insulators
LO2: local and average convective heat transfer coefficient in free and forced convection
LO3: emissivities of gray bodies
LO4: analysis of heat exchangers

LIST OF EXPERIMENTS

1. Thermal conductivity of metal rod.
2. Thermal conductivity of insulating material.
3. Heat transfer through composite walls.
4. Heat transfer coefficient by forced convection for fluid flow through conduit.
5. Heat transfer coefficient by forced convection for vertical surface.
6. Heat Transfer coefficient by free convection over a vertical surface
7. Emissivity of non black surfaces.
8. Estimation of Stefan-Boltz man's constant.
9. Heat transfer through pin fin by natural and forced convection.
10. Estimation of critical heat flux in saturated pool boiling.
11. Parallel and counter flow Heat exchangers.
12. Demonstration of Heat pipes.

Text Books:

1. Holman, J. P., "Heat Transfer", *Tata Mc Graw Hill,* 9th Edn., 2008.

Data book:

1. Kothandaraman.C.P, Subramanian. S, "Heat and Mass Transfer Data Book", 8th edn., *New age International*, 2014.

Course Learning Outcomes (CO):
Upon completion of this course, students will be able to….
CO1: determine the thermal conductivity of conductors and insulators
CO2: compute the local and average convective heat transfer coefficient in free and forced convection
CO3: predict emissivity of gray bodies
CO4: analyze the performance of heat exchangers

U14ME607 PRINCIPLES OF METAL CUTTING LABORATORY

Class: B. Tech. VI-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: tool geometry and mechanism of chip formation.
LO2: study the mechanism of chip formation.
LO3: measurement of cutting forces and temperatures in metal cutting operations.
LO4: tool wear and surface roughness.
LO5: basic principle and operation of EDM.

LIST OF EXPERIMENTS

1. Grinding of single point cutting tool
2. Determination of shear angle in turning
3. Determination of shear angle in shaper
4. Study of chip formation in ferrous materials
5. Study of chip formation in non ferrous materials
6. Measurement of cutting force in turning using lathe tool Dynamo meter
7. Measurement of cutting force in drilling using Drill tool Dynamo meter
8. Measurement of cutting force in milling
9. Measurement of temperature in turning
10. Measurement of tool wear in turning using Tool makers micro scope
11. Determination of surface roughness in turning
12. Demonstration of Electric Discharge Machining

Text Books:

1. G. K. Lal , "Introduction to Machining Science", 3rd Edn., *New Age International Publishers, 2012.*
2. A. Bhattacharya, "Metal Cutting Theory and Practice", *Central Book Publishers*, 1st edn., Calcutta, 1984.

Course Learning Outcomes (CO):
Upon completion of this course, students will be able to….
CO1: grind the single point cutting tool as per ASA system.
CO2: describe the mechanism of chip formation in metal cutting.
CO3: measure the cutting forces, temperatures and interpret their importance in machining.
CO4: evaluate the tool wear, surface roughness in machining.
CO5: describe the un conventional machining processes.

U14ME608 COMPUTER AIDED ANALYSIS LABORATORY

Class: B. Tech., VI-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):

This course will develop students' knowledge in/on

LO1: applying the knowledge of fem to construct finite element models using the library of finite elements available in the software; choosing suitable number of finite elements for the given domain to carry out analysis.

LO2: using the appropriate type of boundary conditions for the given problem.

LO3: solving the problem using commercially available software (solver).

LO4: comparison of the results obtained using FEA with analytical or experimental techniques.

LIST OF EXPERIMENTS

1. Static Analysis of Bars of constant cross section area.
2. Static Analysis of Bars of tapered cross section area and Stepped bar.
3. Static Analysis of Plane Truss member.
4. Shear Force and Bending Moment diagrams of Simply supported beams with point load, UDL, varying load.
5. Modeling and Stress Analysis of Rectangular plate with a circular hole (Plane stress).
6. Analysis of circular pipe (Axi-symmetric).
7. Thermal Analysis – One Dimensional problem with conduction and convection boundary conditions for a fin.
8. Thermal Analysis - One Dimensional problem with conduction and convection boundary conditions for a composite slab.
9. Dynamic Analysis – Determination of Natural frequency.
10. Dynamic Analysis - Modal and Harmonic analysis.
11. Static Analysis using Plate, Shell and Solid Elements.
12. Fluid flow Analysis - Potential distribution in the Two Dimensional bodies.

Text Books

1. N. Nakasone, T. A. Stolarski and S. Yoshimoto., *Engineering Analysis with ANSYS Software*, 1st edition, Elsevier Butterworth-Heinemann, 2006
2. Chennakesava R. Alavala, *Finite Element Methods: Basic Concepts and Applications,* 1st edition, PHI Learning Pvt. Ltd., 2009.
3. David. V. Hutton, *Fundamentals of Finite Element Analysis*, 1st edition, McGraw Hill, 2004.

4. S. Moaveni, *Finite element analysis, Theory and Application with ANSYS*, 4th edn., Prentice Hall, 2014.
5. Chandrupatla, T.R. and Belegundu, A.D., *Introduction to finite Elements in Engineering,* 2edn., Pearson Education, New Delhi, 2003.
6. ANSYS Structural Analysis Guide.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: interpret the steps involved in solving a given analysis problem and understand the procedure for carrying out engineering analysis.

CO2: use the software for doing the analysis and simulation.

CO3: compare the results obtained with other methods of analysis.

CO4: plan to carry out number of iterations by changing the parameters involved in FEA software.

U14ME609 **MINI PROJECT**

Class: B. Tech., VI-Semester **Branch:** Mechanical Engineering

Teaching Scheme :

L	T	P	C
-	-	-	2

Examination Scheme :

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LO):
This course will develop students' knowledge in/on…..
LO1: mini project design in one of the selected areas of specialization with substantial multi-disciplinary component
LO2: using current technologies
LO3: problem solving, motivational and time-management skills for career and life
LO4: problem based learning

Student has to take up independent mini project on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their program of study, which would supplement and complement the program assigned to each student.

Guidelines:

1. The HoD shall constitute a *Department Mini Project Evaluation Committee (DMPEC)*
2. *DMPEC* shall allot a faculty supervisor to each student for guiding on (i) selection of topic (ii) literature survey and work to be carried out (iii) preparing a report in proper format and (iv) effective mini project oral presentation
3. There shall be only continuous Internal Evaluation (CIE) for mini project
4. The CIE for mini project is as follows:

Assessment	Weightage
Mini project Supervisor Assessment	20%
Working model developed under mini project	40%
Final Report on mini project	20%
DMPEC Assessment: *Oral presentation (PPT) and viva-voce*	20%
Total Weightage:	100%

Note:

a) **Working Model:** Students are required to develop a working model on the chosen work and demonstrate before the *DMPEC* as per the dates specified by *DMPEC*
b) **Report:** Students are required to submit a well-documented report on the on the work carried out in the prescribed format as per the dates specified by *DMPEC*
c) **Presentation:** The students are required to deliver the seminar before the *DMPEC* as per the schedule notified by the department
d) *DMPEC* shall decide the course of action on the students, who fail to complete mini project, submit report and give oral presentation

Course Learning Outcomes (CO):
Upon completion of this course, the students will be able to
CO1: identify, formulate and solve problems related to their program of study
CO2: work independently with minimal supervision
CO3: demonstrate mastery of knowledge, techniques, practical skills and use modern tools of their discipline
CO4: write concisely & convey meaning in a manner appropriate to different readers and verbally express ideas easily understood by others who are unfamiliar with the topic

KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University)

SCHEME OF INSTRUCTION AND EVALUATION

VII SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAMME

MECHANICAL ENGINEERING

S. No.	Course Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	OE	U14OE701	Open Elective-II	4	-	-	4	15	25	40	60	100
2	PC	U14ME702	Turbo Machines	3	1	-	4	15	25	40	60	100
3	PC	U14ME703	Refrigeration and Air Conditioning	3	1	-	4	15	25	40	60	100
4	PE	U14ME704	Professional Elective – II	4	-	-	4	15	25	40	60	100
5	PE	U14ME705	Professional Elective – III	4	-	-	4	15	25	40	60	100
6	PC	U14ME706	Turbo Machines Laboratory	-	-	3	2	40	-	40	60	100
7	PC	U14ME707	Dynamics of Machinery Laboratory	-	-	3	2	40	-	40	60	100
8	PR	U14ME708	Major Project Work *Phase–I*	-	-	7	4	100	-	100	-	100
			Total	**18**	**2**	**13**	**28**	**255**	**125**	**380**	**420**	**800**

Student Contact Hours / Week : 33
Total Credits : 28

Open Elective-II:
OE 701 A- Operations Research
OE 701 B- Management Information Systems
OE 701 C- Entrepreneurship Development
OE 701 D- Forex and Foreign Trade

Professional Elective:-III
ME 705 A- Fuels and Combustion
ME 705 B- Total Quality Management
ME 705 C- Fundamental Principles of Engineering Design
ME 705 D- Automobile Engineering

Professional Elective- II (Production Engineering Stream):
ME 704 A- Modern Machining Processes
ME 704 B- System Simulation
ME 704 C- Design for Manufacturing and Assembly

U14OE701 A OPEARTIONS RESEARCH

Class: B. Tech., VII-Semester **Branch:** CE, ME and CSE

Teaching Scheme :

L	T	P	C
4	-	-	4

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):

This course will develop students' knowledge in/on….

LO1: concepts to solve linear programming problems arise in real life situations involving several parameters using various methods and their advantages

LO2: applications of linear programming namely transportation, assignment and travelling salesman problem which arise in different situations in all engineering branches

LO3: non-linearity in optimization problems, direct search techniques and iterative methods

LO4: applications of optimization techniques in the problem of queuing systems under several situations and their practical relevance

UNIT-I (12)

Linear Programming Problems (LPP): Mathematical models and basic concepts of linear programming problem; Solution of linear programming problems - Graphical method, Analytical method, Simplex method, Artificial variable technique (Big-M and Two-phase methods), Duality principle and dual simplex method.

UNIT-II (12)

Special type of LPPs: Mathematical model of transportation problem, Methods of finding initial basic feasible solution to find the optimal solution of transportation problem, Exceptional cases in transportation problem, Degenerate solution of transportation problem, Assignment problem as a special case of transportation problem, Hungarian algorithm to solve an assignment problem, Special cases in assignment problem.

The travelling salesman problem, Formulation of travelling salesman problem as an assignment problem.

UNIT-III (12)

Non-linear Programming Problems (NLPP): Classical method of optimization using Hessian matrix, Iterative methods - Random search methods, Steepest decent method and Conjugate gradient method; Direct methods - Lagrange's method, Kuhn-Tucker conditions, Penalty function approach.

UNIT-IV (12)

Queuing Theory: Elements of operating characteristics of a queuing system, Probability distribution of arrivals and services system, Generalized model (Birth-Death process), Poisson queuing system, Study of various queuing models with single server and multiple servers having finite and infinite populations.

Text Books:

1. Kanti swarp, P.K.Gupta, Man Mohan, "Operations Research", *S. Chand & Sons*, New Delhi. 16th edn., 2013. (*Unit I,II,IV*)
2. S.S. Rao, "Optimization Techniques", *New Age International*, New Delhi, 3rd edn., 2013. (*Unit III*)

Reference Books:

1. Hamdy. A. Taha, Operations Research, *Prentice Hall of India Ltd,* New Delhi, 7th edn., 2002.
2. J.C. Pant, "Introduction to Optimization", *Jain Brothers*, New Delhi, 7th edn., 2012.

Course Learning Outcomes (CO):

Upon completion of this course, the students will be able to..

CO1: develop the mathematical model of an optimization problem and identify particular case of activities among the several alternatives and solve a given linear programming problem using suitable method

CO2: obtain solution for a special type linear programming problem namely transportation, assignment & travelling salesman problem and infer their practical relevance

CO3: analyze the characteristics of non-linearity in optimization and solve certain NLPP using searching and iterative techniques

CO4: state the importance of queuing system and solve the problems of Poisson queuing models of different types

U14OE701B MANAGEMENT INFORMATION SYSTEM

Class: B. Tech., VII-Semester **Branch:** Common to CE, ME and CSE

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on…
LO1: essentials and strategies of managing information systems
LO2: information technology impacts on society and decision making
LO3: information system applications in manufacturing and service sectors
LO4: information systems in enterprise and supply chain management

UNIT-I (12)

Management information systems: Concepts, Role of the management information system, Impact of the management information system.

E-Business enterprise: Introduction, Organization of business in an E-enterprise, E-business, E-commerce, E-communication, E-collaboration.

Strategic management of business: The concept of corporate planning, Essentiality of strategic planning, Development of the business strategies, Types of strategies, Short-range planning, Tools of planning, Strategic analysis of business.

Information security challenges in E-enterprises: Introduction, Security threats and vulnerability, Controlling security threat and vulnerability, Management security threat in E-business, Disaster management, MIS and security challenges.

UNIT-II (12)

Information technology impact on society: Introduction, Impact of IT on privacy, Ethics, Technical solutions for privacy protection, Intellectual property, Copyright and patents, Impact of information technology on the workplace, Information system quality and impact, Impact on quality of life.

Decision making: Decision-making concepts, Decision-making process, Decision analysis by analytical modeling, Behavioral concepts in Decision-making, Organizational Decision-making, MIS and Decision-making.

Information and knowledge: Information concepts, Information - a quality product, Classification of the information, Methods of data and information collection, Value of the information, General model of a human as an information processor, Knowledge, MIS for knowledge.

UNIT-III (12)

Development of MIS: Development of long range plans of the MIS, Determining the information requirement, Development and implementation of the MIS, Management of information quality in the MIS, MIS - Development process model.

Applications in manufacturing sector: Introduction, Personal management, Financial management, Production management, Raw materials management, Marketing management, Corporate overview.

Applications in service sector: Introduction to service sector, Service concept, Service process cycle and analysis, Customer service design, Service management system, MIS applications in service industry.

UNIT-IV (12)

Business processing Re-engineering (BPR): Introduction, Business process, Process model of the organization, Value stream model of the organization, what delays the business process, Relevance of information technology, MIS and BPR.

Decision support system and Knowledge management: Decision support systems (DSS) concepts and philosophy, DSS application in E-enterprise, Knowledge management, Knowledge management systems, Knowledge based expert system.

Enterprise management systems: Enterprise resource planning (ERP) systems, ERP model and modules, Benefits of the ERP, ERP product evaluation, ERP implementation, Supply chain management (SCM), Information management in SCM.

Text Books:

1. Waman S Jawadekar, "Management Information Systems", *Tata McGraw Hill, Third Edition,* ISBN 0-07-061634-5, 2007.

Reference Books:

1. Ken Laudon, Jane Laudon, Rajnish Dass, "Management information system", *Pearson, Eleventh Edition,* ISBN 978-81-317-3064-5, 2010.
2. Robert Schultheis, Mary Sumner, "Management Information Systems – The Manager's View", *Fourth Edition, Tata McGraw Hill*, ISBN: 0 – 07 – 463879 – 3, 2003.
3. Robert G.Murdick, Joel E.Ross, James R.Clagget, "Information Systems for Modern Management", *Third Edition, Prentice Hall of India,* ISBN: 81 – 203 – 0397 – 0, 2002.
4. Gordon B.Davis, Margrethe H.Olson, "Management Information Systems", *Second Edition, Tata McGraw Hill,* ISBN: 0 – 07 – 040267 – 1, 2000.

Course Learning Outcomes(CO):

Upon completion of this course, students will be able to…

CO1: describe concepts of managing information systems in e-business enterprises

CO2: evaluate privacy, security and quality of information management and decision making systems

CO3: analyze systems for managing information in manufacturing and service sector

CO4: asses effective of information systems which can be adopted in enterprise and supply chain management

U14OE 701C ENTREPRENEURSHIP DEVELOPMENT

Class: B. Tech., VII-Semester **Branch:** CE, ME and CSE

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: various characteristics of entrepreneur and his role in development of the nation
LO2: market survey and demand survey
LO3: functions of various managements/managers in industry
LO4: legal issues in entrepreneurship and intellectual property rights

UNIT –I (12)

Entrepreneurship: Definition, Significance of entrepreneurship, Role of entrepreneurship in development of nation, Characteristics of an entrepreneur, Motivation theories, Role of women entrepreneurship, Types of business organizations, Agencies dealing with entrepreneurship and small scale Industries; Case studies of successful entrepreneurs-Identification of business opportunity.

UNIT-II (12)

Business opportunity: Definition, selection, opportunities in various branches of engineering, Sources of new ideas and screening of ideas
Planning and Launching of an entrepreneurial activity: Market survey and demand survey.
Feasibility studies: Technical feasibility, financial viability and social acceptability.
Break even analysis: Graphical and analytical methods, Preparation of preliminary and bankable project reports, Factors influencing site selection.

UNIT-III (12)

Project Planning: Product planning and development process, Definition of a project, Sequential steps in executing the project.
Plant layout: Principles, types and factors influencing layouts.
Material Management: Purchase procedures, procurement of material.
Fundamentals of Production Management: Production Planning and Control (PPC)-Concepts and Functions, Long & short run problems.
Marketing Management: Definition, Functions and market segmentation.
Financial Management: Objectives & Functions; Sources of finance-internal and external.

UNIT-IV (12)

Human Resource Management: Introduction, Importance, Selection, Recruitment, Training, Placement, Development, Performance appraisal systems.
Legal Issues in Entrepreneurship: Mechanisms for resolving conflicts; Industrial laws- Indian Factories Act, Workmen Compensation Act; Intellectual Property Rights.

Text Books:

1. Robert D.Hisrich, Michael P. Peters, "Entrepreneurship", *Tata McGraw-Hill*, 5th Edition 2002.
2. David H. Holt, "Entrepreneurship New venture creation" *Prentice Hall of India*.2004.

Reference Books

1. Handbook for "New Entrepreneurs", *Entrepreneurship Development Institute of India*, Ahmadabad.
2. T.R. Banga, "Project Planning and Entrepreneurship Development", *CBS Publishers*, New Delhi,1984.
3. Personnel efficiency in Entrepreneurship Development-"A Practical Guide to Industrial Entrepreneurs", *S. Chand & Co.*, New Delhi.

Course Learning Outcomes (COs):

Upon completion of this course, students will be able to….

CO1: describe characteristics of entrepreneur and his role in development of the nation

CO2: apply market survey and demand survey methods to real time situations

CO3: explain the functions of production, marketing and financial managements

CO4: identify the legal issues in entrepreneurship and explain intellectual property rights

U14OE701D FOREX AND FOREIGN TRADE

Class: B. Tech., VII-Semester **Branch:** CE, ME and CSE

Teaching Scheme :

L	T	P	C
4	-	-	4

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

COURSE LEARNING OBJECTIVES (LO):
This course will develop students' knowledge in/on…
LO1: business, business system and its objectives
LO2: fundamentals of foreign trade, procedure and documents required in all the clearances of foreign trade
LO3: foreign exchange market, exchange rate and its determination under various monetary systems
LO4: exchange control objectives, features and methods of exchange control

UNIT-I (12)

Business: Nature and scope, Classification of business activities, Functions of commerce & trade.
Business System: Characteristics and components of business system.
Objectives of Business: Concept, Significance and classification of objectives, Objections against profit maximization.

UNIT-II (12)

Foreign Trade: Introduction of international trade, Basic of external trade, special problems of foreign trade, stages in import procedure, stages in export procedure-bill of lading, mate's receipt, certificate of origin.
Corporations assisting foreign trade: state trading corporation of India, export credit and guarantee corporation, minerals and metals trading corporation of India.

UNIT-III (12)

Foreign Exchange: meaning and importance of exchange rate, methods of foreign payments, the demand and supply of foreign exchange, the equilibrium rate of foreign exchange, functions of foreign exchange market, determination of foreign exchange rate under different monetary systems, mint policy theory, balance of payment theory.

UNIT-IV (12)

Objectives of Exchange Control: characteristics, advantages and disadvantages of exchange control, methods of exchange controls-intervention, exchange restriction, multiple exchange rates, exchange clearing agreements, method of operation, exchange clearing agreements in practice, payments agreements, transfer moratoria; indirect methods.

Text books:

1. C.B. Guptha, "Business Organization & Management" *Sultan & Sons Publishers, New Delhi 14/e,* 2012.
2. M.L. Seth, "Macro Economics " *Lakshmi Narayan Agarwal, Publishers, New Delhi , 22/e* 2014.
3. M.C. Vaish, Ratan Prakashan Mandir, "Monetary Theory "*Vikas Publications, New Delhi 16/e,* 2014.

Reference Books:

1. Y.K.Bhushan, "Business Organization and Modern Management" *Sultan & Sons Publishers, New Delhi. 15/e,* 2014.
2. S.A. Sherlekhar "Business Organization and Management", *Himalaya Publishing House, 2000.*
3. K.P.M. Sundaram, "Money Banking, Trade & Finance ", *Sultan & Sons Publishers, New Delhi.*
4. P.N.Chopra, "Macro Economics", *Kalyani Pubnlishers, 1/e, Ludhiana*

COURSE LEARNING OUTCOMES (CO):

Upon completion of this course, students will be able to….

CO1: describe business, business system and classify the business objectives

CO2: outline the foreign trade procedure and explain the special problems involved in foreign trade

CO3: describe the foreign exchange market, determine exchange rate and explain theories of exchange rate determination

CO4: state objectives and illustrate methods of exchange control

U14ME702 **TURBO MACHINES**

Class: B. Tech., VII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: impact of fluid jets and hydraulic turbines
LO2: reaction turbines and hydraulic pumps
LO3: functioning of rotary compressors and related performance parameters
LO4: jet and rocket propulsion systems

UNIT-I (9+3)

Impact of Free Jets: Introduction, Force exerted by fluid jet on stationary flat plate, moving flat plate, stationary curved vane and moving curved vane. Torque exerted on a wheel with radial curved vane.

Hydraulic Turbines: Introduction, Head and Efficiencies of hydraulic turbines, Classification, Pelton wheel- Work done and efficiencies, Working proportions, Design of Pelton turbine runner, Multiple jet pelton wheel, Radial flow impulse turbine.

UNIT-II (9+3)

Reaction Turbines: Francis turbine, Work done and Efficiencies of Francis turbine, Working proportions, Design of Francis turbine runner, Draft Tube Theory, Kaplan Turbine, Working proportions of Kaplan turbine.

Performance of Turbines: Introduction, Performance under unit head-unit quantities, Performance under specific conditions, Expressions for specific speeds for different turbines, Performance characteristic curves, Model testing of turbines, Cavitation in turbines; Selection of turbines.

Centrifugal Pumps: Introduction, Components and Working of centrifugal pumps, Types, Work done by the impeller, Head of pump, Losses and efficiencies. Specific speed, Model testing of pumps, Pumps in series and parallel, Characteristics curves and Cavitation.

UNIT-III (9+3)

Rotary Compressors: Introduction, Classification, Comparison between reciprocating and rotary compressors; Roots blower, Vane type and Screw compressors.

Centrifugal Compressors: Working, Velocity diagram, Degree of reaction, Losses and Efficiency of centrifugal compressor, Slip and Slip factor, Work factor and Pressure coefficient, Effect of impeller blade shape on compressor performance, Choking and Surging.

Axial flow compressors: Working, velocity triangles, Degree of reaction, Polytropic work input, polytropic efficiency, Flow coefficient, Work coefficient, Pressure coefficient, Losses in axial flow compressor, Surging, Choking and Stalling, Difference between centrifugal and axial flow compressors.

UNIT-IV (9+3)

Jet Propulsion: Principle of Jet Propulsion, Classification of Propulsive engines, Ram jet, pulse jet, turbo jet and turbo prop engines, Terminology of turbojet engine, Analysis of turbo jet cycle.

Rocket Propulsion: Principle, Classification, Difference between jet engine and rocket engine, Propellants- solid, liquid and hybrid propellants, Analysis of rocket propulsion

Text Books:

1. Modi and Seth, "Hydraulics and Fluid Mechanics", 17th edn., *Standard Book House*, New Delhi, 2009.(Chapter 20, 21, 22 & 24)
2. Mahesh M Rathore, "Thermal Engineering", 1st edn., *Tata Mc Graw-Hill*, New Delhi, 2010. (Chapter 26 & 28)

Reference Books:

1. B. U. Pai, "Turbomachines", 1st edn., *Wiley India Pvt. Ltd*. New Delhi, 2013.
2. Jagadish Lal, "Fluid Mechanics & Hydraulics", 19th edn., *Metropolitan Book Co., Pvt. Ltd.*, New Delhi, 2009.
3. P.R. Khajuria, S.P.Dubey, "*Gas Turbines & Propulsive systems*", 5th edn., *Dhanapat Rai & sons*, New Delhi, 2013.

Course Learning Outcomes (COs):

Upon completion of this course, students will be able to…

CO1: apply the momentum principle to fluid jets on different profile vanes
CO2: analyze the impulse and reaction turbines for energy transfer
CO3: determine the performance parameters of centrifugal and axial flow compressors
CO4: explain jet and rocket propulsion systems

U14ME703 REFRIGERATION AND AIR CONDITIONING

Class: B. Tech. VII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	0	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):

This course will develop students' knowledge in/on

LO1: different methods of refrigeration systems and properties of refrigerants

LO2: refrigeration equipment, types of vapor absorption refrigeration systems and non-conventional refrigeration systems

LO3: properties of moist air, psychrometric chart and cooling load calculations

LO4: comfort air conditioning, pressure losses in the duct design and applications of refrigeration & air conditioning

UNIT I (9+3)

Methods of Refrigeration: Definition of Refrigeration, units of refrigeration, Evaporative Refrigeration, Air Refrigeration- Open and dense air refrigeration systems, Bell Coleman cycle, Necessity of providing air conditioning to the air crafts.

Vapor Compression Refrigeration Systems: Representation of Vapor compression Refrigeration cycle on p-h, T-s diagrams,Types of vapor compression Refrigeration system - Wet versus dry compression, super heating, sub cooling, effect of suction pressure and discharge pressure on COP.

Refrigerants: Classification, Refrigerant nomenclature, properties of refrigerants-thermodynamic, physical and safe working properties, Global warming potential, Ozone depletion potential

UNIT II (9+3)

Refrigeration Equipment: Advantages of Hermetically sealed compressor, Condensers-air cooled, water cooled and evaporative condensers, Effect of Non condensable gasses on performance of condenser, Expansion devices-Capillary tube, Thermo static and Automatic expansion valve, Evaporators-Flooded and Dry expansion type evaporators.

Vapor Absorption Refrigeration System: Determination of COP, Types-Aqua-Ammonia, Lithium Bromide –water, Electrolux, Comparison of Vapor compression and Vapor absorption Refrigeration Systems.

Non conventional refrigeration systems:. Thermo-electric refrigeration system – working principle, comparison between thermo electric and vapour compression refrigeration system, Vortex-tube – description, advantages, disadvantages, applications

UNIT III (9+3)

Psychrometry: Definition of Air-conditioning, Psychrometry- properties, relations, chart, processes-steam injection, water injection, adiabatic saturation and chemical dehumidification, bypass factor, summer, winter and year round air conditioning systems-air washer**.**

Cooling Load Calculations: Simple air-conditioning system-state and mass rate of supply air, summer air conditioning, apparatus dew point, with and without ventilation of air, purpose of ventilation, Sensible heat factor- Room, Grand and Effective sensible heat factor.

UNIT IV (9+3)

Comfort Air conditioning: Requirements, Factors governing optimum effective temperature, Metabolic rate, Mechanism of body heat loss

Pressure losses and duct sizing: Continuity equation, Bernoulli's equation, pressure losses, variation of pressure losses along a duct, system resistance, duct design methods.

Applications of Refrigeration & Air Conditioning: Household Refrigerators, Comparison among Window, Split and Central air-conditioners, Design considerations in air-conditioning of Bus, Theatres, Hospitals and Cold storage.

Text Books:

1. Arora S.C. and S. Domkundwar, "A course in Refrigeration and Air Conditioning", *Dhanpat Rai & Sons*, 1st edn., New Delhi, 1999.

Reference Books:

1. Arora C.P., *Refrigeration and Air Conditioning*, Tata McGraw-Hill, 3rd edition, New Delhi, 2009.
2. Wilbert F. Stoecker, Jerold W. Jones , *Refrigeration and Air Conditioning*, McGraw-Hill, 1st edition New Delhi, 1982.
3. Roy J. Dossat, *Principles of Refrigeration,* Prentice Hall International Paperback Editions, 3rd edition, New Delhi , 1991.
4. *ASHRAE Hand Book,* 1st edn., McGraw-Hill, New York, 2009.

Data Books:

1. C. P. Kothandaraman, P B Nagaraj and D Venkatesh, "Refrigerant Tables and Charts including Air Conditioning Data", New age International publishers, New Delhi, 2006.
2. Mathur, M. L., and Mehta, F. S., "*Refrigerant and Psychrometric Properties (Tables & Charts) SI Units*", Jain Brothers publishers, New Delhi, 2010.
3. Khurmi, R. S., and Gupta, J. K., "*Refrigeration Tables with chart*", S. Chand publishers, New Delhi, 2008.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: evaluate the performance of air and vapor compression refrigeration system and explain the desirable properties of refrigerants

CO2: explain the types and working principle of compressors, condensers, expansion devices, evaporators, vapor absorption refrigeration system and non-conventional refrigeration systems

CO3: estimate the cooling load capacity for a given application and represent various processes on the psychrometric chart

CO4: state the requirements of air conditioning determine various types of pressure losses and state the design considerations in various applications of refrigeration & air conditioning

U14ME704A **MODERN MACHINING PROCESSES**

Class: B. Tech., VII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: the nature and characteristics of unconventional machining processes
LO2: the necessity and significance of each modern machining process
LO3: the basic working principle, process capability and application of each modern machining processes
LO4: effect of various process parameters on output performance of the machines

UNIT-I (12)

Introduction: Comparison of conventional and unconventional machining processes, Technological and commercial need, classification, Applications.
Mechanical Energy Based Processes: Ultrasonic Machining (USM)-working principles, components of system, process parameters, material removal rate, surface finish, Tool – feed mechanisms and frequency in USM, Types of abrasives and liquid media, applications and limitations. **Abrasive Jet Machining (AJM)-**elements of the process, types of abrasives and particle sizes, process parameters, **Water jet machining (WJM) -** Introduction**,** jet cutting equipment.

UNIT-II (12)

Electrical Energy Based Processes: Electrical Discharge Machining (EDM)-Working principle, mechanism of material removal, types of spark generators, process parameters, analysis of R-C circuit, equations for material removal rate and surface finish, Dielectric fluids and flushing, electrode materials, Machining accuracy and characteristics of spark eroded surface, applications and limitations, Hybrid Process- Introduction to Electrical Discharge Grinding (EDG).

UNIT-III (12)

Chemical Energy Based Processes: Chemical Machining (CHM)- working principle, equipment used for CHM, Etchants and maskants used in CHM, applications and limitations; **Electro Chemical Machining (ECM)-** Working principle, chemistry of the process, tool-work gap, process parameters, material removal rate and surface finish, applications and limitations, Electrolytes, economy, etchants; **Hybrid Processes**- Introduction to Electro Chemical Grinding (ECG), Electro-Chemical Discharge Grinding (ECDG) and Electro Chemical Honing (ECH).

UNIT-IV (12)

Thermal Energy Based Processes: Plasma Arc Machining (PAM) - working principles, process parameters, Types of torches in PAM, comparison with oxy-fuel cutting. **Electron Beam Machining (EBM)** - working principles, Accuracy and surface finish, metallurgical effects and work environment, applications and limitations; **Laser Beam Machining (LBM)-**Production of lasers, Types of lasers, material removal, applications and limitations.

Text Books:

1. P. C. Pandey and H.S. Shan, "Modern Machining Processes", 1st edn., *Tata McGraw Hill Publications*, 2008.

Reference Books:

1. V. K. Jain, "Advanced Machining Processes", 1st edn., *Allied Publications Limited*, 2010.
2. Carl Sommer, "Non-traditional Machining Handbook", 2nd edn., *Advance Publishing Inc.*, 2009.
3. HMT Production Technology Hand Book, 28th reprint *Tata McGraw Hill*, 2008.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: discriminate the fundamental differences between the conventional and modern machining processes

CO2: compare and contrast all modern machining processes

CO3: apply knowledge and processing characteristics of MMP to production of precision components

CO4: demonstrate the effect of process parameters on the output performance characteristics like material removal rate and surface finish

U14ME704B **SYSTEM SIMULATION**

Class: B. Tech., VII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: concepts of system simulation
LO2: know the random number generation and their tests
LO3: explain about various distribution methods of random numbers
LO4: apply simulation principles to manufacturing systems

UNIT-I (12)

Introduction to Simulation, System and environment – Introduction, Need for simulation, advantages and disadvantages of simulation, areas of application, Components of a system, Discrete and continuous systems, Types of models, Principles used in Modeling, Monte Carlo Simulation, Steps in simulation ,Discrete Event Simulation – concepts of DES , Time advance mechanism, manual simulation using event scheduling, single channel queue, two server queue, , simulation of inventory problem.

UNIT-II (12)

Random Number Generation : Properties of Random Numbers, Techniques for generating random numbers, Midsquare method ,The Midproduct method, Constant multiplier technique, Additive congruential method, Linear congruential method, Tests for random numbers , Frequency tests, Runs tests, Tests for Autocorrelation, Gap Test, Poker test.

UNIT-III (12)

Random Variate Generation : Inverse transform technique – exponential distribution - uniform distribution , Discrete uniform distribution, Triangular distribution, Weibull distribution, Empirical continuous distribution; Convolution method - Erlang distribution. Acceptance – rejection technique for Poisson distribution and Gamma distribution.

UNIT-IV (12)

Analysis of Simulation Data : Data Collection, Identification of Distribution with data, Parameter Estimation, Goodness-of-Fit Tests- Chi square test, Kolmogorov-smirnov good ness of fit dat**a**; Verification and Validation of simulation models; Output Analysis Methods- Transient and steady state behavior –Simulation Based Optimization;
Simulation of Manufacturing Systems: Simulation of waiting line systems, Job shop with material handling and Flexible manufacturing systems, Simulation software for manufacturing, Case studies.

Text Books:

1. Jerry Banks, John S. Carson II etal., "Discrete- Event System Simulation", 5th edn., *Prentice Hall of India*,2010.

Reference Books:

1. Gordon G, "Systems Simulation", 9th edn., *Prentice Hall of India*, 2004.
2. Narsingh Deo, "System Simulation with Digital Computer", 9th edn., *Prentice Hall of India, 2006*.
3. Francis Neelamkovil, "Computer Simulation and Modeling", 1st edn., *John Wiley & Sons, 1987.*

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: design and simulate models
CO2: generate random numbers and perform various tests
CO3: describe statistical distribution of random numbers
CO4: apply simulation techniques to solve various problems in manufacturing

U14ME704 C DESIGN FOR MANUFACTURING AND ASSEMBLY

Class: B. Tech., VII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO:
This course will develop students' knowledge in/on
LO1: the principles of design and material selection for economical production
LO2: the design considerations for machining process.
LO3: the casting processes design and its estimation.
LO4: design guidelines for assembly and metal joining

UNIT-I (12)

INTRODUCTION: Design philosophy steps in Design process - General Design rules for manufacturability -basic principles of designing for economical production - creativity in design, Advantages and Disadvantage of DFM.
MATERIALS: Selection of Materials for design, Developments in Material technology - criteria for material selection - Material selection interrelationship with process, ASHBY charts.

UNIT-II (12)

MACHINED COMPONENTS DESIGN: Considerations for the manufacture of turned parts-drilled parts-milled parts, planed parts,, shaped and slotted parts-Ground parts-parts produced by EDM.

MACHINING PROCESS: Overview of various machining processes - general design rules for machining; dimensional tolerance and surface roughness; Design for machining - Ease - General design recommendations for machined parts.

UNIT-III (12)

METALCASTING: Appraisal of various casting processes, selection of casting process, - general design considerations for casting - casting tolerances - product design rules for sand casting.
DESIGN FOR INJECTION MOLDING: Injection molding systems, Molds, molding cycle time, mold cost estimation, estimation of optimum number of cavities, Assembly techniques, Design Guidelines.

UNIT-IV (12)

DESIGN FOR ASSEMBLY: Design guidelines for manual assembly, Large assemblies, Analysis of an assembly, Rules for product design for automation.
METAL JOINING: Factors in design of weldments-general design guidelines - pre and post treatment of welds - design of brazed joints. Forging - Design factors for forging - general design recommendations.

Text Books:

1. George E Dieter, "Engineering Design- A material processing approach", 5th edn., *McGraw hill international*, 2003.

Reference Books:

1. Geoffrey Boothroyd, Peter Dewhurst & Winston Ansthony Knight, "Product Design for Manufacturing and Assembly" 3rd Edn., CRC Press/2011.
2. Peck, H., "Designing for manufacture", 1st edn., Sir Isaac Pitman & Sons Ltd., 1973.
3. ASM Handbook, Design for manufacture, 2000.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: explain the principles of design and material selection
CO2: apply the design considerations for machining process
CO3: design and analyze the cost estimation for casting
CO4: implement design guidelines for assembling and metal joining

U14ME705A **FUELS AND COMBUSTION**

Class: B. Tech., VII- Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: various types of solid fuels their composition & properties, analysis, process and handling
LO2: liquid fuel processing methods
LO3: various types of gases fuels and gasification process
LO4: stoichiometry relations and combustion process

UNIT-I (12)

Solid Fuels: General, Biomass, Peat, Lignite or Brown Coal, Sub-Bituminous Coal or Black Lignite, Bituminous Coal, Semi-anthracite, Anthracite Coal, Cannel Coal and Boghhead coal, Natural coke, SLV fuel, Origin of coal, Composition of coal, Analysis and Properties of coal, Action of heat on coal, Oxidation of coal, Hydrogenation of coal, Classification of coal.
Processing of Solid Fuels: General, Coal preparation, Storage of Coal, Coal Carbonization, Briquetting of solid fuels and Liquefication of solid fuels.

UNIT-II (12)

Liquid Fuels: Petroleum, Origin of petroleum, Petroleum production, Composition of petroleum, Classification of petroleum, Nature of Indian crude's, Petroleum processing, Important petroleum products.
Properties and Testing: Properties and testing of petroleum and petroleum products, Petroleum refining in India, Liquid fuels from sources other than petroleum, Gasification of liquid fuels, Storage and handling of liquid fuels.

UNIT-III (12)

Gaseous Fuels: Types of gaseous fuels, Natural gas, Methane from coal mines, Producer gas, Water gas, Carbureted water gas, Complete gasification of coal, Underground gasification of coal, Coal gas, Blast furnace gas, Gases from biomass, Refinery gases, Liquified petroleum gases (LPG), Oil gasification, Cleaning and purification of gaseous fuels.

UNIT-IV (12)

Combustion Process (Stiochiometry and Thermodynamics): Combustion Stiochiometry- General, Examples, Rapid methods of combustion stiochiometry; Combustion Thermodynamics- General.
Combustion Process (Kinetics): Nature of Combustion process, Types of Combustion processes, Mechanism of combustion reaction, Spontaneous Ignition Temperature (SIT), Velocity of flame propagation, Limits of inflammability, Structure of flame, Flame stability, Kinetics of liquid fuel combustion, Kinetics of solid fuel combustion.

Text Books:

1. Samir Sarkar, "Fuels and Combustion", 3rd edn., *Universities Press*, 2009.

Reference Books:

1. H. Joshua Philips, "Fuels, Solid, Liquid and Gaseous-Their analysis and valuation", General Books, 2010.
2. K. Kanneth, "Principles of Combustion", 2nd edn., Wiley and Sons, 2005.
3. S.P. Sharma and C. Mohan, "Fuels and Combustion", Tata McGraw-Hill, 1984.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: differentiate between types and processing of various solid fuels
CO2: identify the various liquid fuels other than petroleum
CO3: explain the phenomenon of gasification, cleaning and purification of gaseous fuels
CO4: discuss fundamentals of combustion kinetics

U14ME705B **TOTAL QUALITY MANAGEMENT**

Class: B. Tech., VII- Semester **Branch:** Mechanical Engineering

Teaching Scheme

L	T	P	C
4	-	-	4

Examination Scheme

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: the philosophy, approaches and core values of total quality management (TQM)
LO2: customer requirements and the impact of quality on economic performance of an organization
LO3: statistical tools and techniques
LO4: various quality management certification systems

UNIT- I (12)

Introduction- Need for TQM, definitions and importance of quality, traditional approach to the quality management – Inspection, rejection; evolution of quality;
TQM philosophies –contributions of Deming, Juran, Crosby and Ishikawa; TQM models.

UNIT-II (12)

Planning - Vision, Mission, Quality policy, objective planning and organization for quality; quality policy deployment, quality function deployment (QFD), introduction to business process reengineering (BPR) and analysis of Quality Costs.
Quality Management systems: Need for ISO 9000 systems, clauses, documentation, implementation; Introduction to ISO14000, QS9000 and CMM levels; Implementation of TQM, case studies.

UNIT- III (12)

TQM principles - customer focus, leadership and top management commitment; Employee involvement – Empowerment and team work, supplier quality management, continuous process improvement; training, performance measurement and customer satisfaction.

UNIT-IV (12)

TQM tools and techniques - PDCA, seven statistical tools of quality, new seven management tools, concept of six sigma, failure mode effect analysis (FMEA), Bench marking, JIT, POKA YOKE, 5S, KAIZEN, Quality circles.

Text Books:

1. Oakland. J .S. "*Total Quality Management*", 3rd edn., Butterworth–Hcinemann Ltd., Oxford, , 2003. (Chapters 1-6, 11-13, 15 and 17)
2. V.A. Kulkarni and A.K. Bewoor, "Quality Control", 1st edn., Wiley India Ltd., 2009 (Chapters 1-6, 8 and 10)

Reference books:

1. Juran J.M and Frank M.Gryna Jr., *Quality Planning and Analysis*, 3rd edn., TMH, India, 1993.
2. Dale H. Besterfiled, *Total Quality Management*, 3rd edn., Pearson Education Asia, 2003.
3. Juran's Quality hand book, 5th edn., TMH, 1999.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: describe the TQM philosophies contributed by Deming, Juran, Crosby and Ishikawa

CO2: discuss TQM principles, employee involvement and continuous process improvement in TQM

CO3: explain the importance of leadership, management commitment, team work and customer satisfaction

CO4: adopt proven statistical tools and techniques to enhance quality and management processes

CO5: select proper certification system to evaluate the quality performance of an organization

U14ME705C FUNDAMENTAL PRINCIPLES OF ENGINEERING DESIGN

Class: B. Tech. VII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: different scientific methods and considerations of a good design
LO2: the importance of market scenario, time management, codes and standards
LO3: various customer needs and the QFD technique
LO4: team behavior, creativity and specifications development

UNIT-I (12)

Product design Process: Introduction, Types of design problems, Languages of design constraints, goals, static product, Dynamic product, Design Process, scientific methods of design. Problem solving methodology, Design phases, Considerations of a good design; Conceptual design, embodiment design, detailed design, retirement of the product.; Information sources, Technology Innovation, Design Review.

UNIT-II (12)

Design for customer: Classification of the customers and levels; Market Scenario. Regulatory and social issues, Organization for design, Time management, planning and scheduling, designing codes and standards, Responsible design, Social considerations, Relation of material selection for design, selection process for design

UNIT-III (12)

Need Identification and problem Definition: Identification of customer needs, concurrent design. Bench marking, customer requirements, QFD, Problems solving tools, Brain storming, Affinity diagram, Nominal group technique, Cause and effect diagram, Why-Why diagram, How- How diagram.

UNIT-IV (12)

Concept generation and evaluation: Need of both team and individual effort for concept generation and evaluation, Team behavior and tools, team role, team dynamics, rules for meeting success; Characteristics of a creative designer, Steps to enhance Creative thinking, Creativity methods, Concept generation methods, Concept evaluation method; Conceptual Decomposition, Specifications development.

Text Books:

1. George E. Dieter "Engineering Design" 3rd edn., *Mc Graw-Hill*, 2000.

Reference Books:

1. David G. Ullman "The Mechanical design process" *MC Graw-Hill*, 4th Edition, 2009.
2. Jaya Krishna S. Product *life cycle management concepts and cases, ICFAI* publications, 2011.
3. Karl. T. Ulrich D Eppinger "*Product design and Development* ", Irwin Mc Graw Hill, 2000.
4. Mayall W. H "*Industrial Design for Engineers*", London Hiffee book Ltd, 1988.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: describe the different scientific methods and considerations of a good design
CO2: explain the significance of market scenario, time management, codes and standards in design
CO3: identify various customer needs and apply the QFD technique
CO4: analyze the team behavior, creative thinking and appraise the process of specifications development

U14ME705D **AUTOMOBILE ENGINEERING**

Class: B. Tech., VII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: the anatomy of the automobile in general, location and importance of each part
LO2: the functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels
LO3: suspension, frame, springs and other connections
LO4: emissions controls, electrical systems and ventilation

UNIT-I (12)

Introduction and History - Types of automobiles, classification of automobiles.
Chassis and body- Systems in an automobile, body, chassis frame, parts of automobile body, terminology, automobile frames.
Power unit-All engine components details- engine parts –cylinder heads- cylinder block- piston- piston rings- connecting rod – crank shaft- valve activating mechanisms- combustion chambers, multi cylinder engines , engine balance, firing order.

UNIT-II (12)

Transmission System Gear Box-Tractive effort, types of gear boxes, Automatic Transmission, Over drive, Electronic Transmission Controls, Clutch- Functions of clutches, Principle of a friction clutch, Single and multi plate clutch, Construction of friction disc, wet and Cone clutches, other types of clutches. Propeller shafts**-** Hotchkiss Drive-design considerations, torque tube drive, four wheel drive arrangement.
Braking systems Principle of operation, Theory of leading and trailing shoes, Brake effectiveness, Constructional classification, Operational classification, parking brakes.

UNIT-III (12)

Steering System- Principles and need of steering, components parts, steering gear, steering ratio, Steering lock, turning radius, centre point. Steering, wheel geometry, power steering principle and typical schemes, Front axle scheme and end connections, rear axle, functions, types of rear axle, loads on rear axles, axle casing, Differential gear box.
Suspension System - functions of suspension, component parts, coil springs, leaf springs, air springs, shock absorbers, torsion bars, stabilizer bars, typical combinations of components in suspension systems.

UNIT-IV (12)

Wheel and Tyres - Wheel assembly and parts, pressed wheels and cast wheels, wheel rim, Tyres, aspect ratio, tyres with tubes and tubeless tyres, advantages, construction of a tyre, plies, radial plies, tyre treads and tyre specifications.
Electrical systems- generator circuit and need for cut-out, starting with solenoid and over-running clutch, lighting points in a passenger car, high beam and restricted high beam from head lights, circuits for flashers, horn, wind screen wiper, fuel level indicator, speedometer Cabin heating and cooling,

Emissions and Control – emissions and their effects, pollution control measures, catalytic converters, exhaust system layout, mufflers and resonators. Engine parameters, brief discussion of testing devices, engine service, engine tuning, engine re-boring, cyaniding, nitriding, de-carbonization.

Text Books:

1. Kamaraju Ramakrishna, "Automobile Engineering", *PHI Learning*, New Delhi, 1st Print, 2012.

REFERENCES:

1. Dr. Kirpal Singh, "Automobile Engineering", *Vol. I & II, Standard Publishers* New Delhi 12th Edition, 2011.
2. R. K. Rajput "Automobile Engineering", *PHI Learning Pvt. Ltd.*, 1st Edition, 2007.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: identify the different parts of the automobile and explain the working of various parts like engine, transmission, clutch, brakes

CO2: describe how the steering and the suspension systems operate

CO3: understand the environmental implications of automobile emissions

CO4: develop a strong base for understanding future developments in the automobile industry

U14ME706 **TURBO MACHINES LABORATORY**

Class: B. Tech., VII-Semester **Branch: Mechanical Engineering**

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: performance analysis of different types of hydraulic pumps
LO2: parametric study on impulse and reaction turbines
LO3: working characteristics of simple gas turbine
LO4: analysis of axial, reciprocating and centrifugal compressors

LIST OF EXPERIMENTS

1. Impact of jet on vertical flat plate.
2. Performance parameters of Pelton Wheel.
3. Parametric analysis of Francis Turbine.
4. Performance test on Kaplan Turbine.
5. Performance analysis of Centrifugal Pump.
6. Experimental parametric study of Submerged Pump.
7. Performance analysis of Turbine Pump.
8. Performance test on Reciprocating Air Compressor.
9. Performance characteristics of Axial Flow pump.
10. Performance of a Simple Gas Turbine test rig.
11. Convergent and Divergent Nozzles.
12. Study on performance of Centrifugal blower.
13. Performance characteristics of Axial flow fan.
14. Performance of a gear pump.
15. Estimation of torque by torque converter.

Note*: Any 12 Experiments may be conducted from the above list of experiments.*

Text Books:

1. P.N. Modi and S.M. Seth, "*Hydraulics and Fluid Mechanics including Hydraulic Machines*", Standard Book House, Rajsons Publications Private Limited, 18th edn., 2011.

Course Learning Outcomes (CO):
Upon completion of this course, students will be able to….
CO1: advocate different types of hydraulic pumps
CO2: compute the performance of impulse and reaction turbines
CO3: predict the working characteristics of simple gas turbine
CO4: analyze the performance of axial, reciprocating and centrifugal compressors

U14ME707 **DYNAMICS OF MACHINERY LABORATORY**

Class: B. Tech., VII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: working of cam and follower, the variation of displacement, velocity and acceleration of follower w.r.t the angle of rotation of cam
LO2: working of governors and how the movement of sleeve will regulates fuel to engine
LO3: working of gyroscope and unbalance masses and balancing of masses
LO4: whirling phenomenon and critical speeds and concept of radius of gyration on bi-filar suspension
LO5: importance of dunkerley's rule for beams and damped torsional oscillations, damping coefficient
LO6: programming concepts for vibratory models using c++/matlab

LIST OF EXPERIMENTS

1. To draw the curves for displacement, velocity and acceleration vs angle of rotation for a given cam-follower combination.
2. To draw the controlling force diagrams of Hartnel governors.
3. To verify the relations of gyroscopic effect.
4. Static and dynamic balancing of rotating mass system.
5. To study the whirling phenomenon in shafts.
6. To determine the radius of gyration of given bar by using Bi-Filar suspension.
7. To study the undamped free vibrations of equivalent spring mass system.
8. To verify Dunkerly's rule.
9. Study of damped Torsional vibrations (undamped) of single Rotor shaft system.
10. To Plot the resulting motions of a mass subjected to two harmonic motions & identify the Beat Frequency.
11. To Plot the time variations of the displacement, velocity & acceleration of the mass in a given spring mass system.
12. To plot the impulse response of a single degree of freedom structure due to
    a) a single impact and b) a double impact.

Note: Exercises from 10 to 12 will be solved using MATLAB or C++

Text Books:

1. S.S Rattan, Theory of machines 3rd edition, Tata McGraw Hill Education Private Limited, New Delhi 2009.
2. Singiresu S. Rao, Mechanical Vibrations, 4th Edition, Pearson Education LPE, 2004.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to….

CO1: know the relation between displacements, velocity and acceleration w.r.t angle of rotation for tangent cam-flat follower

CO2: analyze the condition of hartnell governor under different loads

CO3: understand the applied couple is equal to the gyroscopic couple and find the balanced mass and its angular displacement using static and dynamic balancing

CO4: determine the critical speeds during the various loops formed in the shaft at various speed and know the restoring torque and observe the experimental and theoretical radius of gyration is same

CO5: find the natural frequencies of beam at various conditions and then check the dunkeley's rule and determine critical damping factor, logarithmic decrement and damping ratio for torsional oscillations

CO6: write the programs for vibratory models using the c++/matlab

U14ME708 **MAJOR PROJECT WORK** *PHASE-I*

Class: B. Tech., VII-Semester **Branch:** Mechanical Engineering

Teaching Scheme :

L	T	P	C
-	-	7	4

Examination Scheme :

Continuous Internal Evaluation	100 marks
End Semester Examination	-

Course Learning Objectives (LO):
This course will develop students' knowledge in/on…..
LO1: problem based & project based learning
LO2: major project design in one of the selected areas of specialization with substantial multi-disciplinary component
LO3: analytical and research skills
LO4: team work, leadership and interpersonal skills

Student has to take up Major project on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their program of study, which would supplement and complement the program assigned to each student.

- The major project work is a practical, in-depth study of a selected problem and showing an implementable solution the problem
- Major project work enables the student to synthesize and integrate knowledge, connect theory and practice as well as demonstrate holistic achievement of program learning outcomes

Guidelines:

1. The HoD shall constitute a *Department Project Evaluation Committee (DPEC)*
2. Major project work shall be normally conducted in two stages: Major project work *Phase-I* in seventh semester and Major project work *Phase-II* in eighth semester
3. There shall be only continuous Internal Evaluation (CIE) for Major project *Phase-I*
4. CIE for the Major project *Phase-I* in seventh semester is as follows:

Assessment	Weightage
Project Supervisor Assessment	50%
DPEC Assessment: *Registration Presentation, Progress presentation-I, Report submission, oral (PPT) presentation & viva-voce*	50%
Total Weightage:	100%

DPEC shall decide the course of action on the students, who fail to complete the Major project *Phase-I*, submission of preliminary report and oral (PPT) presentation.

Course Learning Outcomes (CO):
Upon completion of this course, the students will be able to
CO1: demonstrate creativity in the design of components, systems or processes of their program of study
CO2: design an innovative product by applying current knowledge and adopt to emerging applications of engineering & technology
CO2: work cooperatively with others to achieve shared goal by motivating team-mates with a clear sense of direction, values and ethics
CO4: write concisely & convey meaning in a manner appropriate to different readers and verbally express ideas easily understood by others who are unfamiliar with the topic

KAKATIYA INSTITUTE O TECHNOLOGY & SCIENCE: WARANGAL-15

(An Autonomous Institute under Kakatiya University)

SCHEME OF INSTRUCTION AND EVALUATION

VIII SEMESTER OF 4-YEAR B.TECH DEGREE PROGRAMME

MECHANICAL ENGINEERING

S. No.	Course Category	Course Code	Course Name	Periods			Credits	Evaluation Scheme				
				L	T	P		CIE			ESE	Total Marks
								TA	MSE	Total		
1	HS	U14MH801	Management, Economics & Accountancy	3	1	-	4	15	25	40	60	100
2	PC	U14ME802	Computer Integrated Manufacturing Systems	3	1	-	4	15	25	40	60	100
3	PE	U14ME803	Professional Elective – IV	4	-	-	4	15	25	40	60	100
4	PE	U14ME804	Professional Elective – V	4	-	-	4	15	25	40	60	100
5	PC	U14ME805	Computer Integrated Manufacturing Systems Laboratory	-	-	3	2	40	-	40	60	100
6	PC	U14ME806	Energy Engineering Laboratory	-	-	3	2	40	-	40	60	100
7	PR	U14ME807	Major Project Work *Phase–II*	-	-	13	7	40	-	40	60	100
			Total	**14**	**2**	**19**	**27**	**180**	**100**	**280**	**420**	**700**

Student Contact Hours / Week : 35
Total Credits : 27

Professional Electives – IV (Thermal Engineering Stream):

ME 803 A- Power Plant Engineering
ME 803 B- Computational Fluid Dynamics
ME 803 C- Design of Thermal Equipment

Professional Electives – V:

ME 804 A-Renewable Energy Sources
ME 804 B- Additive Manufacturing
ME 804 C- Robotics
ME 804 D- Materials Technology

U14MH801 MANAGEMENT, ECONOMICS AND ACCOUNTANCY

Class: B. Tech., VIII semester **Branch:** CE, ME & CSE

Teaching Scheme :

L	T	P	C
3	1	-	4

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):
This course will develop student's knowledge in/on…
LO1: the concepts of management
LO2: the concepts of economics and forms of business organizations
LO3: fundamentals of accountancy
LO4: preparation of final accounts

UNIT-I (9+3)

Management: Meaning and definition, Scope of management, Principles of management; Scientific management- Definition, Characteristics.

Functions of Management: Planning-Definition, Process, Characteristics. Organizing; Definition of organization, Characteristics, Types, Principles of organization. Centralization and Decentralization; Definitions, Features, Merits and Demerits. Communication; process of communication- channels- media and barriers.

Staffing: Meaning and functions of personnel management.

Coordination : Definition, steps to achieve effective coordination.

Controlling: Definition and process.

UNIT-II (9+3)

Economics: Meaning and definition, scope; Micro and macro-Assumptions-Methods and usefulness of economics. Laws of economics-Differences with laws of physical sciences.

Factors of Production: Meaning, definition and characteristics of Land-Labor-capital and entrepreneur. Division of Labor: Types, advantages and disadvantages.

Forms of Business Organization: Sole Proprietor ship, Partnership firm, Types of Partners Cooperative society & Joint stock company-features-Types of Joint stock companies-Merits and demerits.

UNIT-III (9+3)

Double Entry System and Book Keeping: Accounting concepts and conventions, Overview of accounting-cycle. Journal-meaning and journalisation; Ledger- meaning, Ledger posting, Balancing; Two- column-cash book (cash and bank), Preparation of trial balance.

UNIT – IV (9+3)

Preparation of Final Accounts: Trading Account, profit and loss account and Balance Sheet with simple adjustments.

Text Books:

1. Y.K Bhushan, Business Organization and Mamgt., *Sultan Chand*,2012, (Unit I)
2. K.K. Dewett, Modern Economic Theory., *Pearson Ed.,* 2010 (Unit II).
3. T S Grewal. Introduction to Accountancy., *Sultan Chand*.,(Unit III & IV).

Reference Books:

1. Koontz and O'Donnell, Management. ,*Oxford* Publications.,2011
2. L.M.Prasad, Principles and Practice of Management *Sultan Chand*.,2010
3. R.L.Gupta Principles of Accountancy., *Sultan and Chand* Co.,2010

Course Learning Outcomes (CO):

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

CO 1: judge the differences between practical and theoretical management.

CO 2: associate an idea of Micro, Macro Economics and Forms of Business Organisations

CO 3 distinguish between Journal and Ledger.

CO 4: assess the profits and losses & financial position through the Balance Sheet.

U14ME802 COMPUTER INTEGRATED MANUFACTURING SYSTEMS

Class: B. Tech., VIII- Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
3	1	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: types of automation and automation strategies
LO2: robot configuration and concepts of group technology
LO3: basic building blocks and system models
LO4: system transfer functions and closed loop controllers

UNIT-I (9+3)

Automation in Production Operations: Introduction, Functions in manufacturing, Types of automations, automation strategies; Production concepts and mathematical modeling; Organization and information processing in manufacturing system.
Numerical Control of Production Systems: Basic principle and elements of NC CNC, DNC systems.

UNIT-II (9+3)

NC Part programming: Introduction, Manual and Computer Aided Part Programming.
Introduction to Robots: Types, configuration, sensor technology and applications
Group Technology: Introduction, Part families, Classification and coding-OPITZ code; Benefits of GT.
CAPP: Introduction, types of process planning- retrieval and generative, applications**.**

UNIT-III (9+3)

Basic Models: Mathematical models, mechanical system building blocks, electrical system building blocks, fluid system building blocks and thermal system building blocks.
System Models: Engineering system, rotational-translational system, electro- mechanical systems and hydraulic-mechanical system.

UNIT-IV (9+3)

System Transfer functions: Transfer function, first order system, second order system, system in series and systems with feedback loops.
Closed Loop Controllers: Continuous and discrete processes; Control modes Two step mode and proportional mode; Derivative control, integral control, PID controller, digital controllers, velocity controllers and adaptive control.

Text Books:

1. Mikell P Groover, "Automation, Production system and Computer Integrated Manufacturing", 7th edn., *Prentice Hall of India*, New Delhi, 1998. (Chapters 1,2,8,9,10,11,16 and 24)
2. Bolton W, "Mechatronics",*6th edn.,* Pearson Education, 2004 (Chapters 8,9,11 and 13)

Reference Books:

1. PN Rao, NK Tiwari and TK Kundra, *Computer Aided Manufacturing,* Tata McGraw-Hill, New Delhi,
2. Yorem Koran, *Computer Numerical Control of Manufacturing Systems,* McGraw-Hill, New Delhi, 2004.
3. Nitaigour Premchand Mahalik, *Mechatronics: Principles concepts and applications,* Tata McGraw-Hill, New Delhi, 2012.
4. HMT, *Mechatronics,* Tata McGraw-Hill, New Delhi

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: describe types of automation and automation strategies

CO2: explain robot configuration and describe group technology

CO3: define basic building blocks and develop system models

CO4: describe system transfer functions and closed loop controllers

U14ME803A **POWER PLANT ENGINEERING**

Class: B. Tech., VIII- Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: types of nuclear power stations and nuclear waste disposal techniques
LO2: working principles of steam and hydel power plants
LO3: functioning of diesel, gas turbine and combined power plants
LO4: solar thermal & solar photovoltaic power plants

UNIT-I (12)

INTRODUCTION: History, Classification of various energy sources and Present status of energy sources for modern power plants, Types of power plants, Power potentiality in India.

NUCLEAR POWER PLANTS: Introduction, Fuels, Components of nuclear power plants, Types of nuclear power plants- Direct cycle, indirect cycle and indirect with loop, Components of reactor, Properties of coolants and moderators. Types of reactors- Boiling Water, Pressurized Water, Gas Cooled, Breeder and Liquid metal Cooled, Heavy water cooled and moderated, Organic moderated and cooled Reactors. Indian nuclear power stations, Comparison between nuclear and thermal power plants, Disposal of Nuclear waste.

UNIT-II (12)

STEAM POWER PLANTS: Classification of power plants, Site selection, Power plant layout and system components, Fuel handling, Burning-over feed and under feed stokers, Pulverized fuel and its advantages, Air circulation, Water treatment, Cooling towers, Principle of Fluidized Bed Combustion and its advantages, Ash handling and Dust collection.

HYDEL POWER PLANTS: Site selection, Advantages of hydel plants over thermal plants. Classification of hydel power plants- High, Medium and Low head plants, Runoff River plants, Storage reservoir and Pumped storage plants

UNIT-III (12)

DIESEL POWER PLANT: Introduction, advantages and disadvantages, Site selection, Layout of plant, Essential components, Operation of power plant.

GAS TURBINE POWER PLANT: Introduction, Advantages and Disadvantages, Site selection, Essential components, Classification of power plants, Comparison of gas turbine power plants with diesel and thermal power plants, Combined power plant- Introduction, Advantages and Disadvantages, Gas and steam turbine plant, Gas turbine and Diesel power plant.

UNIT-IV (12)

SOLAR POWER PLANTS: Introduction to solar energy, Solar energy measuring devices- Pyranometer, Pyrheliometer and sunshine recorder, Classification of Solar energy collectors- Flat plate collector, Cylindrical parabolic collector and Heliostat Central receiver system, Performance of solar collectors, Types of solar power plants- Low, Medium and High, Solar Pond Technology.

SOLAR PHOTOVOLTAIC POWER PLANT: Principle of solar cell/module, Performance of SPV system, Components of SPV system. Types of SPV power plants- Stand alone system, Grid interactive system, Hybrid power plants-Solar thermal-photovoltaic plant, SPV-Diesel power plant.

Text Books:

1. S.C.Arora & S.Domakundwar, "A Course in Power Plant Engineering", *Dhanpat Rai & Sons,* 3rd Edition New Delhi, 1988.

Reference Books:

1. Wakil M.M.El., "Power Plant Technology", *McGraw-Hill, New York*, 1988.
2. Nag P.K., "Power Plant Engineering", *Tata McGraw-Hill, New Delhi*, 2002.
3. Nagpal G.R., "Power Plant Engineering", *Khanna Publishers, New Delhi*, 1988.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: explain the working of nuclear power plants and waste disposal techniques
CO2: describe the working principles of steam and hydel power plants
CO3: compare the working of diesel, gas turbine and combined power plants
CO4: discriminate solar thermal & solar photovoltaic power plants

U14ME803B COMPUTATIONAL FLUID DYNAMICS

Class: B. Tech., VIII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: basics of CFD and solution procedure to solve CFD problems
LO2: formulation of fluid flow equations
LO3: boundary layer theory and significance of partial differential equations.
LO4: discretization methods used in CFD

UNIT I (12)

Introduction: Introduction to CFD, applications, future scope, advantages and limitations of CFD.
CFD Solution Procedure: Creation of geometry, specification of fluid properties; specification of boundary conditions; numerical solution – initialization, solution control, convergence, post processing – x-y plots, vector plots, contours plots.

UNIT II (12)

Governing Equations: Substantial derivative; divergence; continuity equation for - finite control volume fixed in space and moving with the fluid, infinitesimally small element fixed in space and element moving with the flow; momentum equation; energy equation; Navier-Stokes equations; Euler's equations; types of physical boundaries and corresponding conditions

UNIT III (12)

Turbulence: Boundary Layer Theory over a flat plate-Hydrodynamic and thermal, Boundary layer theory for Internal and external flow of fluids, Definition of turbulence; its source; its impact on solution methodology, k-ε two equation model.
Classification of Partial Differential Equations: Hyperbolic, parabolic and elliptic equations; mathematical behavior of PDEs.

UNIT IV (12)

Discretization: Review on numerical solutions – Lagrangian 2-point and 3-point formulae, forward, backward and central difference methods, applications of numerical methods for discretization, Introduction to finite difference, finite volume method, finite difference equations, explicit and implicit formulations; consistency; error and stability analysis.

Text Books:

1. John D. Anderson Jr, "Computational Fluid Dynamics", *McGraw Hill Education*, 1st edn., 1995.

Reference Books:

1. S. V. Patankar, "Numerical Heat Transfer and Fluid Flow", *McGraw-Hill*, 1st edn, 1980.
2. John C. Tannehill, Dale A. Anderson and Richard H. Pletcher, *Computational Fluid Mechanics and Heat Transfer*, Taylor &Francis, 3rd edn., 2013.

3. H. K. Versteeg & W. Malalasekera, *An Introduction to Computational Fluid Dynamics*, *Pearson*, 2nd edn., 2008.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: create the geometry of simple profiles

CO2: evaluate the nature of PDEs

CO3: formulate fluid flow equations, and derive the equations using control volume and infinitesimally small element for fixed and moving in space

CO4: advocate about discretization, explicit and implicit methods used in CFD

U14 ME803C **DESIGN OF THERMAL EQUIPMENT**

Class: B. Tech., VIII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: classification and design methods of heat exchangers
LO2: pressure drop, friction and pumping power, heat transfer in different flow conditions
LO3: analysis of double pipe heat exchanger
LO4: different types of compact heat exchangers and condensers

UNIT-I (12)

Classification of heat exchangers: Classification – Tubular, plate, extended, surface heat exchangers. Flow arrangements, applications. Basic design methods of heat exchangers- Overall heat transfer coefficient. Multi pass and cross flow heat exchangers – LMTD, effectiveness, NTU method, heat exchanger design calculation and design methodology.

UNIT II (12)

Correlations for forced convection heat transfer coefficients: Laminar forced convection in ducts and concentric annuli, turbulent forced convection in circular pipes, heat transfer in helical coils and spirals, heat transfer in bends.
Heat exchanger pressure drop and pumping power: Tube side pressure drop in laminar and turbulent flows, pressure drop in helical and spiral coils, pressure drop in bends and fittings;

UNIT III (12)

Fouling of heat exchangers: Basic considerations, effect of fouling on heat transfer and pressure drop, aspects of fouling, design of heat exchangers subject to fouling
Double pipe heat exchangers: Pressure drop, hydraulic diameter, hairpin heat exchanger, parallel and series arrangements of hairpins, total pressure drop.

UNIT-IV (12)

Compact heat exchangers: Plate-fin and tube-fin heat exchangers, pressure drop for finned-tube heat exchangers, gasketed plate heat exchangers, pressure drop for plate-fin heat exchangers.
Condensers: Classification- Horizontal shell and tube, horizontal in-tube, plate, air-cooled; Thermal design of shell and tube condensers – design and operational considerations.

Text Books:

1. SadikKakac and Hongtan Liu, "Heat Exchangers Selection *Rating and Thermal Design"*, 2nd edn., *CRC Press*, 2002.

References:

1. Robert W. Serth, "Process heat transfer principles and applications", *Academic press, Elsevier, 2nd edn., 2014.*
2. Sarit Kumar Das, "Process heat transfer", *Alpha Science International,* 1st edn., 2005.
3. Donald Q. Kern, "Process Heat Transfer", *Tata McGraw-Hill*, 2nd edn., 1988.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: apply various design methods to obtain basic dimensions of heat exchangers
CO2: design the heat exchangers with pressure drop and fouling
CO3: compare the design parameters of double pipe, compact, hairpin and plate fin heat exchangers
CO4: compute the size of compact heat exchangers and condensers

U14ME 804A **RENEWABLE ENERGY SOURCES**

Class: B. Tech., VIII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: non-conventional energy sources and solar energy technologies
LO2: wind and geothermal energy sources, hydrogen energy and energy extraction technologies
LO3: methods to extract energy from fuel cell, ocean thermal energy, tidal energy, wave energy
LO4: biomass & biogas energy production, mhd, thermoelectric & thermo-ionic power generation technologies

UNIT-I (12)

Introduction: Distinction between Conventional and Non-conventional sources of energy, present energy scenario, brief description of the different sources.
Solar Energy: Estimation of Solar radiation on the earth surface, Principles of Solar flat Plate Collectors-Air heaters, Evacuated Tube collector, Collectors with booster mirrors, Concentric collectors; Applications of Solar Thermal Collectors - Solar absorption A/c system, water pump, chimney, drier, dehumidifier, still, cooker, Thermal Storage Systems- Energy Storage**,** Sensible, Latent heat and Thermo-chemical storage, Pebble bed.
Solar Photovoltaic (SPV) Systems: Introduction, prospects of SPV systems, principle of a PV cell, large scale SPV systems. PV Cell Technologies- Single, Multi-crystalline and Thin film. SPV Systems – Merits, Limitations, Design considerations, Applications-Street lighting, domestic lighting, Battery charging, SPV pumping systems, Concept of Satellite solar power systems.

UNIT-II (12)

Wind Energy: Brief history of wind power, Principles of wind power, Operation of a wind turbine, Site Characteristics.
Geothermal Energy: Origin and Types of geothermal energy, Operational difficulties, Vapor dominated, Liquid dominated Petro-thermal systems and Hybrid geothermal systems.
Hydrogen Energy: Basics of Hydrogen Energy, Production methods, Storage, Transportation and Applications.

UNIT-III (12)

Fuel Cell: Working principle, Basic thermodynamic and Electrochemical principles, Classification and Applications for power generations.
Energy from Oceans: Ocean temperature difference, Open and Closed cycle analysis, Modification of the Open and closed cycle Analysis, Ocean Waves, Wave motions and Tides, Energy from the waves.

UNIT-IV (12)

Bio Energy: Introduction, Biomass conversion technologies, Wet and Dry processes, Photosynthesis, Biogas generation, Biogas from plant wastes, Methods of maintaining Biogas production, Utilization of biogas; Biomass gasification, Applications of gasifiers.
Magneto Hydro Dynamic (MHD) Power Generation: MHD systems, Open and closed systems, MHD design problems and Developments, Advantages of MHD

Thermoelectric & Thermo-ionic Power Generation: Thermoelectric effects, Principle of thermoelectric power generation, Principle of thermo-ionic converter, Applications.

Text Books:

1. Rai G.D., "Non-conventional Energy Sources", *Khanna Publishers*, 4th Edition, New Delhi, 2009

Reference Books:

1. Sukhatme, S. P., and Nayak, J. K., *Solar Energy: Principles of Thermal collection and storage,* Tata McGraw-Hill,3rd Edition, New Delhi, 2008
2. Duffie and Beckman, *Solar Engineering of Thermal Processes*, John Wiley & Sons, New York, 1991.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: classify non-conventional energy sources and solar energy technologies

CO2: discuss the working mechanism of wind, geothermal and hydrogen energy

CO3: explain the methods to extract energy from fuel cell, ocean thermal energy, tidal energy, wave energy

CO4: design biogas power plant for various applications and explain the working principle of mhd, thermo-electric, thermo-ionic technologies

U14ME804 B **ADDITIVE MANUFACTURING**

Class: B. Tech., VIII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: basics of rapid prototyping process and liquid based rapid prototyping systems
LO2: solid based and powder based rapid prototyping systems
LO3: extrusion based systems, errors in RP processes and rapid tooling techniques
LO4: the rapid prototyping data formats and applications of rapid prototyping.

UNIT-I (12)

Introduction: Introduction to Prototyping, Traditional Prototyping and Rapid Prototyping fundamentals of Rapid prototyping, Advantages and limitations of RP, Distinction between RP and CNC, other related technologies, Classification of RP, rapid prototyping process chain.
Liquid-based Rapid Prototyping Systems: Stereo lithography Apparatus (SLA): Process, working principle, photopolymers, photo polymerization, Layering technology, laser and laser scanning, Applications, Advantages and Disadvantages, Solid ground curing (SGC): Process, working principle, Applications, Advantages and Disadvantages.

UNIT-II (12)

Solid-based Rapid Prototyping Systems: Laminated Object Manufacturing (LOM) Process, working principle, Applications, Advantages and Disadvantages, Fused Deposition Modeling (FDM): Process, working principle, Applications, Advantages and Disadvantages,
Powder Based Rapid Prototyping Systems: Selective laser Sintering (SLS), Powder fusion mechanism and powder handling, Electron Beam melting (EBM), Applications of Powder Bed Fusion Processes. Fraunhofer's Multiphase Jet Solidification, (MJS) , Therics inc.'s theriform technology,Three dimensional Printing (3DP): working principle, Applications, Advantages and Disadvantages,

UNIT-III (12)

Extrusion-Based RP Systems: Fused Deposition Modeling (FDM), Principles, Plotting and path control, Applications of Extrusion-Based Processes.
Rapid Tooling: Conventional Tooling and Rapid Tooling, Classification of Rapid Tooling, Direct and Indirect Tooling Methods, Soft and Hard Tooling methods
Errors in RP Process: Pre-processing, Processing, Post-Processing Errors, Part building errors in SLA, SLS.

UNIT-IV (12)

Rapid Prototyping Data Formats: STL Format, STL File Problems, Consequence of Building Valid and Invalid Tessellated Models, STL file Repairs: Generic Solution, Other Translators, Newly Proposed Formats
RP Applications: Application in Design, Application in Engineering, Analysis and Planning, Aerospace Industry, Automotive Industry, Jewelry Industry, Coin Industry, GIS application, Arts and Architecture and RP Medical and Bioengineering Applications.

Text Books:

1. Chua Chee Kai., Leong Kah Fai., Chu Sing Lim, Rapid Prototyping: Principles and Applications in Manufacturing, 2nd edn., World Scientific, 2003.

Reference Books:

1. Ian Gibson., David W Rosen., Brent Stucker., Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, 1st edn., Springer, 2010.
2. Pham D T and Dimov S S, "Rapid Manufacturing", 1st edn., Verlag, 2001.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: explain the process, working principle and application of liquid base RP processes
CO2: explain the process, working principle and application of solid base RP processes
CO3: explain the process and working principles of extrusion based RP processes,
CO4: describe the rapid prototyping data formats and applications of rapid prototyping

U14ME804C **ROBOTICS**

Class: B. Tech., VIII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: the basic concepts and the various drives and control systems for robots
LO2: overview of the direct kinematics in robotics
LO3: trajectory planning, computed torque technique and feedback control
LO4: the working of different sensors for the robot vision and sensing

UNIT-I (12)

Basic concepts in robotics: Classification of robots, advantages and applications of robots, different joints-revolute joint, prismatic joint etc, degrees of freedom of a manipulator for positioning & orientation, dexterous work space, reachable work space, basic components of a robotic system, factors affecting accuracy and repeatability of a manipulator, controller resolution, dexterity & compactness, Drives and control systems for robots.

UNIT-II (12)

Robot arm kinematics: Direct kinematics, position & orientation of a manipulator, representation of orientation in terms of unit vectors , successive rotations, rotations about two distinct moving axes, rotations about three distinct moving axes, transformation matrix for rotations, combined rotations, transformation between co-ordinate systems, Denavit - Hartenberg representation.

UNIT-III (12)

Trajectory planning: General considerations in trajectory planning, joint interpolated trajectories, planning of Cartesian path trajectories.
Control of robot manipulators: Control of robot arm, computed torque technique, feedback control, resolved motion control, adaptive control.

UNIT-IV (12)

Robot vision and sensing: Different types of sensors, proximity, touch, force and torque sensors, low level and high level vision, vision systems.

Text Book:

1. K.S. Fu, R.C. Gonzalez, C.S.G. Lee, *Robotics*, McGraw Hill, 1987.

Reference Books:

1. Y.Koren, *Robotics for Engineers,* McGraw Hill, 1985.
2. J.J. Craig, *Robotics,* Addison-Wesley, 1986.

Course Learning Outcomes (CO):
Upon completion of this course, students will be able to…
CO1: generate an overview of the basic concepts and categorize the various drives and control systems for robots
CO2: describe advanced algebraic tools like dh representation for the description of motion
CO3: explain basic concepts of trajectory planning and techniques for the control of robot
CO4: differentiate the working of sensors for the robot vision and sensing

U14ME 804 D **MATERIALS TECHNOLOGY**

Class: B. Tech., VIII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
4	-	-	4

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: familiarize student to service requirement of different spectrum of materials
LO2: develop knowledge on scale- heat- corrosion-resisting steels and alloys
LO3: classify mechanical properties and heat resistance of high melting metals
LO4: achieve an understanding of how ceramic materials, polymers are related in origin and structural characteristics

UNIT-I (12)

Alloy steels and alloys - classification-Effects of alloying elements. Structural steels, Mechanical Properties of steel, effect of structure and elements. Heat treatment of Structural steels, Low-Carbon steels, medium-Carbon steels, High strength steels.
Weldability of steel, constructional steel, reinforcing steel, spring steel, ball- bearing steel, defects in alloying steels. Tool steels-general, Tool steels of reduced hardenability, Tool steels of elevated hardenability (alloy tool steels), High speed steels, die steels, hard alloys.

UNIT-II (12)

Scale-resisting, heat-resisting steels and alloys, Estimation, effect of structure and composition on heat-resistance, Classification of heat-resisting alloys
Corrosion-resisting (Stainless) steels Wear- resisting steels and alloys- Wear- resistance, graphitizable steel, high manganese steel, Hard-facing materials.

UNIT-III (12)

Titanium and Titanium alloys, Properties of Titanium, Alloying of Titanium, Heat treatment of Titanium alloys, Impurities in Titanium alloys, Corrosion-resistance of Titanium.
High-melting metals, Mechanical properties and heat resistance, cold brittleness of High-melting metals, Oxidation resistance and Oxidation protection, Corrosion resistance, Alloys with special thermal and elastic properties, Magnetic steels and alloys.

UNIT-IV (12)

Non-ferrous metals and alloys-Light metals and alloys, Copper and Copper alloys, Bearing alloys and Solders, Miscellaneous non-ferrous alloys.
Ceramic materials-Classification of ceramics, mechanical-thermal-electrical properties of ceramic phases, Glasses, polymers and composites; Classification, properties and applications,
Nanomaterials-Advantages and its applications, Selection of materials based on service requirements.

Text Books:

1. A.G. Guy, ***Elements of Physical Metallurgy***, 2nd Edn., Addison and Wesley, New York 1959.

Reference Books:

1. Sydney H. Avner, ***Introduction to Physical Metallurgy***, 2nd Edn., Tata McGraw-Hill, New York 2009.
2. A. Gulyaev, ***Physical Metallurgy***, Volume 2, MIR Publishers, Moscow, 1980.

Course Learning Outcomes (CO):

Upon completion of this course, students will be able to…

CO1: understand properties and effects of alloy addition to steels and heat treatment of steels

CO2: classify scale-resisting, heat-resisting, corrosion-resisting steels and alloys

CO3: gain knowledge on mechanical properties and heat resistance of high melting metals

CO4: understand composition and structure of non ferrous alloys, ceramics, glasses and composites

U14ME805 COMPUTER INTEGRATED MANUFACTURING LABORATORY

Class: B. Tech., VIII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This course will develop students' knowledge in/on
LO1: developing part program on CNC lathe
LO2: developing part program on CNC milling machine
LO3: writing programs to operate various actuators in closed loop and open loop systems
LO4: writing programs to integrate the input and output devices

LIST OF EXPERIMENTS

Part-A

1. Prepare a part program for step turning component and run simulation.
2. Produce a tapered component on CNC lathe.
3. Produce a contour profile component on CNC lathe.
4. Produce linear profile cut on a component using CNC milling machine.
5. Produce circular profile cut on a component using CNC milling machine.
6. Write a program and cut 'K I T S' alphabets

Part-B

1. Controlling A.C. Non servomotor clockwise and anti clockwise with time delay.
2. Controlling A.C. Non servo motor using digital inputs (sensors and micro switches).
3. Control of D.C servomotor in open loop and closed loop with time delay and number of times.
4. Write a program to move X-Y table with time delay and number of times.
5. Write a program to run rotary table in clockwise and anti-clock wise direction with time delay and number of times.
6. Integration of Axis1, AC Non- servomotor and pneumatic cylinder with digital inputs.

Text Books:

1. *ATS Manual of L.S. Mechatronics*, Secunderabad, 2000.
2. P. Radha Krishnan, *Introduction to CNC Machines*, New Age International, New Delhi, 1995.

Course Learning Outcomes (CO):
Upon completion of this course, students will be able to…
CO1: describe part program for various turned parts and perform on CNC lathe
CO2: describe part program for various turned parts and perform on CNC milling
CO3: estimate the performance of ac non servo synchronous motors and dc motors in both open and closed loop systems
CO4: analyze the performance of integrated system (ac non servo synchronous motors and dc motors integrated with sensors

U14ME806 ENERGY ENGINEERING LABORATORY

Class: B. Tech., VIII-Semester **Branch:** Mechanical Engineering

Teaching Scheme:

L	T	P	C
-	-	3	2

Examination Scheme:

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives(LO):
This laboratory course will develop students' knowledge in/on
LO1: Performance parameters of a solar water and air heating system
LO2: characteristics of solar flat collectors
LO3: performance of single and multi photovoltaic modules
LO4: Coefficient of Performance of various refrigeration systems

LIST OF EXPERIMENTS:

1. Identifying and measuring the parameters of a solar PV Module.
2. Series and parallel connection of PV modules.
3. Estimating the effect of sun tracking on Energy Generation by solar PV Modules.
4. Effect of surrounding temperature and intensity on solar PV Panel.
5. Performance parameters of solar water heating system.
6. Performance parameters of solar air heating system.
7. Effect of tilt angle on solar flat plate collector.
8. Performance parameters of solar concentrating collector.
9. Coefficient of Performance parameters of window air-conditioning tutor.
10. Coefficient of Performance of vapour compression refrigeration system.
11. Coefficient of Performance of vapour compression refrigeration system with different lengths of capillary tube.
12. Coefficient of Performance of vapour absorption refrigeration system.
13. Coefficient of Performance of Air-conditioning tutor.
14. Calculation of psychometric properties of various processes using air-conditioning tutor.
15. Vortex tube refrigeration system.

Note*: Any 12 Experiments may be conducted from the above list of experiments.*

Text Books:

1. V. Kadambi, Manohar Prasad, "An *Introduction to Energy Conversion*", Vol -II, 1st edn., New Age International Publications, New Delhi, 1995.

Course Learning Outcomes(CO):
Upon completion of this laboratory course, students will be able to…
CO1: compute the performance parameters of a solar water and air heating system
CO2: advocate the characteristics of solar flat collectors
CO3:determine characteristics of single and multi photovoltaic modules
CO4: compare COP of various refrigeration systems

U14ME807 MAJOR PROJECT WORK *PHASE-II*

Class: B. Tech., VIII-Semester **Branch:** Mechanical Engineering

Teaching Scheme :

L	T	P	C
-	-	13	7

Examination Scheme :

Continuous Internal Evaluation	40 marks
End Semester Examination	60 marks

Course Learning Objectives (LO):
This course will develop students' knowledge in/on…..
LO1: problem based and project based learning
LO2: major project design in one of the selected areas of specialization with substantial multi-disciplinary component
LO3: analytical and research skills
LO4: team work, leadership and interpersonal skills

Student has to continue the major project work in eighth semester as Major Project Work Phase-II.

The evaluation for Major project work *Phase-II* is as follows:

Assessment	Weightage
Project Supervisor Assessment	20%
DPEC Assessment *: Progress presentation-II, Final presentation & Viva-voce and Final Project Report*	20%
End Semester Examination: *Oral (PPT) Presentation & Viva Voce*	60%
Total Weightage:	100%

DPEC shall decide the course of action on the students, who fail to complete the Major project work *Phase-II*, submit final project report and give oral (PPT) presentation.

Course Learning Outcomes (CO):
Upon completion of this course, the students will be able to
CO1: demonstrate creativity in the design of components, systems or processes of their program of study
CO2: design an innovative product by applying current knowledge and adopt to emerging applications of engineering & technology
CO2: work cooperatively with others to achieve shared goal by motivating team-mates with a clear sense of direction, values and ethics,
CO4: write concisely & convey meaning in a manner appropriate to different readers and verbally express ideas easily understood by others who are unfamiliar with the topic