**KAKATIYA INSTITUTE OF TECHNOLOGY & SCIENCE: WARANGAL-15**

*(An Autonomous Institute under Kakatiya University)*

**SCHEME OF INSTRUCTION AND EVALUATION**

**I SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME**

**COMMON FOR ALL BRANCHES OF ENGINEERING**

| S.No. | Course category | Course code | Course Name | Periods | | | Credits | Evaluation Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CIE | | | ESE | Total Marks |
| | | | | L | T | P | | TA | MSE | Total | | |
| 1 | BS | MH101 | Engineering Mathematics – I | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 2 | ES | CS102 | Programming in 'C' | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 3 | BS | CH103 | Engineering Chemistry | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 4 | ES | ME104 | Engineering graphics | 2 | - | 4 | 4 | 15 | 25 | 40 | 60 | 100 |
| 5 | ES | EE105 | Basic Electrical Engineering | 3 | - | - | 3 | 15 | 25 | 40 | 60 | 100 |
| 6 | ES | CE106 | Basic Engineering Mechanics | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 7 | ES | CS107 | Programming in C Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 8 | BS | CH108 | Engineering Chemistry Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| | | | **Total** | **17** | **4** | **10** | **27** | **-** | **-** | **320** | **480** | **800** |
| 9 | MC | CH109 | Environmental Studies | 2 | - | - | 2 | 15 | 25 | 40 | 60 | 100 |
| 10 | MC | EA110 | EAA: Physical Education and NSS | - | - | 2 | 1 | 100 | - | 100 | - | 100 |

MC – Mandatory Course
Student Contact hours/week : 35
Total Credits : 27

**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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1: To enable the student to acquire fundamental knowledge of mathematical concepts and mathematical methods and apply in engineering disciplines.*

*LO2: 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*

*LO3: To introduce the concept of partial differentiation and total differentiation, and maxima & minima of functions of two/several variables*

*LO4: To introduce the concept of double integral and triple integral*

*LO5: 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*

*CO1: 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*

*CO2: understand the basic concepts of limit, continuity, differentiability of a function, and will be able to expand a given function in series*

*CO3: trace a given curve*

*CO4: apply the technique of differentiation under integral sign to solve an integral*

*CO5: find maxima & minima of functions of two/several variables*

*CO6: find double integral and triple integral and apply them to find moment of inertia, centre of gravity of plane lamina*

*CO7: understand Beta and Gama functions and their relations and evaluate an improper integral in terms of Beta and Gamma functions*

*CO8: 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 Examination : | 60 marks |

**Course Learning Objectives:**

*LO1: To expose the students to the concepts of problem solving using structured programming language*
*LO2: To improve students capability in applying logical skills in problem solving*
*LO3: To improve students expertise in C Programming concepts.*
*LO4: 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*

*CO1: know the fundamentals of computers*
*CO2: understand applying logical skills for problem solving*
*CO3: learn C programming language concepts*
*CO4: apply C programming language concepts for problem solving*
*CO5: gain knowledge in using memory management techniques in c programming*
*CO6: 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1: To make the bridge between physics in intermediate level and its applications in engineering by giving proper inputs.*

*LO2: To introduce the basic concepts of all types of oscillations with illustrations by mechanical examples.*

*LO3: To introduce the basic concepts of coherence and polarized nature (interference, diffraction & polarization) of light waves and their applications.*

*LO4: To introduce and explore the knowledge of high frequency sound waves & their application in different fields.*

*LO5: 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.*

*LO6: 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,*

*CO1: understand the basic concepts of physics for its applications to Engineering.*

*CO2: understand the basic principles of oscillations that can be applied to all types of oscillatory phenomena like acoustic, mechanical, electromagnetic, atomic, nuclear etc.,.*

*CO3: 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.,.*

*CO4: appreciate the knowledge gained in studying ultrasonics and their multi dimensional applications in various fields like industrial, engineering (like NDT etc.,.) and medical etc.,.*

*CO5: understand the fundamental principles and applications of lasers and Optical fibers.*

*CO6: 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1: To understand the fundamental principles and applications of chemistry.*
*LO2: To identify the significance of electro chemistry.*
*LO3: To introduce and explore the knowledge of corrosion and its prevention*
*LO4: To impart and inculcate proper understandings of energy sources, phase rule, organic and polymer chemistry*
*LO5: To acquire the techniques of water analysis and treatment*
*LO6: 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,*

*CO1: understand basic principles and role of chemistry in the field of engineering*
*CO2: gain the knowledge of interrelationship between electrical and chemical energy*
*CO3: make a judicious selection of materials in the field of engineering*
*CO4: understand the phase rule and its application in the study of material science*
*CO5: understand the methods of chemical analysis of water and its treatment*
*CO6: know the synthetic methods and versatile applications of polymers*
*CO7: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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1: To acquire writing skills with a focus on accuracy avoiding common errors in English.*
*LO2: To acquire word power enabling to use them in speaking and writing.*
*LO3: To develop reading comprehension skills with local and global comprehension.*
*LO4: 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,*
*CO1: develop writing skills with a focus on accuracy to develop error free English.*
*CO2: develop word power to enable to use them in speaking and writing.*
*CO3: develop reading skills with a focus on developing reading comprehension skills.*
*CO4: 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 Examination | : | 60 marks |

**Course Learning Objectives**:

*LO1. To understand the importance of Engineering Drawing*
*LO2. To communicate effectively through Engineering Drawing*
*LO3. To impart and inculcate proper understanding of theory of projections*
*LO4. 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,*

*CO1. develop concepts on Engineering Drawing in order to become professionally efficient*

*CO2. understand the theory of projections*

*CO3. 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 Examination : | 60 Marks |

**Course Learning Objectives:**

*LO1. To introduce basic concepts of semi conductors and conductivity in semiconductors*
*LO2. To introduce the operation and applications of semiconductor diodes*
*LO3. To introduce the basic concepts of BJT & its DC biasing concepts and FET*
*LO4. 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,*

*CO1. learn the concepts of conductivity in semi conductors*
*CO2. learn the operation of basic semi conductor devices and their V-I characteristics*
*CO3. get familiarized with the concepts of BJT& FET*
*CO4. 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 Examination** | : | 60 marks |

**Course Learning Objectives:**

*LO1. To impart basic knowledge about the Electrical & Magnetic Circuits.*
*LO2. To apply Kirchhoff's laws and Equivalent circuit models to analyze voltage & current relationship in passive circuit.*
*LO3. To inculcate the understanding about A.C. fundamentals and transformers.*
*LO4. 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,

*CO1. predict the behavior of any Electrical & Magnetic Circuits.*
*CO2. solve Electrical Networks by mesh & nodal analysis.*
*CO3. analyze 1-$\phi$ & 3 -$\phi$ AC Basic network and measure the 3-$\phi$ power*
*CO4. 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. To identify various engineering materials and applications.*
*LO2. To understand the basic elements of power transmission.*
*LO3. To know the basic manufacturing processes.*
*LO4. To understand fundamental principles and applications of thermodynamics.*
*LO5. 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,*

*CO1. know the properties and applications of various engineering materials*
*CO2. learn the basic concepts of power transmission*
*CO3. follow the principles and operations of manufacturing technology*
*CO4. understand the laws of thermodynamics and their applications*
*CO5. 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. Study the concept of force, principles of force and their application on engineering structures and machines.*

*LO2. To expose the students various kinds of statically determinate pin jointed structures and methods of analysing the truss.*

*LO3. To know the importance of geometric centre, cross sectional areas of plane bodies through centre of gravity and moment of inertia respectively.*

*LO4. 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,*

- *CO1. understand the physical action of forces on the bodies through free body diagrams and analyse the forces using principles of force.*
- *CO2. determine the axial forces in members of pin jointed structures subjected to various types of loadings.*
- *CO3. understand the technical importance of geometrical shapes and centre of various cross sections.*
- *CO4. 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. To expose the undergraduate students to the practical implementation of C Programming concepts*
*LO2. To improve students capability in applying C Programming for problem solving.*
*LO3. To make students use effective memory management techniques in programming*
LO4. *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,*
*CO1. learn practical implementation of C programming language concepts.*
*CO2. debug and document programs in C.*
*CO3. know usage of logical skills in developing C programs.*
*CO4. apply effective memory management techniques for problem solving*
*CO5. 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. To understand the oscillatory phenomena in determining the various properties like rigidity modulus, moment of inertia, acceleration due to gravity and other elastic properties.*

*LO2. To determine the wavelengths, slit widths, diameters of thin wires etc., with high degree of accuracy using interference and diffraction techniques.*

*LO3. To study the optical activity of some substances.*

*LO4. To determine the optical fiber characteristics.*

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## 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,*

*CO1. handle and apply the powerful radiations like lasers and radioactive rays.*

*CO2. know the interference and diffraction patterns and apply them in precise measurements.*

*CO3. make preferential selection of Optical fibers.*

*CO4. 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. To gain hands-on experience of conventional and instrumental methods of chemical analysis*
*LO2. To introduce water analysis techniques*
*LO3. To understand the principles involved in the polymerization reactions*
*LO4. To gain the knowledge of estimation of metals from their ores*
*LO5. To expose the experiments such as estimation of metal ion by using ion-exchange resin, instrumental methods of chemical analysis, adsorption*
*LO6. 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,*

*CO1. handle analytical instruments for chemical analysis.*
*CO2. determine alkaline species, temporary and permanent hardness of a water sample.*
*CO3. estimate some metals from their ores.*
*CO4. understand the advantages of instrumental methods of chemical analysis over conventional methods.*
*CO5. 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. To understand the importance of workshop practice in Engineering*
*LO2. To acquire proper understanding of various manufacturing processes*
*LO3. 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,*

*CO1. know and understand the types of trades in engineering*
*CO2. 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*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: U**se 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,*

*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*

**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 Examination | : | - |

## I. PHYSICAL EDUCATION

**Course Learning Objectives & Outcomes:**

*LO1. To perform and engage in a variety of physical activities*
*LO2. To develop and maintain physical health and fitness through regular participation in physical activities*
*LO3. To demonstrate positive self esteem, mental health and physiological balance through body awareness and control*
*LO4. 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*

*LO5. arouse the social consciousness of the students*
*LO6. provide them with opportunity to work with people in villages and slums*
*LO7. expose them to the reality of life*
*LO8. bring about a change in their social perceptions*
*LO9. 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,*

*CO1. develop his / her personality through community service rendered*
*CO2. apply their education to find solutions to individual and community problems*
*CO3. acquire capacity to meet emergencies and natural disasters*
*CO4. 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**

**II SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME**

**COMMON FOR ALL BRANCHES OF ENGINEERING**

| S.No | Course category | Course code | Course Name | Periods | | | Credits | Evaluation Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CIE | | | ESE | Total Marks |
| | | | | L | T | P | | TA | MSE | Total | | |
| 1 | BS | MH201 | Engg. Mathematics – II | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 2 | ES | CS202 | Object Oriented Programming (OOP) | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 3 | BS | PH203 | Engineering Physics | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 4 | HS | MH204 | English for communication | 2 | - | 4 | 3 | 15 | 25 | 40 | 60 | 100 |
| 5 | ES | EI205 | Basic Electronics Engineering | 3 | - | - | 3 | 15 | 25 | 40 | 60 | 100 |
| 6 | ES | ME206 | Basic Mechanical Engineering | 3 | 1 | - | 3 | 15 | 25 | 40 | 60 | 100 |
| 7 | ES | CS207 | Object Oriented Programming (OOP) Laboratory | - | - | 3 | 2 | 15 | 25 | 40 | 60 | 100 |
| 8 | BS | PH208 | Engineering Physics Lab | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 9 | ES | ME209 | Engineering Workshop Practice | - | - | - | 2 | 40 | - | 40 | 60 | 100 |
| | | | **Total** | 17 | 4 | 10 | 27 | - | | 460 | 540 | 1000 |
| 10 | MC | EA210 | EAA. Physical Education and NSS | - | - | 2 | 1 | 100 | - | 100 | - | 100 |

MC – Mandatory Course

Student Contact hours/week : 33

Total Credits : 27

**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 Examination | : | 60 marks |

## Course Learning Objectives:

*LO1. To enable the student to acquire fundamental knowledge of mathematical concepts and methods and apply in engineering disciplines*
*LO2. To introduce the methods of solving higher order linear differential equations with constant coefficients and introduce simple applications*
*LO3. To introduce the concept of vector function and vector differential calculus*
*LO4. To introduce integration of vector valued functions*
*LO5. 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*

*CO1. solve a given higher order linear differential equation with constant coefficients*
*CO2. understand few simple applications*
*CO3. 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*
*CO4. 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*
*CO5. find line, surface and volume integrals of vector valued functions and understand Green's theorem, Stokes theorem and Gauss theorem*
*CO6. understand the concept of a function of complex variable and verify whether a function is analytic or not.*
*CO7. construct analytic function when real/imaginary part of the function is known*
*CO8. 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 Examination | : | 60 marks |

## Course Learning Objectives:

*LO1. to expose the students to the concepts of Object-Oriented Paradigm*
*LO2. to improve students capability in applying object oriented programming concepts in problem solving*
*LO3. to improve students expertise in implementing object oriented concepts using C++ Programming*
*LO4. 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*

*CO1: know the differences between procedural language and object-oriented languages*
*CO2: gain knowledge of Object-Oriented Paradigm for problem solving*
*CO3: will be able to gain practical knowledge of OOP concepts using C++*
*CO4: apply reusability concepts like inheritance, polymorphism in application development*
*CO5: use generic programming concepts*
*CO6: 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. To understand the fundamental principles and applications of chemistry.*
*LO2. To identify the significance of electro chemistry.*
*LO3. To introduce and explore the knowledge of corrosion and its prevention*
*LO4. To impart and inculcate proper understandings of energy sources, phase rule, organic and polymer chemistry*
*LO5. To acquire the techniques of water analysis and treatment*
*LO6. 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,*

*CO1: understand basic principles and role of chemistry in the field of engineering*
*CO2: gain the knowledge of interrelationship between electrical and chemical energy*
*CO3: make a judicious selection of materials in the field of engineering*
*CO4: understand the phase rule and its application in the study of material science*
*CO5: understand the methods of chemical analysis of water and its treatment*
*CO6: know the synthetic methods and versatile applications of polymers*
*CO7: 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. To make the bridge between physics in intermediate level and its applications in engineering by giving proper inputs.*

*LO2. To introduce the basic concepts of all types of oscillations with illustrations by mechanical examples.*

*LO3. To introduce the basic concepts of coherence and polarized nature (interference, diffraction & polarization) of light waves and their applications.*

*LO4. To introduce and explore the knowledge of high frequency sound waves & their application in different fields.*

*LO5. 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.*

*LO6. 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,*

- *CO1: understand the basic concepts of physics for its applications to Engineering.*
- *CO2: understand the basic principles of oscillations that can be applied to all types of oscillatory phenomena like acoustic, mechanical, electromagnetic, atomic, nuclear etc.,.*
- *CO3: 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.,.*
- *CO4: appreciate the knowledge gained in studying ultrasonics and their multi dimensional applications in various fields like industrial, engineering (like NDT etc.,.) and medical etc.,.*
- *CO5: understand the fundamental principles and applications of lasers and Optical fibers.*
- *CO6: 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 Examination | : | 60 marks |

**Course Learning Objectives**:

*LO1. To understand the importance of Engineering Drawing*
*LO2. To communicate effectively through Engineering Drawing*
*LO3. To impart and inculcate proper understanding of theory of projections*
*LO4. 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,*

*CO1. develop concepts on Engineering Drawing in order to become professionally efficient*
*CO2. understand the theory of projections*
*CO3. 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. To acquire writing skills with a focus on accuracy avoiding common errors in English.*
*LO2. To acquire word power enabling to use them in speaking and writing.*
*LO3. To develop reading comprehension skills with local and global comprehension.*
*LO4. 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,*

*CO1. develop writing skills with a focus on accuracy to develop error free English.*
*CO2. develop word power to enable to use them in speaking and writing.*
*CO3. develop reading skills with a focus on developing reading comprehension skills .*
*CO4. 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 Examination** | : | 60 marks |

**Course Learning Objectives:**

*LO1. To impart basic knowledge about the Electrical & Magnetic Circuits.*
*LO2. To apply Kirchhoff's laws and Equivalent circuit models to analyze voltage & current relationship in passive circuit.*
*LO3. To inculcate the understanding about A.C. fundamentals and transformers.*
*LO4. 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,

*CO1. predict the behavior of any Electrical & Magnetic Circuits.*
*CO2. solve Electrical Networks by mesh & nodal analysis.*
*CO3. analyze 1-$\phi$ & 3 -$\phi$ AC Basic network and measure the 3-$\phi$ power*
*CO4. 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 Examination | : | 60 Marks |

**Course Learning Objectives:**

*LO1. To introduce basic concepts of semi conductors and conductivity in semiconductors*
*LO2. To introduce the operation and applications of semiconductor diodes*
*LO3. To introduce the basic concepts of BJT & its DC biasing concepts and FET*
*LO4. 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,*

*CO1. learn the concepts of conductivity in semi conductors*
*CO2. learn the operation of basic semi conductor devices and their V-I characteristics*
*CO3. get familiarized with the concepts of BJT& FET*
*CO4. 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 Examination | : | 60 marks |

**Course Learning Objectives:**

*LO1. Study the concept of force, principles of force and their application on engineering structures and machines.*

*LO2. To expose the students various kinds of statically determinate pin jointed structures and methods of analysing the truss.*

*LO3. To know the importance of geometric centre, cross sectional areas of plane bodies through centre of gravity and moment of inertia respectively.*

*LO4. 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,*

- *CO1. understand the physical action of forces on the bodies through free body diagrams and analyse the forces using principles of force.*
- *CO2. determine the axial forces in members of pin jointed structures subjected to various types of loadings.*
- *CO3. understand the technical importance of geometrical shapes and centre of various cross sections.*
- *CO4. 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 Examination : | 60 marks |

**Course Learning Objectives:**

*LO1. To identify various engineering materials and applications.*
*LO2. To understand the basic elements of power transmission.*
*LO3. To know the basic manufacturing processes.*
*LO4. To understand fundamental principles and applications of thermodynamics.*
*LO5. 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,*

- *CO1. know the properties and applications of various engineering materials*
- *CO2. learn the basic concepts of power transmission*
- *CO3. follow the principles and operations of manufacturing technology*
- *CO4. understand the laws of thermodynamics and their applications*
- *CO5. 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 Examination : | 60 marks |

## Course Learning Objectives:

*LO1. To expose the students to the practical implementation of Object-Oriented concepts using C++ programming language*

*LO2. To improve students capability of object oriented programming for problem solving*

*LO3. 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,*

*CO1: gain knowledge of implementing Object-Oriented Programming concepts using C++*

*CO2: know the application of Object-Oriented Programming concepts for developing applications*

*CO3: debug and document programs in C++*

*CO4: develop applications using modularization technique*

*CO5: 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 Examination : | 60 marks |

**Course Learning Objectives:**

*LO1. To gain hands-on experience of conventional and instrumental methods of chemical analysis*
*LO2. To introduce water analysis techniques*
*LO3. To understand the principles involved in the polymerization reactions*
*LO4. To gain the knowledge of estimation of metals from their ores*
*LO5. To expose the experiments such as estimation of metal ion by using ion-exchange resin, instrumental methods of chemical analysis, adsorption*
*LO6. 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,*

*CO1. handle analytical instruments for chemical analysis.*
*CO2. determine alkaline species, temporary and permanent hardness of a water sample.*
*CO3. estimate some metals from their ores.*
*CO4. understand the advantages of instrumental methods of chemical analysis over conventional methods.*
*CO5. 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 Examination : | 60 marks |

**Course Learning Objectives:**

*LO1. To understand the oscillatory phenomena in determining the various properties like rigidity modulus, moment of inertia, acceleration due to gravity and other elastic properties.*

*LO2. To determine the wavelengths, slit widths, diameters of thin wires etc., with high degree of accuracy using interference and diffraction techniques.*

*LO3. To study the optical activity of some substances.*

*LO4. To determine the optical fiber characteristics.*

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## 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,*

*CO1. handle and apply the powerful radiations like lasers and radioactive rays.*
*CO2. know the interference and diffraction patterns and apply them in precise measurements.*
*CO3. make preferential selection of Optical fibers.*
*CO4. 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 Examination : | 60 marks |

**Course Learning Objectives:**

*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: U**se 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,*

*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*

**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 Examination : | 60 marks |

**Course Learning Objectives:**

*LO1. To understand the importance of workshop practice in Engineering*
*LO2. To acquire proper understanding of various manufacturing processes*
*LO3. 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,*
*CO1. know and understand the types of trades in engineering*
*CO2. 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 Examination : | - |

## I. PHYSICAL EDUCATION

**Course Learning Objectives & Outcomes:**

*LO1. To perform and engage in a variety of physical activities*
*LO2. To develop and maintain physical health and fitness through regular participation in physical activities*
*LO3. To demonstrate positive self esteem, mental health and physiological balance through body awareness and control*
*LO4. 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*

*LO1. arouse the social consciousness of the students*
*LO2. provide them with opportunity to work with people in villages and slums*
*LO3. expose them to the reality of life*
*LO4. bring about a change in their social perceptions*
*LO5. 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,*

*CO0. develop his / her personality through community service rendered*
*CO1. apply their education to find solutions to individual and community problems*
*CO2. acquire capacity to meet emergencies and natural disasters*
*CO3. 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**

**ELECTRONICS & COMMUNICATION ENGINEERING**

| S.No | Course Category | Course Code | Course Name | Periods | | | Credits | Evaluation Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CIE | | | ESE | Total Marks |
| | | | | L | T | P | | TA | MSE | Total | | |
| 1 | BS | U14MH301 | Engineering Mathematics – III | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 2 | PC | U14EC302 | Switching Theory and Logic Design | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 3 | PC | U14EC304 | Electronic Circuits | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 4 | PC | U14EC305 | Signals and Systems | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 5 | PC | U14EC306 | Electro Magnetic Waves and Transmission Lines | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 6 | ES | U14EE310 | Network Analysis and Synthesis | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 7 | PC | U14EC308 | Electronic Devices and Circuits Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 8 | ES | U14EE311 | Electrical Technology and Networks Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| | | | **Total** | **18** | **6** | **6** | **28** | **-** | **-** | **320** | **480** | **800** |
| 9 | MC | U14MH309 | Compliance with Current English | - | - | 2 | 1 | 100 | - | 100 | - | 100 |

Student Contact hours/week : 32; 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 (LOs):**

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 $\left[t^2u(t)\right]$,Real exponential $\left[e^{at}u(t)\right]$, Complex exponential $\left[e^{j\Omega t}u(t)\right]$, 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 (COs):**

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*

## U14EC302 SWITCHING THEORY AND LOGIC DESIGN

**Class:** B. Tech., **III**-Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge in/on

*LO1: number Systems & Binary Codes, Switching Algebra and various minimization techniques of switching functions.*

*LO2: combinational Circuits Design and implementation using logic gates and adders/subtractors.*

*LO3: sequential Circuits design and implementation using flip flops, counters and registers.*

*LO4: finite State Machines/Algorithmic State Machines.*

### UNIT – I (9+3)

**Number Systems and Codes:** Review of number systems, Binary arithmetic, Binary weighted and non weighted codes, Error detecting and error correcting codes; Boolean Algebra - Postulates and theorems; Logic gates and truth tables, Representation of switching functions, SOP & POS forms, Karnaugh map representation, Minimization using K-Map, Quine Mc'Clusky method of minimization.

### UNIT – II (9+3)

**Design of Combinational Circuits:** Design of combinational circuits using conventional AND, OR, NOT, NAND, NOR & EX-OR gates; Adders/ Subtractors - Half Adder, Full Adder, Half Subtractor Full Subtractor, Parallel Adder, Serial Adder, Carry Look ahead Adder, BCD Adder, 1's complement subtractor, 2's complement subtractor; Decoders - BCD to 7 segment, BCD to decimal decoders; Encoders - Priority encoders, Multiplexers, Demultiplexers, Realization of switching functions using multiplexers and decoders.

### UNIT – III (9+3)

**Sequential Circuits:** Flip Flops – SR flip flop, JK flip flop, D flip flop, T flip flop, Excitation tables, Race around condition, Master slave flip flop**;** Design of Synchronous and Asynchronous counters; Shift registers - Modes of operation, Bidirectional shift registers; Ring counters, Johnson counters.

**Synchronous Sequential Circuits:** State table, State diagram, State assignment, State minimization; Sequential circuits – Sequence detectors, Binary counters.

### UNIT – IV (9+3)

**Capabilities and Minimization of Sequential Machines**: Mealy and Moore machines, Capabilities and Limitations of finite state machine; State equivalence and machine minimization of completely specified or incompletely specified machines - Partition method, Merger table and Graph method.

**Algorithmic State Machines:** Salient features of the ASM charts, Design example, ASM chart, Timing sequence, Datapath design, ASM design examples using Flip-Flop, Multiplexer, Binary Multiplier.

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**Text Books:**

1. Moris Mano, M.D. Cillett, "Digital Design", *Prentice Hall of India, New Delhi*. 4th Edition, 2006.*(Chapters 1,2,3,4,5,6,8,9)*
2. Zvi. Kohavi, "Switching and Finite Automata Theory", *Cambridge University Press*. 3rd Edition 2010. *(Chapters 9, 10)*

**Reference Books:**

1. G.K. Kharate, "Digital Electronics", *Oxford University Press*, Hyderabad, India, 1st Edition 2012.
2. R.P. Jain, "Modern Digital Electronics", *Tata McGraw-Hill,* India, 4th Edition 2010.
3. A. Anand Kumar, "Switching Theory & Logic Design", *Prentice Hall of India*, New Delhi, 1st Edition, 2014
4. Samuel. C. Lee & B.S. Sonde, "Digital Circuits & Logic Design", *Prentice Hall of India*, New Delhi. 1st Edition 1976

**Course Learning Outcomes:**

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

*CO1: define Number Systems, Binary Codes and their usage in Digital design, minimization techniques of logic functions.*
*CO2: design and implement Combinational Circuits using Logic Gates and Adders/ Subtractors*
*CO3: design and implement Sequential Circuits using Flip Flops and Logic Gates.*
*CO4: implement Finite State Machines/Algorithmic State Machines.*

## U14EC304 ELECTRONIC CIRCUITS

**Class:** B.Tech., **III**-Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge in/on

*LO1: biasing and Operating Point, analysis of transistor at low and high frequency.*
*LO2: multi stage amplifiers, analysis of FET at low and high frequencies, MOSFET.*
*LO3: negative feedback amplifiers, Oscillators and their stability considerations.*
*LO4: large signal amplifiers and tuned amplifiers.*

### UNIT – I (9+3)

**Small Signal Low Frequency Transistor Amplifier Circuits:** Review of BJT Biasing and operating point, BJT small signal low frequency h-parameter model, Analysis of single stage transistor amplifier circuits using h-parameters in CE, CB and CC configurations, Simplified analysis of these configurations.

**High Frequency Transistor Amplifier Circuits**: High frequency model of a transistor and cut-off frequencies, Frequency response analysis of single stage amplifier at mid band gain, Gains at low and high frequency, Calculation of bandwidth of single stage amplifier.

### UNIT – II (9+3)

**Multistage Amplifiers:** Cascade (RC Coupled) and cascode configurations, Darlington pair, bootstrap circuit, Differential amplifier, Effect of cascading on gain and bandwidth.

**FET Amplifiers**: Review of FET; Biasing of FET, FET low frequency and high frequency models, Low and High frequency response of amplifier circuits, Analysis of single stage amplifier; MOSFET- Operation and Characteristics.

### UNIT – III (9+3)

**Feed Back Amplifiers**: Concept of feedback, Classification of feedback amplifiers, General characteristics of negative feedback amplifiers, Effect of negative feedback on amplifier characteristics.

**Oscillators**: Condition for oscillations, RC and LC oscillators, Crystal oscillator, Frequency and Amplitude stability of oscillations.

### UNIT – IV (9+3)

**Large Signal Amplifiers**: Classification of large signal amplifiers, Class A, B and AB power amplifiers, Push-Pull amplifiers and Complementary symmetry, Design of heat sinks, Power efficiency, Cross over and Harmonic distortion.

**Tuned Amplifiers**: Single tuned and Double tuned voltage amplifiers, Inter stage design, Stability considerations, Class B and Class C tuned power amplifiers.

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**Text Books:**

1) Jacob .Millman and C.C.Halkias, "Integrated Electronics", *TMH, New Delhi,* 2nd Edition, 1991.*(Chapters 8,9,10,11,12,13,14,18)*
2) S.Salivahanan and N.Suresh Kumar, "Electronic Devices and Circuits", *Tata McGraw Hill Education (INDIA) Private Ltd,* 2nd Edition., 2009. *(Chapter 13)*

**Reference Books:**

1. S. Sedra and Kenneth C. Smith, "Microelectronic Circuits'', *Oxford University publisher*, 2014.
2. J.B Gupta, "Electronic Devices and Circuits", *S.K Katarina and Sons,* 2002.

**Course Learning Outcomes:**

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

*CO1: analyze biasing circuits and design single stage transistor amplifier at low and high frequencies.*
*CO2: design and analyze multistage transistor amplifiers and FET amplifiers at low & high frequencies.*
*CO3: design and implement negative feedback amplifiers, Oscillators.*
*CO4: explain large signal amplifiers and tuned amplifiers.*

## U14EC305 SIGNALS AND SYSTEMS

**Class**: B.Tech., III-Semester **Branch:** Electronics & Communication 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**:
This course will develop student's knowledge on/in…

LO1: *continuous-time (CT) and discrete-Time (DT) signals & systems and convolution*
LO2**:** *continuous-time Fourier transform (CTFT) and discrete-time Fourier series (DTFS)*
LO3**:** *discrete-time Fourier transform (DTFT) and its applications*
LO4**:** *z-Transform, stability of LTI systems and realizations of IIR systems*

### UNIT – I (9+3)

**Signals and Systems:** Continuous-time (CT) and Discrete-Time (DT) signals, Sampling theorem (statement only), Transformations of independent variable, Exponential and sinusoidal signals, Singularity functions, CT & DT Systems, Basic system properties.
**Linear Time–Invariant (LTI) Systems:** DT-LTI systems, Convolution sum, CT-LTI systems, Convolution integral, Properties of LTI systems, LTI systems described by differential and difference equations, FIR and IIR systems.

### UNIT – II (9+3)

**Continuous-Time Fourier Transform (CTFT):** CTFT for representation of aperiodic signals, CTFT for periodic signals; Properties of the CTFT - Convolution property, Multiplication property; Systems characterized by linear constant–coefficient differential equations (LCCDE).
**Discrete-Time Fourier Series (DTFS):** Fourier series representation of DT periodic signals, Properties of DTFS, Fourier series and LTI systems, Filtering, Examples of DT filters described by difference equations.

### UNIT – III (9+3)

**Discrete-Time Fourier Transform (DTFT):** DTFT for aperiodic signals, DTFT for periodic signal, properties for the DTFT, Convolution property, Multiplication property, Systems characterized by linear constant-coefficient difference equations (LCCDE).

### UNIT – IV (9+3)

***z*-Transform:** Representing signals by using DT complex exponentials, *z*-transform, Region of convergence (ROC), Inverse *z*-transform, Properties of *z*-transform, *z*-transform of some common signals, Analysis and characterization of LTI system using *z*-transform.
**Block Diagram Representations:** Structures for IIR systems - Direct, cascade and parallel form realizations of IIR systems.

**Text Book:**

1. Alan V. Oppenheim and Alan S.Willsky with S. Hamid Nawab, "Signals & Systems", *PHI*, 2/e, 2010 *(Chapters 1, 2, 3, 4, 5, 10)*.

**Reference Books:**

1. Simon Haykin and Barry Van Veen, "Signals & Systems", Wiley India, 2/e , 2008.
2. Mrinal Mandal and Amir Asif, "Continuous and Discrete Time Signals and Systems", Cambridge University Press, 1/e, 2008.
3. M.J.Roberts and Govind Sharma, "Fundamentals of Signals and Systems", *McGraw Hill*, 2/e, 2010.
4. H.P. Hsu, "Signals & Systems", Schaum's Outlines (McGraw Hill), 2/e, 2009.

**Course Learning Outcomes:**

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

CO1: *classify CT and DT signals & systems and perform convolution for finding response of an LTI system to any arbitrary signal*

CO2: *evaluate CTFT of standard signals, use properties of CTFT for solving LCCDE and find DTFS of periodic signals*

CO3: *compute DTFT of standard signals, derive properties of DTFT and use them for solving LCCDE*

CO4: *determine the z-transform of standard DT signals with ROC, use properties of z-transform to solve difference equations, evaluate stability of an LTI system and realize the DT systems in direct, cascade & parallel forms*

## U14EC306 ELECTRO MAGNETIC WAVES AND TRANSMISSION LINES

**Class:** B.Tech., III-Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge in/on

*LO1: co-ordinate systems and Electrostatics.*
*LO2: magneto statics, Time varying fields and Electromagnetic waves.*
*LO3: modes of propagation in the Waveguides.*
*LO4: transmission line parameters and Smith Chart.*

### UNIT – I (9+3)

**Introduction:** Review of Vector analysis and Co-ordinate systems - Cartesian, Cylindrical and Spherical.

**Electro Statics:** Coulomb's law, Electric field intensity, Field due to Line charge and Sheet charge, Flux density, Gauss's law, Work and Potential, Relation between E & V, Derivations of Poisson's and Laplace's Equation, Energy stored in electric field, Energy density, Boundary conditions; Capacitor – Parallel plate, Coaxial and Spherical.

### UNIT – II (9+3)

**Magneto statics:** Biot – Savart's law, Magnetic field strength, Flux density, Ampere's circuit law, Ampere's force law, Magnetic potential, Magnetic boundary conditions, Energy stored in magnetic field.

**Time varying fields & Electromagnetic waves :** Faraday's laws of Electro Magnetic Induction, Continuity Equation, Inconsistency of Ampere's law, Maxwell's Equations in differential & integral forms, Conductors and dielectrics, Wave equations for free space and conducting medium, Wave propagation through good conductors and good dielectrics, Polarization, Reflection of EM waves, Skin effect.

### UNIT – III (9+3)

**Poynting vector:** Poynting theorem, Instantaneous, average and complex Poynting vectors, Power loss in a plane conductor.

**Guided waves & Wave guides:** Waves between parallel planes - TE, TM, TEM waves; Characteristics of TE, TM & TEM Waves; Rectangular wave guides - TE & TM waves; Impossibility of TEM waves in rectangular wave guides, Propagation characteristics; Introduction to circular wave guides.

### UNIT – IV (9+3)

**Transmission Lines:** Primary & Secondary constants, Transmission Line Equations, Phase and Group velocities, Loss less lines, Condition for distortion less lines, Input impedance, SC & OC lines, Quarter wave transformer; Smith chart – Construction, Properties and Applications; Single stub matching technique.

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**Text Books:**

1. Mathew N.O. Sadiku, "Principles of Electromagnetics", *Oxford University Press, 4th Edition, 2014*. *(Chapters 1,2,3,4,5,6,7,8,9,10,11)*
2. UmeshSinha "Transmission Lines and Networks", *Satya Prakashan Publication*, 2nd Edition 1999 *(Chapters 1,2,3,5,6)*

**Reference Books:**

1. K.D.Prasad,"Antennas and Wave Propagation", *Satya Prakashan Publications*, 5th Edition 1995.
2. R K Shevgaonkar, "Electromagnetic Waves", *McGraw Hill education, 2nd Edition 1998*.
3. E.C. Jordan & K.G. Balman, "Electro Magnetic Waves and Radiating Systems", *Prentice Hall of India, 2nd Edition,* 2001.
4. Joseph A Edminister, "Electromagnetics", *Schaum's Outlines,* 2013.

**Course Learning Outcomes:**

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

*CO1: explain co-ordinate systems and Electrostatics.*
*CO2: describe Time varying fields and electromagnetic waves.*
*CO3: analyze modes of propagation in wave guides.*
*CO4: calculate transmission line parameters.*

## U14EE310 NETWORK ANALYSIS AND SYNTHESIS

**B.Tech, III Semester** **Branch:** ECE & EIE

**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 : network Topology, KCL & KVL for D.C and A.C Circuits*
*LO2 : network Theorems & Transient analysis*
*LO3 : two port network parameters*
*LO4 : network functions and Filters*

### UNIT – I (9 + 3)

**Network Topology**: Topological description of networks - Lumped Vs Distributed circuits - Network graph theory - Trees, Co-Tress and loops - Incidence matrix - Tie-set and cut-set Matrices - Kirchhoff's Laws and analysis of Networks.
**Steady State Analysis of Circuits for Sinusoidal Excitations**:-Single phase series, parallel, series-parallel circuits, solutions of AC networks using mesh and nodal analysis.

### UNIT – II (9+3)

**Network Theorems and applications for A.C. Circuits** : Thevenin's - Norton's - Reciprocity - Millman's - Maximum power-Telligen's –Compensation and Substitution Theorems
**Time response analysis of networks Using Laplace Transforms:** Transient analysis of R-L,R-C,R-L-C series and parallel networks with step , impulse , sinusoidal and pulse excitation. Initial conditions.

### UNIT – III(9+3)

**Two port networks** : Characterization of linear time invariant two port networks - Open circuit impedance Parameters - Short circuit admittance parameters - transmission parameters – Inverse transmission parameters - Hybrid parameters -Inverse Hybrid parameters - Inter relationship between parameters - Inter connections of two port networks –Ladder network-Bridged-T, Parallel-T and Lattice-T network-Network representation of element devices - Network transmission criteria.

### UNIT – IV(9+3)

**Network Functions**: Network functions for 1-port and 2-port networks and their relationships Ladder Networks - General Networks - Poles and Zeros of Network functions - Restrictions of pole- zero locations for immitance functions.
**Network Synthesis** : Positive real function properties - Hurwitz Polynomials - Even and odd functions - Test for positive Real functions - Elementary synthesis operation - Properties and Foster and Cauer forms of RL, RC and LC networks.
**Filters**: LPF, HPF, BPF and BRF constant K-and m derived Filters, Composite filters.

**Text Books:**


1. M.E. Van Valken Burg: "Network Analysis", *Pearson Education* 3/e, 2006.
2. W.H.Hayt and Jr.Kemmerly, "Engineering Circuit Analysis" *Tata McGraw Hill*, 2/e, 2014

**References Books:**


1. David A Bell "Electric Circuits", *Oxford University Press*, 1/e, 2010
2. D. Roy Choudhary, "Network analysis and Synthesis" *New age Publishers*, 1/e, 2006
3. K. A. Gangadhar, "Circuit Theory" *Khanna Publishers*, 2/e, 2006.
4. Parker Smith "Problems in Electrical Engineering", *CBS Publishers*, 2010.


**Course Learning Outcomes (CO):**

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

*CO1 : analyze electric circuits using Network Topology, KCL & KVL*
*CO2 : evaluate steady state and transient behavior of networks for DC and AC excitations & Solve Problems*
*CO3 : evaluate Two port network parameters & Solve Problems*
*CO4 : analyze Network Functions and Filters & Solve Problems*

## U14EC308 ELECTRONIC DEVICES AND CIRCUITS LABORATORY

**Class:** B.Tech. III-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination: | 60 marks |

**Course Learning Objectives:**
This laboratory course will develop students' knowledge in/on

*LO1: electronic devices and their applications*
*LO2: frequency response of BJT and FET Amplifiers*
*LO3: feedback amplifiers*
*LO4: RC, LC Oscillators and Tuned amplifiers*

**LIST OF EXPERIMENTS**

1. Characteristics of a Semiconductor diode &Zener Diode.
2. Half-wave / full – wave Rectifier with and without filters
3. BJT Characteristics – CE configuration
4. Biasing of transistor using fixed bias, self-bias
5. FET Characteristics CS (Common Source)
6. Design of Single Stage BJT amplifiers and its frequency response
7. Design of FET CS Amp and its frequency response
8. Design of voltage series feedback amp
9. Design of RC Phase Shift Oscillator
10. Design of LC Oscillator
11. Design of class B Power amplifier
12. Design of Single tuned amplifier.

### Laboratory Manual:

1) Laboratory Manual for "EDC laboratory", *prepared by the department of ECE*

### Text books:

1) Jacob. Millman and C.C.Halkias, "Integrated Electronics", *TMH, New Delhi,* 2nd Edition, 1991.

**Course Learning Outcomes:**
After completion of this laboratory course, students' will be able to…

*CO1: apply the electronic device applications*
*CO2: differentiate the RC and LC Oscillators*
*CO3: design the different types of amplifiers*
*CO4: calculate the Bandwidth and gain of amplifiers*

## U14EE311 ELECTRICAL TECHNOLOGY & NETWORKS LABORATORY

**Class:** B.Tech. III-Semester **Branch:** ECE and E&I

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This laboratory course will develop students' knowledge in/on

*LO1: various theorems for simplification of network.*
*LO2: determination of parameters of a choke coil.*
*LO3: measurement of 3-Φ active power.*
*LO4: performance parameters of static &rotating electrical machines.*

**LIST OF EXPERIMENTS**

1. Verification of Kirchhoffs Laws
2. Verification of Superposition Theorem.
3. Verification of Thevenin's Theorem.
4. Measurement of 3-Φ Active Power by two wattmeters method
5. frequency response of R-L-C series circuit
6. Determination of Parameters of choke coil.
7. Predetermination of regulation and efficiency of a 1- Φ transformer by O.C and S.C. tests.
8. Efficiency and voltage Regulation of a 1- Φ transformer by direct load test.
9. Speed control of D.C shunt Motor.
10. Break test on 3- Φ induction motor.
11. Determination of self and mutual inductances of a coupled coil.
12. Determination of hybrid parameters and inverse hybrid parameters of a 2-port network.

**Laboratory Manual:**

1. Laboratory Manual for "Electrical Technology & Networks Laboratory", *prepared by the department of EEE*

**Course Learning Outcomes:**

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

*CO1: apply network theorems for solving a network.*
*CO2: measure 3-Φ active power for balanced load.*
*CO3: determine the parameters of choke coil.*
*CO4: determine the performance parameters of static &rotating electrical machines.*

## U14MH309 COMPLIANCE WITH CURRENT ENGLISH

**Class:** B.Tech. III Semester **Branch:** EIE, EEE, IT and ECE

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 2 | 1 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation | 100 marks |
| End Semester Examination | -- |

**Course Learning Objectives (LOs):**

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 (COs):**

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*

*CO2: develop dialogues and conversations in English and make oral presentations effectively*

*CO3: use sound vocabulary in communication*

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

**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**

**ELECTRONICS & COMMUNICATION ENGINEERING**

| S No | Course Category | Course code | Course Name | Periods | | | Credits | Evaluation Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CIE | | | ESE | Total Marks |
| | | | | L | T | P | | TA | MSE | Total | | |
| 1 | BS | U14MH401 | Engineering Mathematics – IV | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 2 | PC | U14EC402 | Pulse and Digital Circuits | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 3 | PC | U14EC403 | Probability and Random Processes | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 4 | PC | U14EC404 | Digital Design | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 5 | PC | U14EC405 | Linear Integrated Circuits | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 6 | PC | U14EC406 | Pulse and Digital Circuits Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 7 | PC | U14EC407 | Digital Electronics Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 8 | PC | U14EC408 | Linear Integrated Circuits Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| | | | **Total** | **15** | **5** | **9** | **26** | **-** | **-** | **320** | **480** | **800** |
| 9 | MC | U14MH409 | Soft and Interpersonal Skills | - | - | 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 (LOs):**
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 (COs):**

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*

## U14EC402 PULSE AND DIGITAL CIRCUITS

**Class:** B.Tech, **IV**-Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge in/on

*LO1: linear and non linear wave shaping circuits*
*LO2: operation and designing of Multivibrators*
*LO3: various sweep circuits.*
*LO4: unidirectional and bidirectional sampling gates*

### UNIT – I (9+3)

**Linear Wave Shaping Circuits:** High pass RC and Low pass RC circuits, Response to sine, step, pulse, square, exponential and ramp inputs with different time constants, High pass RC circuit as a differentiator, Low pass RC circuit as an Integrator.

**Non-Linear Wave Shaping Circuits**: Switching characteristics of diode; Clipping Circuits - Diode Clippers, Shunt Clippers, Series Clippers, Clipping at two Independent Levels; Clamping Circuits - Clamping Theorem.

### UNIT – II (9+3)

**Multivibrators**: Introduction; Bistable multivibrator - Fixed bias, Self bias, Unsymmetrical triggering, Symmetrical triggering, Direct connected Bistable multivibrator; Schmitt Trigger - UTP, LTP, Hysteresis, Applications of Schmitt Trigger; Monostable multivibrator - Collector coupled, Triggering of Monostable multivibrator, Voltage to Time converter; Astable multivibrator - Collector coupled, Voltage to frequency converter.

### UNIT – III (9+3)

**Negative Resistance Switching Circuits**: Negative resistance characteristics - Basic principles, Bistable, Monostable and Astable operation, Tunnel diode.

**Time Base Generators:** General features of a time base signal; Methods of generating a time base waveform - Exponential sweep circuits, Sweep circuit using UJT, Miller sweep circuit and Bootstrap sweep circuit.

### UNIT – IV (9+3)

**Sampling Gates:** Basic operating principle of sampling gates, Unidirectional diode gate, Other forms of the unidirectional diode gate, Bidirectional gates using transistors, Reduction of pedestal in gate circuit and Bidirectional diode gate; Applications of sampling gates - Chopper amplifier and Sampling scope.

**Synchronization and Frequency Division**: Pulse synchronization of relaxation devices, Frequency division with sweep circuits, Other astable relaxation circuits, Synchronization of Astable multivibrator, Monostable relaxation circuits as dividers, Stability of relaxation dividers; Synchronization of a sweep circuit with symmetrical signals - Sinusoidal synchronization signals and Sine wave frequency division with a sweep circuit.

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**Text Books:**

1. Millman and Taub, "Pulse, Digital and Switching Waveforms", 2nd Edition, *McGraw Hill,* 2007 *(Chapter 2,4,5,6,8,9,10,11,12,13,15,17)*

**Reference Books:**

1. A.Anand kumar," Pulse and digital circuits", *PHI*, 2nd Edition, 2008.
2. B.N. Yoganarasimha, " Pulse and Digital Circuits", *Dhanpat Rai Publications*

**Course Learning Outcomes:**

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

*CO1: analyze the response of high pass and low pass RC circuits for different input signals.*
*CO2: design bistable, monostable and astable multivibrators.*
*CO3: analyze voltage sweep generators - miller sweep circuit and bootstrap sweep circuit.*
*CO4: differentiate unidirectional sampling gates and bidirectional sampling gates.*

## U14EC403 PROBABILITY AND RANDOM PROCESSES

**Class:** B.Tech.,**IV**-Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge in/on…

*LO1: distribution function, density function and statistical parameters of a random variable*
*LO2: operations of multiple random variables.*
*LO3: spectral characteristics of random processes.*
*LO4: response of linear system with random inputs.*

### UNIT-I (9+3)

**Random Variable:** Introduction; Random variable concept - Discrete and Continuous random variables; Cumulative Distribution function, Probability Density function and their Properties; Binomial, Poisson, Uniform and Gaussian Distribution functions; Conditional Distribution function, Conditional Density function and their properties.

**Operations on One Random Variable– Expectation:** Introduction, Expected Value of a Random Variable, Function of a Random Variable, Conditional expected value; Moments - Moments about the Origin, Central Moments, Variance and Skew; Characteristic Function, Moment Generating Function; Transformations of a Random Variable - Monotonic and Non monotonic Transformation of continuous random variable and transformation of discrete random variable.

### UNIT-II (9+3)

**Multiple Random Variables:** Vector Random Variables; Joint Distribution Function – Properties; Marginal Distribution Function; Joint Density Function – Properties; Marginal Density Functions, Conditional Distribution and Density Function, Statistical Independence, Distribution and Density of a sum of Random Variables, Central Limit Theorem**.**

**Operations on Multiple Random Variables**: Expected value of a function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions; Jointly Gaussian Random Variables- Two Random Variables case, N Random Variables, Properties of Gaussian Random Variables; Transformations of Multiple Random Variables and Linear Transformations of Gaussian Random Variables.

### UNIT-III (9+3)

**Random Processes – Temporal Characteristics:** Random Process Concept - Classification; Distribution and Density Functions, Concept of Stationarity and Statistical Independence, First-Order and N-order Stationarity, Wide-Sense and Strict-Sense Stationarity, Time Averages and Ergodicity, Ergodic Processes, Autocorrelation Function, Cross-Correlation Function and their Properties, Covariance.

**Random Processes-Spectral Characteristics:** Power Density Spectrum - Properties; Relationship between Power Spectrum and Autocorrelation function; Cross-Power Density Spectrum - Properties; Relationship between Cross-Power Spectrum and Cross-Correlation Function.

## UNIT-IV (9+3)

**Linear System with Random Inputs:** Introduction, Linear System Fundamentals; Random signal response of Linear systems- Convolution, Mean and Mean-square value, Autocorrelation function of response, Cross-Correlation functions of input and output; System evaluation using random noise; Spectral Characteristics of system response- Power Density Spectrum of response, Cross-Power Density Spectrums of input and output; Noise Bandwidth; Band pass, Band Limited and Narrowband Processes.

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**Text Book:**


1. Peyton Z. Peebles, "Probability, Random Variables and Random Signal Principles", *TMH*, 4th Edition, 2001.(Chapters 2,3,4,5,6,7,8)


**Reference Books:**


1. R.P. Singh and S.D. Sapre, "Communication Systems Analog and Digital", *TMH*, 2nd Edition, 2008.
2. Henry Stark and John W. Woods,"Probability and Random Processes with Application to Signal Processing", *Prentice Hall*, 3rd Edition, 2002.
3. Athanasios Papoulis and S. UnnikrishnaPillai, "Probability, Random Variables and Stochastic Processes", *PHI*, 4th Edition, 2002.
4. S.P. Eugene Xavier,"Statistical Theory of Communication", *New Age Publications*, 1997.


**Course Learning Outcomes:**

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

*CO1: evaluate various statistical parameters of a random variable.*
*CO2: perform various operations on multiple random variables.*
*CO3: describe the Spectral characteristics of Random Processes.*
*CO4: evaluate the response of Linear System for different inputs.*

## U14EC404 DIGITAL DESIGN

**Class:** B. Tech., **IV**-Semester **Branch:** Electronics and Communication 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:**
This course will develop students' knowledge in/on

*LO1: logic families such as RTL, DTL, CMOS, TTL etc.*
*LO2: memory devices, PLDs and FPGA.*
*LO3: VHDL programming using behavioral, dataflow and structural modeling.*
*LO4: generics and Configurations.*

### UNIT I (9+3)

**Logic Families:** Introduction to logic families; Characteristics -Fan in, Fan out, Noise margin, Figure of Merit, Propagation delay, Current sourcing, Current sinking; RTL, DCTL, $I^2L$, DTL, HTL, TTL-open collector, Totempole and Tristate output, ECL, MOS, CMOS families, comparison.

### UNIT II (9+3)

**Memory Devices:** Introduction to memories, Functional classification, Basic memory unit; Read Only Memory -Types, Programming mechanism and Applications**;** Combinational logic design using ROM; PROM, Methods of programming; EPROM, EEPROM; RAM – Types, Read & Write operations, Timing diagrams.
**Programmable logic devices:** Introduction to PLD's, PLA, PAL, SPLD, CPLD, FPGA

### UNIT III (9+3)

**EDA Tools**: Introduction to HDL and VHDL, Simulation & Synthesis; Primary Constructs of VHDL - Entity declaration, Architecture description; Basic elements of VHDL- Identifiers, Data objects, Data types, Operators, Various modeling styles of VHDL.
**Behavioural Modelling:** Process assignment statements - WAIT, IF, CASE, NULL, LOOP, EXIT, NEXT, ASSERTION, REPORT statements, Design examples.

### UNIT IV (9+3)

**Data Flow Modelling:** Concurrent signal assignment statement, Comparison of concurrent and sequential signal assignment statements, Conditional and Selected signal assignment statements, Design examples.
**Structural Modelling:** Component declaration, Component instantiation, Design examples; Generics and Configurations**,** Advanced features of VHDL, Design examples.

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**Text Books:**

1. M. Moris Mano, M.D.Cilletti, "Digital Design", *PHI*, India, 4th Edition, 2006 *(Chapters 7,8,9,10)*.
2. J. Bhaskar, "VHDL Primer", *PHI Learning*, India, 3rd Edition, 1992 *(Chapters 2,3,4,5,6,7)*

**Reference Books:**

1. Taub & Schiling, "Digital Integrated Electronics", *McGraw Hill Education (India) Pvt. Ltd.*, India, 1997.
2. Richard S Sandige, Michael L Sandige, "Fundamentals of Digital and Computer Design with VHDL", *McGraw Hill Education(India) Pvt. Ltd.*, 1st Edition, 2014.
3. R. Ananda Natarajan, "Digital Design", *PHI learning, India*, 1st Edition, 2015.

**Course Learning Outcomes:**

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

*CO1: explain various logic families.*
*CO2: describe Memory devices, PLDs and FPGA*
*CO3: write VHDL programs using behavioral, dataflow and structural modeling.*
*CO4: explain the basic concepts of Generics and Configurations.*

**U14EC405 LINEAR INTEGRATED CIRCUITS**

**Class:** B.Tech. **IV**-Semester **Branch:** Electronics & Communication 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:**
This course will develop students' knowledge in/on

*LO1: ideal and practical characteristics of Op-Amp.*
*LO2: applications of Op-Amps.*
*LO3: frequency Response of various filters using OP-AMP and Waveform Generators using 555 timer.*
*LO4: phase Locked Loop, 723 Voltage Regulator and Data converters.*

## UNIT – I (9+3)

**Integrated Circuits (ICs)**: Introduction, Classification of IC's
**Operational Amplifier (Op-Amp):** Differential Amplifiers, Dual input balanced output differential amplifier, Dual input unbalanced output differential amplifier; Building blocks of Operational Amplifier (Op-Amp); Analysis of Basic Inverting & Non-Inverting Amplifier configurations and voltage follower.
**DC Characteristics of Op-Amp**: Input offset voltage, Input bias current, Input offset current, Total output offset voltage, Thermal drift, Supply Voltage Rejection Ratio (SVRR), Common Mode Rejection Ratio (CMRR).
**AC Characteristics of Op-Amp**: Open loop and closed loop frequency response, stability of Op-Amp, slew rate, Ideal & Practical characteristics of IC μA 741.

## UNIT – II (9+3)

**Applications of Operational Amplifiers:** Summing and Difference amplifiers, Integrator and Differentiator, Current-to-Voltage and Voltage-to-Current converters, Instrumentation amplifier, Sample and Hold circuit.
**Non-Linear Applications:** Precision Rectifiers – Half wave and Full wave, Log and Antilog amplifiers.
**Comparators and Wave form generators**: Op-Amp comparators, Regenerative Comparator (Schmitt Trigger), R.C. phase shift and Wien bridge oscillators.

## UNIT – III (9+3)

**Active Filters**: Introduction of filters, Ideal and Realistic frequency responses of various filters, First order, Second order filters - Analysis and design of V.C.V.S configured Low pass, high pass, Band pass and Band Stop filters, I.G.M.F. configured narrow band pass and narrow band reject filter, Twin T-notch filter.
**Monolithic Timers and their applications**: Introduction to IC 555 Timer, Functional Diagram, Design of Astable and Monostable multivibrators using 555 timer, Applications of Astable Multivibrator – FSK Generator, Pulse-Position Modulation, Schmitt Trigger, Applications of Monostable Multivibrator - missing Pulse Detector, Linear Ramp Generator, Pulse-Width Modulation.

## UNIT – IV (9+3)

**Phase Locked Loops**: Voltage Controlled Oscillator , Basic PLL operation, Transient response of PLL, Definitions related to PLL, Monolithic PLL and design considerations, , Typical PLL applications - FSK, AM detectors. (**Qualitative treatment only**)

**Voltage Regulators:** Basic voltage regulator using Op-Amps, General purpose IC Regulator, μA723-Functional diagram, specifications, Design consideration of 723 as low & high voltage regulators; Three terminal voltage (fixed) regulators – Introduction and general features of three terminal regulators, IC series of three terminal Regulators.

**Data Converters:** DAC types (Weighted Resistor, R to 2R Ladder); ADC types (Flash, Successive Approximation, and Dual Slope)

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**Text Book:**


1. D. Roy Choudhury and Shail B Jain, "Linear Integrated Circuits", *New Age International*, 4th Edition, 2010. *(Chapters 1,2,3,4,5,6,7,8,9,10)*


**Reference Books:**


1. Ramakant A Gayakwad, **"**Op-amp and Linear Integrated Circuits**"**,*Pearson Education***.**
2. David A. Bell, **"**Operational Amplifiers and Linear ICs**",** *Oxford University press*, 3rdEdition, 2011.
3. Adel Sedra and K.C. Smith, "Microelectronic Circuits", *Oxford University Press, International Version*, 5th Edition, 2009.
4. G.B. Clayton**,** **"**Integrated Circuits & Applications**",** *ELBS*, London.


**Course Learning Outcomes:**

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

*CO1: list ideal/practical parameters of Op-Amp.*
*CO2: design op-Amp circuits for Linear/Non-linear Applications.*
*CO3: design filter and timer circuits for various applications.*
*CO4: explain the operation of Phase Locked Loops, IC Voltage Regulator and Data converters.*

## U14EC406 PULSE AND DIGITAL CIRCUITS LABORATORY

**Class:** B.Tech., **IV**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**
This laboratory course will develop students' knowledge in/on

*LO1: the response of linear and non-linear wave shaping circuits.*
*LO2: various types of multivibrators.*
*LO3: the operation of sampling and logic gates.*
*LO3: bootstrap and Miller sweep circuits.*

**LIST OF EXPERIMENTS**

1. Response of a High pass RC circuit for a square wave input.
2. Response of a Low pass RC circuit for a square wave input.
3. Non-Linear Wave Shaping – Clippers.
4. Non-Linear Wave Shaping – Clampers.
5. Transistor as a switch.
6. Bistable multivibrator.
7. Monostable multivibrator.
8. Astable multivibrator.
9. Schmitt Trigger.
10. Sampling gates.
11. Realization of Logic gates.
12. Boot Strap Sweep Circuits.
13. Miller Sweep circuits.
14. UJT as Relaxation Oscillator.

**Laboratory Manual:**

1. Manual for "Pulse and Digital Circuits Laboratory", prepared by the faculty of Department of ECE

**Text Books:**

1. Millman and Taub, "Pulse, Digital and Switching Waveforms", 2nd Edition, 2007 *McGraw Hill*.

**Course Learning Outcomes:**
After completion of this laboratory course, students' will be able to

*CO1: analyze low pass and high pass filters, linear and non-linear wave shaping circuits.*
*CO2: design multivibrators.*
*CO3: implement Sampling gate, logic gates, UJT as a Relaxation Oscillator.*
*CO4: demonstrate sweep circuits.*

## U14EC407 DIGITAL ELECTRONICS LABORATORY

**Class:** B.Tech. **IV**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**
This laboratory course will develop students' knowledge in/on

*LO1: various digital ICs and their specifications.*
*LO2: simplification of Boolean expression and realization of logic circuits.*
*LO3: code converters, multiplexers, de-multiplexers, decoding and encoding functions.*
*LO4: magnitude comparator, counters, shift registers.*

### LIST OF EXPERIMENTS

1 Logic Gates.
2 Adders and Subtractor.
3 Parallel adder and Subtractor.
4 BCD to Excess-3 code converter and Binary to Gray code converter.
5 Multiplexer and Demultiplexer.
6 Comparators.
7 Decoders and Encoders.
8 BCD- to- seven segment decoder/driver.
9 Flip flops.
10 Shift registers.
11 Ring counter and Johnson counter.
12 Asynchronous and Synchronous counters.
13 Presettable 4-bit Up/Down counter

**Laboratory Manual:**

1) Manual for *Digital Electronics laboratory, prepared by the* faculty of *Department of ECE*

**Text books**:

1) Moris Mano, M.D. Cillett, "Digital Design", *Prentice Hall of India, New Delhi.* 4th Edition, 2006.

**Course Learning Outcomes:**
After completion of this laboratory course, students'will be able to

*CO1: verify different switching functions using digital IC's.*
*CO2: implement the logic circuits by simplifying Boolean functions.*
*CO3: apply multiplexing, demultiplexing, decoding, encoding functions.*
*CO4: demonstrate various shift registers, counters.*

## U14EC408 LINEAR INTEGRATED CIRCUITS LABORATORY

**Class:** B.Tech. **IV**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation | 40 marks |
| End Semester Examination | 60 marks |

**Course Learning Objectives:**

This laboratory course will develop students' knowledge in/on

*LO1: static and dynamic parameters of operational amplifier*
*LO2: operational amplifier applications*
*LO3: functioning of 555 IC timer as multivibrators*
*LO4: PLLS and voltage regulators*

### LIST OF EXPERIMENTS

1 Measurement of static and dynamic parameters of Op-Amp IC 741
2 Design and testing of differentiator using Op-Amp IC 741
3 Design and testing of integrator using Op-Amp IC 741
4 Design and testing of Instrumentation Amplifier using Op-Amp IC 741
5 Design and testing of log amplifier using Op-Amp IC 741
6 Design and testing of precision rectifier using Op-Amp IC 741
7 Design and testing of second order active low pass filter using Op-Amp IC 741
8 Design of a Wien's bridge oscillator for specified frequency using Op-Amp IC 741
9 Design and testing of Astable multivibrator using IC 555
10 Design and testing of Monostable multivibrator using IC 555
11 Design and testing of an FSK generator using IC 555
12 Design a voltage regulator using IC 723 for a given O/P voltage and load current

**Laboratory Manual:**

1) Manual for "*Digital Electronics laboratory*", *prepared by the* faculty of *Department of ECE*

**Text books**:

1. D. Roy Choudhury and Shail B Jain, "Linear Integrated Circuits", *New Age International*, 4th Edition, 2010.

**Course Learning Outcomes:**

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

*CO1: measure the characteristics of operational amplifier*
*CO2: implement circuits using operational amplifier*
*CO3: design IC 555 based multivibrators*
*CO4: analyze PLL and voltage regulator*

## U14MH409 SOFT AND INTERPERSONAL SKILLS

**Class:** B.Tech. IV semester **Branch:** EIE, EEE, IT and ECE

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 2 | 1 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation | 100 marks |
| End Semester Examination | - |

**Course Learning Objectives (LOs):**

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:**


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


**Course Learning Outcomes (COs):**

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**

**V SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME**

**ELECTRONICS & COMMUNICATION ENGINEERING**

| S. No | Course Category | Course code | Course Name | Periods | | | Credits | Evaluation Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CIE | | | ESE | Total Marks |
| | | | | L | T | P | | TA | MSE | Total | | |
| 1 | PC | U14EC501 | Antennas and Wave Propagation | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 2 | PC | U14EC502 | Digital Signal Processing | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 3 | PC | U14EC503 | Analog Communication Systems | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 4 | PC | U14EC504 | Microprocessors and Microcontrollers | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 5 | PC | U14EC505 | Computer Architecture | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 6 | PC | U14EC506 | Digital Signal Processing Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 7 | PC | U14EC507 | Analog Communication Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 8 | PC | U14EC508 | Microprocessors and Microcontrollers Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 9 | PR | U14EC509 | Seminar | - | | - | 1 | 100 | - | 100 | - | 100 |
| | | | **Total** | **15** | **5** | **9** | **27** | **-** | | **420** | **480** | **900** |

Student Contact hours/week : 29; Total Credits: 27

## U14EC501 ANTENNAS AND WAVE PROPAGATION

**Class:** B.Tech, **V**-Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge in/on

*LO1: antenna parameters and Radiation mechanisms.*
*LO2: antenna Arrays and its radiation patterns.*
*LO3: types of antennas used at different frequencies- UHF, VHF, Microwave frequencies.*
*LO4: wave propagations-Surface, Space and Sky wave.*

### UNIT – I (9+3)

**Antenna Fundamentals:** Basic concepts and Antenna Parameters – Radiation Patterns (E & H planes), Main Lobe and Side Lobes, Beam width, Beam Area, Radiation Intensity, Beam Efficiency, Directivity and Gain, Resolution; Aperture Concepts and types – Aperture area and efficiency, Effective height; Antenna theorems.

**Radiation Mechanism**: Retarded Potentials, Radiation from Small Dipole, Quarter wave Monopole and Half wave Dipole, Current Distribution, Electric and Magnetic field components, Radiated Power, Radiation Resistance, Directivity and Aperture area.

### UNIT-II(9+3)

**Antenna Arrays:** Two-element arrays – different cases; N-element Linear Arrays – Broadside and End fire arrays, Characteristics and comparison; Multiplication of patterns, Binomial Arrays.

**Non-Resonant Radiators:** Introduction; Travelling wave radiators – Basic concepts, V-antennas, Rhombic antennas, Construction details, Design considerations.

### UNIT-III(9+3)

**VHF, UHF and Microwave Antennas:** Arrays with parasitic elements, Folded Dipoles, Yagi - Uda antenna, Plane sheet and Corner Reflectors; Paraboloidal Reflectors – Characteristics, Types of feeds, Spill over, Aperture blocking, Offset feed, Cassegrain Feeds; Horn Antennas – Types, Characteristics, Optimum Horns; Helical Antenna; Lens Antennas – Features, Dielectric and Metal plate lenses, Applications.

### UNIT-IV(9+3)

**Wave Propagation:** Introduction, Factors involved in Wave Propagation; Ground Wave Propagation – Characteristics, Wave tilt, Flat and Spherical earth considerations; Ionosphere – Formation of layers and mechanism of propagation, Reflection and Refraction mechanisms; Critical Frequency, Maximum Usable Frequency (MUF), Optimum frequency, Skip distance, Virtual Height; Space wave propagation - M Curves and Duct Propagation, Tropospheric Scattering.

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**Text Books:**

1. John D.Kraus and Ronald J.Marhefka,"Antennas", *TMH, 4th* Edition, 2010. *Chapters(2,3,4,5,67,8,9,10,22,23,24,25).*

**Reference Books:**

1. K.D.Prasad, "Antennas and Wave Propagation", *Satya Prakashan Publ,* 3rdEdition, 1996.
2. Constantine A.Balanis,"Antenna Theory", *John Wiley & Sons Publ. 2nd E*dition, 2002.
3. E.C. Jordan & K.G. Balman," Electro Magnetic Waves and Radiating Systems", *Prentice Hall of India,* 2nd Edition, 2000.
4. F.E.Terman,"Electronic and Radio Engineering", *McGraw-Hill Publ*, 4th Edition, 1955.
5. R.L. Yadav, "Antennas and Wave Propagation", *Prentice Hall of India*, 2nd Edition,2013.

**Course Learning Outcomes:**

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

*CO1: explain Antenna parameters and Radiation mechanisms.*
*CO2: design two element and n-element Arrays*
*CO3: describe UHF, VHF, Microwave Antennas*
*CO4: analyze Wave propagations-Surface, Space and Sky wave*

## U14EC502 DIGITAL SIGNAL PROCESSING

**Class:** B.Tech. V Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge on/in…

*LO1: discrete Fourier transform (DFT), computational complexity of DFT and efficient implementation of DFT using fast Fourier transform (FFT)*

*LO2: specifying characteristics of frequency selective filters, design of linear-phase FIR filters*

*LO3: classical analog Butterworth & Chebyshev filters, converting analog filter into equivalent digital filter to design digital IIR filters*

*LO4: correlation, basic theory of adaptive signal processing and its applications*

### UNIT – I (9+3)

**Discrete Fourier Transform (DFT):** Frequency domain sampling and reconstruction of discrete-time signals, DFT, properties of DFT, Circular convolution, Inverse DFT (IDFT), Linear filtering methods based on DFT, Frequency analysis of signals using DFT, Relation between DFT and other transforms, Discrete cosine transform (DCT).

**Fast Fourier Transform (FFT)**: Computational complexity of DFT, Introduction to FFT, Radix-2 FFT algorithms, Decimation-in-time FFT algorithm, Decimation-in-frequency FFT algorithm, Inverse DFT using FFT. *(Chapters 7&8 of text book-1)*

### UNIT – II (9+3)

**Filter concepts:** Causality and its implications, Paley-Wiener theorem, Magnitude characteristics of physically realizable filters, Phase delay, Group delay, Zero phase filter, Linear phase filters, Desirability of linear phase, Filter specifications.

**Finite Impulse Response (FIR) filters**: Introduction to FIR filters, Inherent stability of FIR filters, Symmetric and anti-symmetric FIR filters , Design of linear phase FIR filters - Windowing method (rectangular window, triangular window, hamming window & hanning window) and frequency sampling method; Design of FIR differentiators, Design of Hilbert transformers. *(Chapter 10 of text book-1)*

### UNIT – III (9+3)

**Infinite Impulse Response (IIR) Filters:** Realizability of ideal filter, Introduction to IIR filters, Design of IIR digital filters from analog filter specifications, Mapping techniques - Impulse invariance and bilinear transformation; IIR digital filter design using Butterworth and Chebyshev approximations, Frequency transformations, Comparison of Butterworth and Chebyshev filters, Comparison of IIR and FIR filters. *(Chapter 10 of text book-1)*

### UNIT – IV (9+3)

**Correlation:** Correlation of discrete time signals, Auto correlation, Properties of auto correlation function, Cross correlation, Matrix form representation, Example problems for computation of correlation functions. *(Selected portion from chapter 2, i.e. 2.6 from text book-2)*

**Adaptive Filters:** Concepts of adaptive filtering, configurations, Basic wiener filter theory, Cost function, Error performance surface, Basic LMS algorithm & its implementation, Practical limitations of basic LMS algorithm, RLS algorithm, Limitations of RLS algorithm.

**Applications of Adaptive filters:** Fetal monitoring - Cancelling of maternal ECG during labour; Adaptive telephone echo cancellation. *(Chapter 10 of text book-2)*

**Text Book:**

1. John G.Proakis & D.G.Manolakis, "Digital Signal Processing: Principles, Algorithms and Applications", Pearson education, 4/e, 2007. *(Chapters 2, 7, 8, 10)*
2. Ifeachor, Digital Signal Processing-A practical Approach, Pearson Education India, 4/e, 2013. *(Chapter 10)*

**Reference Books:**

1. A. V. Oppenheim & R. W. Schafer, "Discrete-Time Signal Processing", PHI, 2/e, 1999.
2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", TMH, 2/e, 2002.
3. Johnny R. Johnson, "Introduction to Digital Signal Processing" , PHI, 1/e, 2001.
4. Adreas Antanio, "Digital filter Analysis and Design", *TMH,* 4/e, 1988.

**Course Learning Outcomes:**

After completion of this course, students will be able to

*CO1: find the DFT of a DT sequence, perform circular convolution using DFT & IDFT and compute 2, 4 & 8-point DFT of a sequence using radix-2 DIT & DIF algorithms*

*CO2: design a linear-phase FIR filter with a prescribed magnitude response using windowing & frequency-sampling methods*

*CO3: design an IIR Butterworth/Chebyshev digital filter meeting the required specifications by performing impulse invariance/bilinear transformation*

*CO4: compute auto & cross correlation sequences for given DT sequences, explain the need & use of adaptive filters, LMS & RLS algorithms for updating weight vectors and describe popular applications of adaptive filters*

## U14EC503 ANALOG COMMUNICATION SYSTEMS

**Class:** B.Tech., **V**-Semester **Branch:** Electronics & Communication 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:**
This course will develop students' knowledge in/on

*LO1: analog modulation techniques.*
*LO2: different types of AM & FM transmitters and receivers.*
*LO3: various pulse modulation techniques.*
*LO4: effect of noise on the performance of analog communication systems.*

### UNIT – I (9+3)

**Introduction:** Communication system, Need for modulation, Radio frequency spectrum, Modulation techniques.
**Amplitude Modulation:** Time and frequency domain description of AM, DSB waves, Generation and demodulation of AM, DSB waves, Carrier Recovery; Hilbert transform-Properties; Pre-envelop and Complex envelop representation of band pass signals, In-phase and Quadrature component representation of band pass signals; SSB, VSB - Time and Frequency domain description, Generation and Demodulation; FDM; AM Transmitters – Low level and High level.

### UNIT – II (9+3)

**Angle Modulation:** Instantaneous frequency, Phase and Frequency Modulation, Single tone FM and its Spectral analysis, NBFM, WBFM, Band width requirements; FM generation - Direct and Indirect (Armstrong's) methods; FM Demodulation - Slope detector, Balanced slope detector, Phase discriminator, Ratio Detector; FM Capture Effect, Pre-emphasis & De-emphasis, FM transmitters.

### UNIT – III (9+3)

**AM & FM Receivers**: Tuned Radio Frequency (TRF) , Super Heterodyne receivers, RF section and characteristics, Mixers, Frequency changing and tracking, Intermediate frequencies and IF amplifiers, Detection and Automatic Gain Control (AGC); FM Receivers - Amplitude Limiter, Automatic Frequency Control (AFC); Communication receivers.
**Analog Pulse Modulation:** Sampling theorem, Natural sampling, Flat top sampling; PAM, PWM, PPM - Generation and Demodulation; TDM.

### UNIT – IV (9+3)

**Noise in Communication System:** Sources of noise, Types of noise; Narrow band noise – In phase and Quadrature components, Time domain representation; Signal-to-Noise ratio, Noise figure, Equivalent noise bandwidth, Noise in AM & FM, Calculation of Signal Power and Noise power; Signal-to-Noise ratio and Figure of Merit calculation - DSB, SSB, FM; Threshold effect.

**Text Books:**

1. Simon Haykin, "Communication Systems",*John Wiley*, 2nd Edition,1986*(Chapters 3,4,6,7)*
2. George Kennedy & Bernard Davis, "Electronic Communication Systems", *TMH*, 3rd Edition, 1999 (*Chapter 6)*

**Reference Books:**

1. Bruce Carlson, "Communication Systems", *TMH*, 5th Edition, 2011.
2. P.Chakrabarthi "Analog Communication Systems" *Dhanpat Rai & Co,* 2006.
3. R.P.Singh, S.D.Sapre " Communication System", *TMH*, 2nd Edition, 1995.
4. Taub and Schilling " Principles of Communications" *TMH*, 2nd Edition, 1991.

**Course Learning Outcomes:**

After completion of this course, students will be able to

*CO1: analyze AM & FM modulation and demodulation techniques*
*CO2: describe AM & FM transmitters and receivers.*
*CO3: compare and contrast analog pulse modulation techniques.*
*CO4: calculate FOM for AM, FM.*

## U14EC504 MICROPROCESSORS AND MICROCONTROLLERS

**Class**: B.Tech., **V**-Semester **Branch**: Electronics & Communication 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:**

This course will develop students' knowledge in/on

*LO1: architecture of 8086 microprocessors.*
*LO2: assembly language programming and implementation of structures in programming.*
*LO3: interfacing of microprocessors to various I/O subsystems.*
*LO4: architecture of 8051 microcontroller and its interfacing*

### UNIT – I (9+3)

Evolution of Microprocessors, **8086 Family Architecture:** Organization of 8086 CPU, Concept of Memory Segmentation, Segment registers, physical and logical addressing, Instruction format, Instruction set, Addressing Modes.

### UNIT – II (9+3)

**Assembly Language Programming:** Assembler directives, simple Programming of 8086 Implementation of structures, time delays, strings, procedures, macros, pin configuration, Min/Max modes, timing diagrams.

### UNIT – III (9+3)

**Interfacing with 8086**: ADC, DAC interfacing, Interfacing of switches, Keyboards, LEDs, Stepper motor; CRT interface, interfacing through devices like 8255, 8257 and 8254. Interrupts & Priority interrupt controller 8259.

### UNIT – IV (9+3)

**8051 Microcontroller:** Architecture, Instruction set, addressing modes, Assembly language Programming, timers, I/o Ports, interrupts, serial ports, interfacing with LEDS Switches & Stepper Motor. Real Time Clock.

**Textbooks:**


1. D.V.Hall, "Microprocessors & Interfacing", *Tata McGraw Hill*, New Delhi.*(Chapter 3,4,5,6,7,8,9,10,11)*
2. Krishnakaant "Microprocessors and Microcontrollers" 2nd edition, PHI learning, 2014 *(Chapter 9, 10).*


**Reference books:**


1. Kenneth J Ayala, "8086 Microprocessor: Programming & Interfacing with PC", *West Publications, India,* reprint 1994.
2. A. K. Ray and K M Burchandi, "Advanced microprocessors and Peripherals", *Tata McGraw Hill,* Eleventh reprint 2009.
3. Kennet Ayala, The Microcontroller Architecture, Programming and Applications, *Penram Publications*, 3rd Edition, 2004.
4. Muhammed Ali Mazidi, the 8051 Microcontrollers and Embedded systems, *Pearson*, *New Delhi,* Reprint 2009.

**Course Learning Outcomes:**

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

*CO1: explain the architecture of 8086.*
*CO2: write assembly language programs and implement structures in programming.*
*CO3: design the interfacing circuits through various peripheral devices.*
*CO4: explain the architecture of 8051 microcontroller and perform its programming.*

## U14EC505 COMPUTER ARCHITECTURE

**Class:** B.Tech., **V**-Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge in/on

*LO1: evolution of Computers, ALU and design of control unit*
*LO2: types of memories and memory organization.*
*LO3: different data transfer modes and I/O devices.*
*LO4: 8085 architecture and assembly language programming.*

### UNIT – I (9+3)

**Introduction:** Types of Computers: Analog, Digital and Hybrid. Generation of Computers and their comparison. Dissection of Computer into various blocks; Communication among the blocks; Common bus concept, design of bus lines using MUXs and tristate buffers.

**The Arithmetic Logic Unit:** General register organization, stack organization of CPU, Instruction formats, Instruction types, addressing modes; Introduction to Assembly Language Programming. BASIC, ALU design: Arithmetic Unit, Logic Unit, and Shift Unit, One stage ALU.

### UNIT – II (9+3)

**Computer Arithmetic**: Fixed point arithmetic and floating point arithmetic.

**Control Unit:** Instruction sequencing, Instruction interpretation. Control Unit design. Methodologies: Hard wired Control Unit – Illustrative example; Micro programmed control unit; Control Memory, Address Sequencing, Micro Instruction format, Micro program sequencer design, concepts of RISC and CISC.

### UNIT – III (9+3)

**Memory Unit:** Memory hierarchy, Main Memory, RAM, ROM, Memory address mapping; Auxiliary Memory: Magnetic tapes & Discs. Associative Memories: Match logic, Read and Write logics, Cache Memory: Mapping techniques, R/W operations; Virtual Memory: Paging, Segmentation; Interleaved Memories.

**Data Transfer Modes:** Synchronous data transfer, Asynchronous data transfer, Strobe Control, Hand Shaking.

**I/O Unit:** Introduction to peripheral devices. I/O interface, I/O data transfer modes: Programmed I/O; Interrupt Driver I/O; Priority Interrupts; Hardware and Software; DMA controller and Data transfer, I/O Processor – CPU and IOP Communication.

### UNIT – IV (9+3)

**8085 CPU:** 8085 Architecture, Instruction set addressing modes, Basic assembly language programming, pin configuration, timing diagrams, interrupts. Basic Assembly Language Programmes – stacks, subroutine, strings.

**Text Book:**

1. Morris Mano, "Computer System Architecture", 3rd edition, Prentice Hall of India, New Delhi. *(Chapters 4, 5.1 to 5.7, 7, 8, 9,10.1 to 10.5, 11, 12)*
2. Krishnakaant "Microprocessors and Micro controllers" 2nd edition, PHI learning, 2014. *(Chapter 3, 4)*.

**Reference Books:**

1. John P. Hayes, *Computer Organization and Architecture,* McGraw-Hill, New York.
2. W.Stallings, *Computer Organization and Architecture,* Prentice Hall of India, New Delhi.

**Course Learning Outcomes**:
After completion of this course, the students' will be able to…

*CO1: explain common bus structure, ALU of a computer system.*
*CO2: compute various arithmetic operations and design a control unit*
*CO3: illustrate memory mapping and infer I/O Communication.*
*CO4: associate 8085 architecture and write 8085 assembly language programs.*

## U14EC506 DIGITAL SIGNAL PROCESSING LABORATORY

**Class:** B.Tech., **V** Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination: | 60 marks |

**Course Learning Objectives:**

This laboratory course will develop students' knowledge in/on

*LO1: MATLAB Programming*
*LO2: implementation of DFT& FFT algorithms*
*LO3: implementation of Digital Filters*
*LO4: DSP starter kits*

### LIST OF EXPERIMENTS

1. MATLAB Program to
   a. Generate - Unit step, Ramp, Impulse, Exponential and Sinusoidal Signals.
   b. Perform mathematical operations on signals.
   c. Perform scaling, shifting and delay operations on the sequences.
2. MATLAB Program on Modulation Techniques
   a. AMDSB and AMDSB-SC.
   b. FM.
3. MATLAB program on
   a. Correlation of two sequences.
   b. Convolution of two sequences.
4. MATLAB Program to Compute DFT and 4-pt FFT. (with and without using the command 'fft')
5. MATLAB Program to observe the spectrum of a given signal.
6. MATLAB programs to perform decimation and sampling rate conversions.
7. MATLAB Program to study the given system .(impulse response, poles and zeros, frequency response and linear phase characteristics )
8. MATLAB Program to Design a Butterworth IIR Filter. (All types of filters)
9. MATLAB Program to Design Chebyshev filter.
10. MATLAB Program to study the types of FIR filters.
11. MATLAB Program to Design FIR Filter using windows.
12. Digital Signal Processor(DSK 6711) programs for
    a. Convolution
    b. Fast Fourier Transform
13. MATLAB Simulink models on DSK 6711.
    a. Simple Mathematical operations on signals
    b. Audio Filtering.

**Laboratory Manual:**

1) Laboratory Manual for "Digital Signal Processing Laboratory", *prepared by the department of ECE*

**Text Books:**


1. Rudra Pratap, Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers, *Oxford University Press*, 2002.
2. Ifeachor, Digital Signal Processing-A practical Approach, 2/E, *Pearson Education. India*, 01-Sep-2002
3. Proakis, Digital Signal Processing using MATLAB, *Cangage Learning*, 3rd edition.


**Course Learning Outcomes:**

After completion of this laboratory course, students' will be able to

*CO1: evaluate convolution, DFT and Filter design using MATLAB.*
*CO2: develop a mini project using MATLAB*
*CO3: design any filter with required specifications and infer designing complications.*
*CO4: implement any method/algorithm using MATLAB*

## U14EC507 ANALOG COMMUNICATION LABORATORY

**Class:** B.Tech., **V**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This laboratory course will develop students' knowledge in/on

*LO1: various AM & FM modulation and demodulation techniques.*
*LO2: super heterodyne receiver characteristics.*
*LO3: different types of Analog Pulse Modulation techniques.*
*LO4: signal to Noise Ratio of various AM & FM systems.*

### LIST OF EXPERIMENTS

1 Amplitude Modulation & Demodulation
2 Balanced Modulator
3 Single Side Band Suppressed Carrier Modulation & Demodulation
4 Frequency Modulation & Demodulation
5 Spectral Analysis of AM & FM signals using Spectrum Analyzer
6 Pre-emphasis & De-emphasis Circuits
7 PLL Characteristics
8 Super Heterodyne AM Receiver
9 Frequency Division Multiplexing and Demultiplexing
10 Sampling and reconstruction
11 Time Division Multiplexing and Demultiplexing
12 PAM,PWM & PPM Modulation & Demodulation
13 Signal to Noise Ratio Measurement of AM,DSBSC,SSB,FM

### Laboratory Manual:

1) Laboratory Manual for "Analog Communication Laboratory", *prepared by the department of ECE*

### Text books:

1) Simon Haykin, "Communication Systems",*John Wiley*, 2nd Edition,1986(Chapters 3,4,6,7)
2) George Kennedy & Bernard Davis, "Electronic Communication Systems", *TMH*, 3rd Edition, 1999 (Chapter 6)

**Course Learning Outcomes:**

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

*CO1: implement and measure the performance of various AM & FM modulation and demodulation techniques*
*CO2: determine characteristics of super heterodyne receiver (sensitivity, selectivity)*
*CO3: implement various Analog Pulse Modulation techniques*
*CO4: calculate Signal to Noise Ratio in various AM & FM systems*

## U14EC508 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY

**Class:** B.Tech., **V**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This laboratory course will develop students' knowledge in/on

*LO1: assembly language programming on 8086 Microprocessor and on personal computer*
*LO2: assembly language programs on basic arithmetic, sorting, strings, and delay calculations*
*LO3: interfacing of DAC/ADC modules, stepper motor/DC motor, Elevator Controller and LED/LCD.*
*LO4: assembly language programming on 8051 Microcontroller and on personal computer*

### LIST OF EXPERIMENTS

Assembly Language Programming on 8086 Microprocessor

1. Study of 8086 kits
2. Finding Sum, Average, Multiplication.
3. Sorting (a) Ascending (b) Descending.
4. Transfer of bytes from DS to ES
5. Code Conversions (i) BCD to Binary (ii) Binary to BCD (iii) Binary to ASCII
6. String Comparison
7. Wave form Generation using DAC modules
   (i) Square Wave (ii) Saw tooth (iii) Triangular.
8. ADC interfacing
9. LED/LCD interfacing.
10. Stepper motor - interfacing
11. Study of Micro Controller kits, Assembly Language Programming
12. Multiplication, Division
13. Sorting
14. Code Conversion

### Laboratory Manual:

1) Manual for "Microprocessors and Microcontrollers Laboratory "*prepared by the faculty of Department of ECE*

### Text Books:

1. Manual for Microprocessors and Microcontrollers Laboratory *prepared by the faculty of Department of ECE*
2. D.V.Hall, "Microprocessors & Interfacing", *Tata McGraw Hill*, New Delhi.*(Chapter 3,4,5,6,7,8,9,10,11)*

**Course Learning Outcomes:**

After completion of this laboratory course, the students' will be able to

*CO1: write assembly language programs on basic arithmetic, sorting, strings and delay calculations*
*CO2: execute assembly language programs on 8086 microprocessor kits and personal computers*
*CO3: demonstrate the interfacing of various peripherals to 8086 microprocessor*
*CO4: implement 8051 assembly language programming.*

## U14EC509 SEMINAR

**Class**: B.Tech. V-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | - | 1 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation | 100 marks |
| End Semester Examination | - |

**Course Learning Objectives (LOs):**
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 (COs):**
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**

**ELECTRONICS & COMMUNICATION ENGINEERING**

| S. No. | Course Category | Course code | Course Name | Periods | | | Credits | Evaluation Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CIE | | | ESE | Total Marks |
| | | | | L | T | P | | TA | MSE | Total | | |
| 1 | OE | U14OE601 | Open Elective-I | 4 | - | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 2 | PC | U14EC602 | Digital Communication Systems | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 3 | PC | U14EE610 | Linear Control Systems | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 4 | ES | U14CS611 | Data Structures | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 5 | PC | U14EI613 | Electronic Measurements and Instrumentation | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 6 | PE | U14EC606 | Professional Elective-I | 4 | - | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 7 | PC | U14EC607 | Digital Communication Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 8 | ES | U14CS612 | Data Structures Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 9 | PR | U14EC609 | Mini Project | - | - | - | 2 | 40 | - | 40 | 60 | 100 |
| | | | **Total** | **20** | **4** | **6** | **30** | **-** | **-** | **360** | **540** | **900** |

Student Contact hours/week : 30; Total Credits : 30

**Open Elective-I**

U14OE 601A: Disaster Management
U14OE 601B: Project Management
U14OE 601C: Professional Ethics in Engineering
U14OE 601D: Rural Technology and Community Development

**Professional Elective-I**

U14EC 606 A: Digital Image Processing
U14EC 606 B : Nano Technology
U14EC 606 C : Neural Networks and Fuzzy Logic

## U14OE 601A DISASTER MANAGEMENT

(*Open Elective-I*)

**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 (LOs):**

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:**


4. Rajib shah and R.R Krishnamurthy, "*Disaster management – Global Challenges and local solutions*" University Press,1st edn,2009.
5. 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 (COs):**

After 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*

**U14OE 601B PROJECT MANAGEMENT**

*(Open Elective-I)*

**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(LOs)**:

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(COs)**:
After 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**

*(Open Elective-I)*

**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 (LOs):**

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(COs):**

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*

**U14OE 601D RURAL TECHNOLOGY AND COMMUNITY DEVELOPMENT**

*(Open Elective-I)*

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

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | 0 | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination: | 60 marks |

**Course Learning Objectives (LOs):**

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.

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**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 (COs):**

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*

## U14EC602 DIGITAL COMMUNICATION SYSTEMS

**Class:** B.Tech., **VI**-Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge in/on

*LO1: channel capacity, source coding, pulse digital modulation techniques, optimizes the transmission and quantization noises.*

*LO2: baseband data transmission systems.*

*LO3: coherent and non-coherent band pass data transmission techniques.*

*LO4: encoding and decoding of various channel coding techniques.*

### UNIT – I (9+3)

Elements of Digital Communication System.

**Source Coding and Channel Capacity:** Discrete Memoryless Source (DMS), Measure of information, Average mutual information and Entropy, Information Rate, Information measure for continuous random variables, Coding for Discrete Memoryless Sources; Source coding theorems - Shannon Fano and Huffman Coding Algorithms; Channel Models – Binary Symmetric Channel, Discrete Memoryless Channels, Discrete input Continuous output Channel, Channel Capacity of discrete memoryless channel; Gaussian Channel capacity – Shannon bound.

**Pulse Digital Modulation:** Pulse Code Modulation (PCM), Quantization, Encoding, Line codes; Noise in PCM systems – Transmission noise, Quantizing noise; Bandwidth of PCM; Differential PCM (DPCM) - Processing gain; Delta modulation (DM) - Quantizing Noise; Adaptive DM (ADM), Comparison of DPCM and DM with standard PCM.

### UNIT – II (9+3)

**Baseband Data Transmission:** Introduction; Baseband Binary PAM Systems – Baseband Pulse Shaping; Optimum Transmitting and Receiving Filters; Duobinary Baseband PAM systems – Use of controlled ISI, Modified Duobinary signaling; M-ary Baseband Signaling – Binary Versus M-ary Signaling Schemes; Equalization – Transversal Equalizer, Automatic Equalizers; Eye diagrams, Synchronization.

### UNIT – III (9+3)

**Band Pass Data Transmission:** Band Pass Data transmission system, Gram Schmidt Orthogonalization Procedure, Geometric Interpretation of signals, Correlation receiver; Coherent Binary Amplitude Shift Keying (BASK), Coherent Binary Phase Shift Keying (BPSK), Coherent Binary Frequency shift keying (BFSK), Quadrature Phase Shift Keying (QPSK), Minimum Shift Keying (MSK),Coherent M-ary PSK & FSK, Non coherent BFSK & Differential PSK (DPSK), Comparison of power & bandwidth requirements for above schemes.

## UNIT – IV (9+3)

**Error Control Coding:** Error detection & correction - Parity Check Codes, Code vectors and Hamming distance; Linear Block Codes - Error detection & Error correction capabilities, Hamming Codes; Cyclic Codes - Syndrome Calculation, Error Detection and Error correction, Special Classes of Cyclic Codes; Burst Error and Random Error Correcting Codes; Convolution Codes – Encoding, Tree and Trellis diagram, Decoding using Viterbi algorithm; Performance of Convolution Codes; Performance of Block codes - Error correction, Error detection.

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**Text Books:**


1. John G. Proakis, "Digital Communications", *McGraw-Hill Education,* 4th Edition,2001 *(Chapters 1, 3, 7, 8)*
2. Simon Haykin, "Digital Communications", *John Wiley,* 2nd Edition , 2007. *(Chapters 8,9,10)*
3. K. Sam Shanmugam, "Digital and Analog Communication Systems" *John Wiley*, 1996. *(Chapters 5,9)*


**Reference Books:**


1. P. Chakrabarti , "Analog and Digital Communication", *Dhanpat Rai & Co. (P) Ltd*., 2006.
2. Bhattacharya, "Digital Communication", *Tata McGraHill Education*, 2014


**Course Learning Outcomes:**

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

*CO1:calculate channel capacity, code efficiency of various source coding techniques, transmission and quantization noises in digital modulation techniques.*

*CO2: describe the baseband data transmission systems.*

*CO3: compare the performances of coherent and non-coherent band pass data transmission techniques.*

*CO4: implement encoding and decoding of various channel coding techniques.*

## U14EE610 LINEAR CONTROL SYSTEMS

**Class:** B.Tech., **VI**-Semester **Branch:** Electronics & Communication 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: transfer function representation &determination using block diagram reduction& signal flow graphs of LTI Systems*
*LO2: time domain analysis of LTI Systems and stability studies*
*LO3: develop the concepts on stability analysis using frequency response.*
*LO4: concepts of state space analysis & compensation techniques*

### UNIT – I (9+3)

**Introduction:** Types of systems, Properties of systems, Linearity, Time-invariance, Stability, Open loop control system, Closed loop control system, Effect of Feedback on overall gain, Sensitivity.

**Mathematical Models of Physical Systems:** Electrical, Mechanical and Electromechanical systems, Transfer function of physical systems by Block diagram reduction techniques, Drawing a signal flow graph from a block diagram.

### UNIT – II (9+3)

**Control System Components:** AC and DC servomotors, Synchros and Tacho generator.

**Time Domain Analysis:** Design specifications, Typical test signals, Time response of first order and of 2nd order systems, Time domain specifications, Basic control actions like P, PI, PD, PID and Derivative feedback, Steady State error and Error constants, Routh Hurwitz Criterion, Concept of root locus and Construction of root loci, Effects of adding poles and zeros.

### UNIT – III (9+3)

**Frequency Domain Analysis:** Frequency response of closed loop systems, Specifications, Correlation between frequency and time domain specifications, Polar plots, Gain Margin and Phase Margin, Bode plots, Nyquist stability criterion.

### UNIT – IV(9+3)

**State Variable Analysis of Continuous Systems:** Concepts of state, State variables and state model, Derivation of state model from transfer function, Diagonolization, Derivation of transfer function from state model, Solution of state equations, State transition matrix, Concept of Controllability and Observability.

**Compensation:** Elementary treatment of Compensation.

**Text Books**


1. A.Anand Kumar "Control Systems", *Prentice Hall of India, New Delhi, 2008*
2. S.Palani, "Control System Engineering", *Tata McGraHill Education, India,* New Delhi,2nd Edition, 2015

**References**


1. J. Nagarth & M. Gopal, "Control System Engineering", *New Age International Publishers,* New Delhi, 3rd Edition, 2003.
2. K.Ogata, Modern Control Engineering" *Prentice Hall of India, New Delhi, 3rd* Edition,
3. B.C. Kuo, "Automatic Control Systems", *Prentice Hall of India, New Delhi, 8th* Edition, 2002


**Course Learning Outcomes (CO):**

After completion of this course, students will be able to

*CO1 : determine the TF of a system using block diagram reduction technique & signal flow graphs of LTI system & Solve Problems.*

*CO2 : determine Transient and Steady State behavior of systems using standard test signals and stability in time domain & Solve Problems*

*CO3 : determine the stability of the LTI systems using frequency domain.*

*CO4 : analyze performance of state space analysis of a continuous system.*

**U14CS611 DATA STRUCTURES**

**Class:** B. Tech VI-Semester **Branch:** Electronics & Communication 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: basic data structures and its usage in handling real world applications*
*LO2: representing the data using linear data structures such as queues, circular queues, dequeue, priority queue, and using non-linear data structures such as trees*
*LO3: representing and retrieving the data in the form of various types of trees and graph data structures*
*LO4: searching of data with the help of various search methods, to sort data using various sorting methods, and to effectively store and retrieve data, using various hashing methods*

## UNIT - I (9+3)

**Basic Concepts:** Algorithm specification- Introduction, Performance analysis and measurement- Performance analysis, Performance measurement.
**Arrays**: The arrays as an abstract data type, The polynomial abstract data type, Sparse matrices- Introduction, Sparse matrix representation, Transposing a matrix.
**Stacks and Queues:** The stack abstract data Type, The queue abstract data type, Evaluation of expressions- Expressions, Postfix notations, Infix to postfix, Infix to prefix.

## UNIT - II (9+3)

**Linked Lists**: Singly linked lists and chains, Representing chains, Circular lists, Linked stacks and Queues, Polynomials, Doubly linked lists.
**Trees**: Introduction, Binary trees- The abstract data type, Properties of binary trees, Binary tree representations, Binary tree traversals and Tree iterator- Introduction, Inorder traversal, Preorder traversal, Postorder traversal, Iterative traversals.
Binary search trees- Definition, Searching a binary search tree, Insertion into a binary search tree, Deletion from a binary search tree.

## UNIT - III (9+3)

**Graphs:** The graph abstract data type- Introduction, Definition, Graph representation, Elementary graph operations- Depth first search, Breadth first search, Connected components, Spanning trees, Minimum cost spanning trees- Kruskal's algorithm, Prim's algorithms, Shortest paths- All pairs shortest paths.

## UNIT - IV (9+3)

**Sorting and Searching:** Searching, Search techniques- Linear Search, Binary search, Sorting- Types of sorting, General sort concepts, Bubble sort, Insertion sort, Selection sort, Quick sort, Heap sort, Merge sort, Comparison of all sorting methods.
**Hashing:** Introduction, Key terms and issues, Hash functions, Collision resolution strategies, Hash table, Extendible hashing.

**Text Book:**

1. Ellis Horowitz, Sartaj Sahani, Dinesh Metha, "Fundamentals of Data Structures in C++", *Universities Press*, 2nd Edition, ISBN-978 81 7371 606 5, 2008.
2. Varsha H.Patil, "Data Structures Using C++", *Oxford University Press*, 1st Edition, ISBN-10: 0-19-806623-6, ISBN-13: 978-0-19-806623-1, 2012 (Chapters :9,11)

**Reference Books:**

1. D. Samanta, "Classic Data Structures", *Prentice Hall India*, 2nd Edition, ISBN- 978-203-3731-2, 2009.
2. Mark Allen Weiss, "Data Structure & Algorithm Analysis in C++", *Pearson Education*, 3rd Edition, ISBN-10: 81-3171-474-8, ISBN-13:97-8813-1714-744, 2007.

**Course Learning Outcomes:**

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

*CO1: implement the basics of data structures in handling real world applications*

*CO2: represent data using linear data structures such as queues, circular queues, dequeue, priority queue, and using non-linear data structures such as trees and graphs*

*CO3: represent and retrieve the data in the form of various non-linear data structures like trees and graphs*

*CO4: search for data with the help of various searching techniques*

## U14EI613 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

**Class:** B. Tech VI-Semester **Branch:** Electronics & Communication 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: Principles and operation of Electrical and Electronic Measuring Instruments.*
*LO2: Bridge circuit measurements and their application*
*LO3: Distinguished features of Special Oscilloscopes, Signal Analyzers and Data recorder*
*LO4: physical parameter measurement using transducers s & their classification*

### UNIT – I (9+3)

**Analog and Digital Meters:** Review of PMMC – Range extension of DC ammeter and DC voltmeter – Measurement of AC Voltage using Rectifier type Instrument – Electrodynamic type wattmeter – Q-meter operation – Digital voltmeters: SAR, Dual slope & Ramp type, DVMs - Review of DMM block diagram

**Bridges**: General bridge balance equation - Wheatstone bridge – Kelvin's Double Bridge – Maxwell Bridge – Schering bridge – Wien's Bridge

### UNIT – II (9+3)

**Ossilloscopes:** Review of CRO block diagram – Attenuators and probes of CRO – Dual Beam Oscilloscope – Dual Trace Oscilloscope – Sampling Oscilloscope – Digital Storage Oscilloscope – Measurement of Phase and Frequency using Lisajjous Patterns

**Signal Analyzers:** Frequency Selective & Heterodyne Wave Analyzers – Harmonic Distortion Analyzer – THD Analyzer - Spectrum analyzer

**Recorders and Display Systems**: X-Y Recorder – Magnetic tape Recorder – working principle of LCD system

### UNIT – III (9+3)

**Transducers:** Transducer & its classification – Basic Requirements of Transducer – Resistive Transducers: Potentiometric type, Strain Gauge type; Capacitive Transducers : Variable gap type, Variable area type and Variable Dielectric type – Inductive Transducers: Variable Reluctance type and LVDT type – Piezo Electric Transducer: Piezoelectric effect, Piezoelectric materials, PZT - Photo electric Transducers: LDR, Photo diode and Photo transistor

### UNIT – IV (9+3)

*(Qualitative Treatment Only)*

**Transducer Applications**: Force Measurement using Strain Gauge transducer – Temperature measurement using RTD & Thermocouple type transducer - Pressure measurement using Differential Capacitive type transducer – Acceleration Measurement using Piezoelectric Accelerometer - Flow Measurement using Electro Magnetic Flow Meter – Fluid Velocity Measurement using Hot wire Anemometer – Level Measurement using Ultrasonic Level Gauge – Sound Level Meter – Data Acquisition system

**Text Books:**

1. Helfrick. A.D and Cooper W.D., "Modern Electronic Instrumentation And Measurement Techniques", 2nd Edition, *PHI,* New Delhi, *1994.* (Chapter 4,5,6,7 and 9)

**Reference Books:**


1. P. Pruthviraj, B. Bhudaditya, S. Das and K. Chiranjib, "Electrical And Electronic Measurement And Instrumentation", 2nd Edition *McGraw Hill Education* 2011, New Delhi,.
2. Sawhney A.K, "Electrical and Electronic Measurement And Instrumentation", 10th Edition 1994 *Dhanpat Rai & Sons,* New Delhi,.
3. David A Bell, "Electronic Instruments And Measurements", 3rd Edition *Oxford University Press* 2003, New Delhi,.


**Course Learning Outcomes**:

After completion of the Course, students will be able to

*CO1:* *use various Electrical and Electronic Measuring Instruments*

*CO2:* *use bridge circuits for the measurement of electrical parameters (r,l and*

*CO3:* *explain the features, operation and applications of dvm, dmm, cro, dso, signal analyzer*

*CO4:* *apply the Transducers principles and Measurement of physical parameters encountered in dosmetic and industrial applications*

## U14EC 606A DIGITAL IMAGE PROCESSING

*(Professional Elective-I)*

**Class:** B.Tech., **VI**-Semester **Branch:** Electronics& Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: image fundamentals and importance of various Transformations*
*LO2: image enhancement using various techniques and image restoration techniques.*
*LO3: various image compression algorithms*
*LO4: image segmentation fundamentals and segmentation techniques*

### UNIT – I (12)

**Introduction:** Elements of Digital Image Processing system, Digital Image representation, Image acquisition, Image model, Sampling and Quantization, Relationship between pixels, neighborhoodness, path, Connectivity, Distance measures, Arithmetic and Logical operations on images; Basic Transformations - Translation, Scaling, Rotation, Perspective Transformations; Color image fundamentals.

**Image Transforms**: Two dimensional DFT and its properties, DCT Unitary Transforms, Walsh Transform, Hadamard Transform, Haar Transform, Slant Transform, KL Transform.

### UNIT – II (12)

Simple Intensity Transforms, Histogram Equalization and Specification techniques, Noise distributions, Bitplane slicing and Gray level slicing.

**Enhancement with Filtering**: 2D Convolution; Smoothing filters - Mean, Median and Gaussian filtering; Sharpening Filtering - High boost filtering and Unsharp masking; Enhancement in frequency domain - Homomorphic filtering, Color image enhancement.

**Image Restoration:** Image Restoration - Degradation model; Unconstrained restoration - Inverse filtering; Constrained restoration - Wiener filtering, Least square filter.

### UNIT – III (12)

**Image Compression**: Redundancy – Coding redundancy, Interpixel redundancy, Psychovisual redundancy; Image compression system model, Fedility criteria- Noiseless and Noisy coding; Error free compression – Huffman, Run length encoding, Arithmetic coding, Bit-plane coding, Constant area coding, lossless predictive coding; Lossy compression – Lossy predictive coding, Transform coding, JPEG 2000.

### UNIT – IV (12)

**Image Segmentation**: Detection of discontinuities – Point detection, Line detection, Edge detection, Threshold based edge detection, Edge Linking, Pixel connectivity; Region – Oriented segmentation – Region similarity, Region growing, Limitations of region growing, Region splitting and Merging.

**Morphological Image Processing**: Structuring element, Fitting and hitting, Dilation, Erosion, Opening and closing, Hit–or–Miss Transform, Basic Morphological Algorithms, Grey Scale Morphology.

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**Text Books:**

1. R.C. Gonzalez and R.E. Woods, "Digital Image processing", *Pearson Education*, 2nd edition New Delhi. 2004. *(Chapters 1, 2, 3, 4, 5, 6, 8, 9, 10).*

**Reference Books:**

1. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins," Digital Image Processing using MATLAB", *Pearson Education, Inc.*, 1st edition, 2004
2. William K. Pratt, , "Digital Image Processing", *John Wiley*, 4th edition, New York, 2002
3. Sridhar, "Digital Image Processing", *Oxford university press*, 1/E, 2013

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**Course Learning Outcomes:**

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

*CO1: analyze basic image fundamentals and perform various operations & Transforms on images.*
*CO2: implement the Image Enhancement, Compression and Segmentations using MATLAB.*
*CO3: apply the advanced mathematics to improve the image processing Techniques.*
*CO4: formulate solutions to real world issues in image processing.*

**U14EC 606B NANOTECHNOLOGY**

*(Professional Elective-I)*

**Class:** B.Tech.,VI-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination: | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: nanoscale, its potential applications and basic chemistry concepts.*

*LO2: nano cones, Quantum Dots, Nano composites and Thin-Films*

*LO3: nano electronics and Quantum mechanical tunnel devices.*

*LO4: nanotechnology instrumentation tools*

**UNIT – I (12)**

**Introduction and Scope:** Introduction to Nanoscale, Plethora of potential applications, Challenges and Opportunities, Technology Scope and Commercialization Scope.

**Basic Nanotechnology Science:** Basic Science, Properties, Conductors, Insulators, Semiconductors, Silicon, Basics of Transistor operation, Basic Chemistry Concepts.

**UNIT – II (12)**

**Nanotubes, Nanomaterials and Nanomaterial Processing:** Introduction, Carbon Nanotubes, Nanowires, Nano cones, Quantum Dots, Nano composites, Thin-Films, Environmental Issues for Nanomaterials, Manufacturing Techniques.

**Nano photonics:** General Photonics Trends, Basic Nano photonics, Photonic crystals, Telecom Applications of Photonic Crystals, Plasmonics, Quantum Optics.

**UNIT – III (12)**

**Nanoelectronics:** Introduction, Single Electron Devices, Quantum Mechanical Tunnel Devices, Spintronics, Molecular Nanoelectronics, Fault Tolerant Designs, Quantum Cellular Automata, Quantum Computing, Fabrication Methods and Techniques for Nanoelectronics, Modeling for Nanomaterials.

**UNIT – IV (12)**

**Nanotechnology Instrumentation:** Transmission Electron Microscope, Infrared and Raman Spectroscopy, Photoemission & X-Ray Spectroscopy, Electron Microscopy, Scanning Probe Microscopy, Atomic Force Microscopy, Electrostatic Force Microscopy, Magnetic Force Microscopy.

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**Text Books:**

1. Daniel Minoli, "Nanotechnology Applications to Telecommunications and Networking", *John Wiley & Sons Publications*, 1st edition, 2006.(**Chapters 1-6, Appendix F**)
2. G. Timp, "Nanotechnology", *Bell Labs, Murray Hill, NJ, USA,* 1st edition,1999.(**Chapters 2,5**)

**Reference Books:**

1. Eric Drexler "Nano systems, Molecular machinery, Manufacturing & Computation.", *John Wiley & Sons,* 1st edition, 1992.
2. S. Dutta, "Electron Transport in Mesoscopic systems", *Cambridge University Press,* 1st edition, 1995.
3. C Charles and P. Poolem, "Introduction to nanotechnology", *Wiley International,* 1st edition, 2010.
4. Lyschevski and Sergey Edward, "Nano and Microelectromechanical Systems: Fundamentals of Nano and Micro Engineering", *CRC Press*, 1st edition, 2000.

**Course Learning Outcomes:**

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

*CO1: describe the basic properties of conductors, insulators and semiconductors.*
*CO2: contrast the Nanotubes, Nanomaterials and Nanomaterial Processing.*
*CO3: discuss Nano electronics concepts.*
*CO4: explain about Nanotechnology Instrumentation tools.*

**U14EC 606C NEURAL NETWORKS & FUZZY LOGIC**

*(Professional Elective-I)*

**Class:** B. Tech., **VI**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous internal Evaluation: | 40 Marks |
| End Semester Examination : | 60 Marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: the fundamental concepts of Artificial Neural Networks*

*LO2: associate Memories referring to Bidirectional Associate Memory and Hopfield Networks.*

*LO3: fuzzy sets, fuzzy logic and use of heuristics based on human experience*

*LO4: neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems*

**UNIT-I (12)**

**Fundamental Concepts and Models of Artificial Neural Networks**

Biological Neuron and their Artificial Models, Models of Artificial Neural Network, Neural Network learning Rules- Hebbian rule, Perception learning rule its Convergence theorem, Delta learning rule, Widrow-Hoff rule, Correlation learning rule, Winner-Take-All learning rule, Outstar learning rule; Comparison of logic families.

**UNIT-II (12)**

**Associative memory:** Associate Memories-Basic Concepts, Linear Associator, Basic Concepts of Recurrent Autoassociative Memory, Retrieval Algorithm and Storage Algorithm.

**Bidirectional associative memory and Hopfield memory:** Bidirectional Associative Memory- Architecture, Processing and Energy function; Associate Memory of Spatio-Temporal patterns, Discrete Hopfield Networks, Continuous Hopfield Networks, Traveling salesman problem; Adaptive Resonance Theory- introduction, Cluster structure, Simplified ART architecture and its Applications

**UNIT-III (12)**

**Fuzzy Sets, Relations and Membership factions:** Classical Sets- Operations and Properties of classical (crisp) sets; Fuzzy Sets-Fuzzy set operations, Properties of fuzzy sets, Alternative fuzzy set operations; Crisp relations and their properties, Fuzzy relations- Operations and properties on fuzzy relations, Fuzzy cartesian product and composition, Crisp/ Fuzzy tolerance and equivalence relations, Feature of membership functions, Various forms, Fuzzification and Defuzzification.

**UNIT-IV (12)**

**Logic and Fuzzy System:** Logic- classical logic, Tautologies, Equivalence, Exclusive–Or & Exclusive-Nor, logical proofs, Deductive inferences, Fuzzy logic, Approximate Reasoning.

Fuzzy Systems, Natural Language, Linguistic Hedges, Fuzzy (Rule-Based) Systems, Graphical of Fuzzy (Rule-Based) Systems. Membership value assignment: Intuition, Inference, Rank ordering, Neural networks, Genetic algorithms, Inductive reasoning.

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**Text Books:**

1. J. Zurada, "Artificial Neural Networks", *Tata McGraw Hill*, NewDelhi,1st Edition,1992 ***(Chapters 2, 5, 6,7)***
2. Timhothy J Ross, "Fuzzy Logic with engineering application", *Wiley publications,* India, 3rd Edition, 2010 ***(Chapters 1, 2,3,4,5,6)***

**Reference Books:**

1. Muller B.Rienhardt,J., "Neural Networks and Introduction",*Springer- Verlag*,1991.
2. Simon Haykin, "Neural Networks (A Comprehensive Foundations)", *McMillan College Pub. Company*, New York, 1994.
3. S. Rajashekaran, G.A. Vijaya laxmi pai, " Neural Networks, Fuzzy Logic & Genetic Algorithms", *PHI.*
4. Bart Kosko, "Neural Networks And Fuzzy Systems", *Prentice Hall*, New york, 1992.

**Course Learning Outcomes:**

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

*CO1: design and define the learning of Artificial Neural Networks in feedforward and feedback networks.*
*CO2: explain about Bidirectional Associate Memory & Hopfield Memory and ART Networks.*
*CO3: identify the concepts of fuzzy sets, fuzzy logic and use of heuristics based on human experience*
*CO4: implement neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems*

## U14EC607 DIGITAL COMMUNICATION LABORATORY

**Class:** B.Tech., **VI**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This laboratory course will develop students' knowledge in/on

*LO1: pulse digital modulation techniques*
*LO2: baseband PAM and M-ary systems, Eye Patterns*
*LO3: coherent BASK, BFSK, BPSK, QPSK, MSK and non-coherent DPSK.*
*LO4: source coding and channel coding techniques, equalizers.*

### LIST OF EXPERIMENTS

1. Source Coding Techniques
2. Pulse Code Modulation & Demodulation
   - Line Coding in PCM
   - Quantization Noise in PCM
3. Differential Pulse Code Modulation
4. Delta Modulation
   - Modulation & demodulation of DM : Linear, CSVD
   - Quantization noise in DM
5. Adaptive Delta modulation and demodulation
6. Baseband Binary PAM system
   - Eye pattern
   - Scrambling and descrambler
7. Equalizers
8. M-ary Baseband signaling
9. Modulation & demodulation of Binary ASK, FSK, PSK
10. Differential Phase Shift Keying (DPSK)
11. QPSK modulation and demodulation
12. Minimum Shift Keying Modulation & demodulation
13. Error Control coding
    - Linear Block Codes
    - Cyclic Codes
    - Convolution Codes
    - Hamming Codes

**Laboratory Manual:**

1. Manual for "Digital Communication laboratory" prepared by *faculty of department of ECE*

**Text books**:

1) John G. Proakis, "Digital Communications", *McGraw-Hill Education*, 4th Edition,2001 *(Chapters 1, 3, 7, 8)*

**Course Learning Outcomes:**

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

*CO1: implement and evaluate the performance of Pulse Digital Modulation techniques.*
*CO2: analyze Baseband Binary PAM, M-ary systems and measure their performance using Eye pattern.*
*CO3: implement and measure the performance of Coherent BASK, BFSK, BPSK, QPSK, MSK and non-coherent DPSK.*
*CO4: implement and evaluate the performance of Source Coding and Channel Coding Techniques, Equalizers.*

## U14CS612 DATA STRUCTURE LABORATORY

**Class:** B. Tech VI-Semester **Branch:** Electronics & Communication 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: concepts, operations and implementation details of various data structures*
*LO2: implementing the different algorithms using C++ programming language*
*LO3: improving the student capability in applying various data structures in different applications*
*LO4: different types of sorting and searching techniques*

### List of Experiments

**Experiment-I**

1. Program to implement array operations.
2. Program to display sparse representation for a given m*n matrix.
3. Program to read a sparse matrix and display its transpose.

**Experiment-II**

4. Program to perform addition of two sparse matrices.
5. Program to implement stack operations using arrays.

**Experiment-III**

6. Program to implement multiple stack operations.
7. Program to convert infix expression into postfix.
8. Program to convert given infix expression into prefix notation.

**Experiment-IV**

9. Program to evaluate given postfix expression.
10. Program to implement queue operations using arrays.

**Experiment-V**

11. Program to implement circular queue operations using arrays.
12. Program to create single linked list and insert an element at desired position.

**Experiment-VI**

13. Implement the following operations on linked list.
    a) Delete b) Concatenation c) Reverse.
14. Program to implement double linked list operations. (Insertions and Deletions).

**Experiment-VII**

15. Program to implement circular single linked list and its operations.
16. Program to implement circular double linked list and its operations.
17. Program to create and display single linked list using header node.
18. Program to create and display double linked list using header node.

**Experiment-VIII**

19. Program to implement stack operations using linked list.
20. Program to implement queue operations using linked list.

**Experiment-IX**

21. Implementation of binary tree and its traversal techniques.
    a) Inorder b) Preorder c) Postorder .
22. Program to create a binary search tree and perform the tree operations.
    a) Insertion of a node b) Deleting a node.

**Experiment-X**

23. Implement the following graph traversal techniques.
    a) Depth first search b) Breadth first search.

**Experiment-XI**

24. Program to implement insertion sort technique.
25. Program to implement selection sort technique.
26. Program to implement quick sort technique.

**Experiment-XII**

27. Program to implement merge sort technique.
28. Program to implement heap sort technique

**Laboratory Manual:**

1. Laboratory manual for "Data Structures laboratory", *prepared by faculty of Dept. of IT.*

**Text Book:**


1. Ellis Horowitz, Sartaj Sahani, Dinesh Metha, "Fundamentals of Data Structures in C++", *Universities Press*, 2nd Edition, ISBN-978 81 7371 606 5, 2008.
2. Varsha H.Patil, "Data Structures Using C++", *Oxford University Press*, 1st Edition, ISBN-10: 0-19-806623-6, ISBN-13: 978-0-19-806623-1, 2012 (Chapters :9,11)


**Course Learning Outcomes:**

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

*CO1: know practical knowledge about implementing various data structures using C++*
*CO2: understand the knowledge about how various data structures will be implemented like arrays, stacks, queues, linked list, trees, and graphs*
*CO3: implement various sorting and searching techniques*
*CO4: apply these data structures efficiently to develop different software applications*

## U14EC609 MINI PROJECT

**Class**: B.Tech. VI-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | - | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation | 100 marks |
| End Semester Examination | - |

**Course Learning Objectives (LOs):**
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 (COs):**
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**

**ELECTRONICS & COMMUNICATION ENGINEERING**

| S.No | Course Category | Course Code | Course Name | Periods | | | Credits | Evaluation Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CIE | | | ESE | Total Marks |
| | | | | L | T | P | | TA | MSE | Total | | |
| 1 | HS | U14MH701 | Management, Economics and Accountancy | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 2 | PC | U14EC702 | VLSI Design | 4 | - | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 3 | ES | U14CS709 | Operating Systems | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 4 | PE | U14EC703 | Professional Elective-II | 4 | - | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 5 | PE | U14EC704 | Professional Elective –III | 4 | - | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 6 | PC | U14EC706 | ECAD Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 7 | ES | U14CS710 | Operating Systems Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 8 | PR | U14EC711 | Major Project Work *Phase-I* | - | - | 7 | 4 | 100 | - | 100 | - | 100 |
| | | | **Total** | 18 | 2 | 13 | 28 | - | - | 380 | 420 | 800 |

Student Contact hours/week : 33; Total Credits: 28

**Professional Elective-II**

U14EC 703A: Satellite Communications
U14EC 703B: Data Communication Networks
U14EC 703C: Smart Antennas

**Professional Elective-III**

U14EC 704A: Cellular and Mobile Communications
U14EC 704B: DSP Processors
U14EC 704C: Industrial Electronics

## U14MH701 MANAGEMENT, ECONOMICS & ACCOUNTANCY

**Class:** B.Tech., **VII** Semester **Branch:** E&I, ECE, IT & EEE

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | - | 4 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives (LOs):**
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 (COs):**

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

*CO1: judge the differences between practical and theoretical management.*
*CO2: associate an idea of Micro, Macro Economics and Forms of Business Organisations*
*CO3 distinguish between Journal and Ledger.*
*CO4: assess the profits and losses & financial position through the Balance Sheet.*

## U14EC702 VLSI DESIGN

**Class**: B.Tech., VII-Semester **Branch**: Electronics & Communication 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**:

This course will develop students' knowledge in/on…

*LO1: fabrication Process and Electrical Properties of MOS Transistors.*

*LO2: stick Diagrams and Mask Layouts for MOS circuits.*

*LO3: scaling and Subsystem Design with Structured Approach.*

LO4: *basic Concepts of Verilog and description of various levels of abstraction (Behavioral, Dataflow, Gate Level and Switch Level)*

### UNIT–I (9+3)

**Review of Micro Electronics and Introduction to MOS Technology:** Introduction to IC Technology, MOS Technology and VLSI, Basic MOS transistor, Photolithographic Process, Etches, Deposition Techniques, Fabrication Process of nMOS, CMOS and BICMOS Transistors, Production of E-Beam Masks.

**Basic Electrical Properties of MOS Transistor:** Derivation of Drain to Source Current, Threshold Voltage, Transconductance, Pass Transistor, nMOS Inverter, Pull Up/Pull Down ratios, Alternate forms of Pull Up, CMOS Inverter, BiCMOS Inverters, Latch Up in CMOS Circuits.

### UNIT–II (9+3)

**MOS and BiCMOS Circuit Design Processes:** MOS Layers, Stick Diagrams and Symbolic Diagrams, nMOS Design Style, CMOS Design Style, Lay Out and Lambda Based Design Rules , Contact Cuts, Layout Diagrams.

**Basic Circuit Concepts:** Sheet Resistance, Area Capacitances of Layers and Calculations, Delay Unit, Inverter Delays, Rise Time and Fall Time estimation.

### UNIT – III (9+3)

**Scaling of MOS Circuits:** Scaling Models and Scaling Factors, Scaling factors for device parameters and Limitations of scaling.

**Subsystem Design and Layout**: Architectural Issues, Switch Logic, Gate Logic, Examples of Structured Design, Clocked Sequential Circuits and System Considerations.

### UNIT–IV (9+3)

**Verilog HDL :** Hierarchical Modeling Concepts; Basic concepts - Data types, Modules and ports; Gate level modeling , Dataflow modeling, Behavioral modeling, Design examples of Combinational and Sequential circuits, Switch level modelling, Tasks and Functions.

**Text Books:**

1. Douglas A Pucknell and Kamran Eshraghian, "Basic VLSI Design", *PHI*, 3rd Edition, 2008 *(Chapters 1 to 6)*
2. Samir Palnitkar, "Verilog HDL–Guide To Digital Design And Synthesis", *Pearson Education*, 3rd Edition, *2003. (PART-I: Chapters 2 to 8)*

**Reference Books:**

1. Weste and Eshraghian, "Principles Of CMOS VLSI Design", *Addison Wesley*, 2nd Edition, 2008.
2. John P Uyemura, "Chip Design For Submicron VLSI: CMOS Layout And Simulation", Thomson India Edition, 2010.

**Course Learning Outcomes**:

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

*CO1: explain various steps of Fabrication Process and Electrical Properties of MOS Transistors.*

*CO2:describe the Color Codes, Symbols and sketch the Stick Diagrams and Mask Layouts for MOS circuits.*

*CO3:determine the scaling factors for various device parameters and outline the structured design approach for several example circuits.*

CO4: *write Verilog description of digital circuits using Behavioral, Dataflow, Gate and Switch Levels of abstraction.*

## U14C709 OPERATING SYSTEMS

**Class**: B.Tech., VII-Semester **Branch**: Electronics & Communication 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: the principles, techniques and approaches in operating systems*
*LO2: process scheduling, process synchronization methods and deadlock handling techniques*
*LO3: memory management and disk management techniques*
*LO4: file management and OS protection and security techniques*

### UNIT-I (9+3)

**Introduction:** What operating systems do, Computer system architecture, Operating system structure, Operating system operations, Process management, Memory management, Storage management, Protection and security, Distributed systems, Special purpose systems, Computing environments, Open source operating systems.

**System structures:** Operating system services, User operating system interface, System calls, Types of system calls, Operating system structure, Virtual machines, Operating system generation, System boot.

**Process concept:** Process, Process states, Process control block, Threads, Process scheduling-Scheduling queues, Schedulers, Context switch, Operation on processes, Inter process communication.

### UNIT-II (9+3)

**Process scheduling:** Basic concepts, Scheduling criteria, Scheduling algorithms – First come first served, Shortest job first, Priority, Round robin, Multilevel queue, Multilevel feedback queue, Multiple processor scheduling.

**Process synchronization:** Critical section problem, Peterson's solution, Synchronization hardware, Semaphores, Monitors. Classic problems of synchronization – Readers writers problem, Bounded buffer problem, Dining philosophers problem.

**Deadlocks:** System model, Deadlock characterization, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

### UNIT-III (9+3)

**Memory management strategies:** Basic hardware, Address binding, Logical versus physical address space, Dynamic loading, Dynamic linking and shared libraries; Swapping, Contiguous memory allocation, Paging, Structure of the page table, Segmentation.

**Virtual memory management:** Background, Demand paging, Page replacement-Basic page replacement, Page replacement algorithms-FIFO, Optimal, LRU, LRU-Approximation, Counting based; Allocation of frames, Thrashing.

**Secondary storage structure:** Disk structure, Disk scheduling, Disk management, Swap space management.

## UNIT-IV (9+3)

**File system:** File concepts, Access methods, Directory and disk structure, File-system structure and implementation, Allocation methods, Free space management.
**System protection and security:** Goals of protection, Domain of protection, Access matrix, Implementation of access matrix, Security problem, User authentication, Program threats, System and network threats.
**Distributed operating systems:** Motivation, Types of network based operating systems - Remote login, Remote file transfer; Naming and transparency, Remote file access, File replication.

### Text Books:


1. Silber Schatz , Gagne & Galvin, "Operating System Concepts", *8th Edition*, *John Wiley & Sons,* ISBN-13-9788126520510, 2009


### Reference Books:


1. H.M. Dietel, "An Introduction to Operating Systems", *2nd Edition, Pearson Education,* ISBN 81-7808-035-4, 2000.
2. Andrew S. Tanenbaum, "Operating System Design and Implementation ", *3rd Edition, Prentice Hall,* ISBN 0-13-142938-8, 2006.
3. William Stalling, "Operating Systems", *1st Edition, Maxwell, McMillan International Editions*, ISBN 81-203-1187-6, 1992.
4. Naresh Chauhan, "Principles of Operating Systems", *1st Edition, Oxford University Press,* ISBN-13:978-0-19-808287-3, 2015


**Course Learning Outcomes:**

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

*CO1: possess the knowledge of role of operating systems and their types*
*CO2: apply the concept of process, scheduling algorithms and process synchronization for problem solving.*
*CO3: acquire the knowledge of memory management techniques and apply them in various application developments*
*CO4: realize the concept of file management, protection and security methods.*

## U14EC 703A SATELLITE COMMUNICATIONS

*(Professional Elective-II)*

**Class:** B.Tech, **VII**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: key issues in satellite communication.*
*LO2: various satellite subsystems and satellite link design.*
*LO3: different multiple access techniques.*
*LO4: low earth orbit, Geo-Stationary Satellite Systems, GPS principle and its applications.*

### UNIT I (12)

**Introduction:** Overview of Satellite Communication, GEO, MEO and LEO satellite systems, Frequency bands.

**Orbital Mechanics:** Orbital equations, Locating the satellite with respect to the earth, Orbital elements, Look Angles, Orbital perturbation, Satellite eclipse, Sun transit outage; Coverage angle – Slant range; Launching Procedures – Launch vehicles and Propulsion.

### UNIT II (12)

**Satellite Subsystems:** Attitude and Orbit Control System (AOCS), Telemetry, Tracking and Command System (TT&C), Power Systems, Communication subsystems, Transponders, Satellite antennas, Equipment reliability and Space qualification.

**Satellite Link Design:** Basic transmission theory, System noise temperature and G/T ratio, CNR, CIR, ACI, IMI, Uplink & Down link analysis and design, Design of satellite links for specified C/N, System design examples.

### UNIT III (12)

**Multiple Access Schemes:** FDM/FM/FDMA, TDMA, Frame structure, Frame acquisition, Synchronization, TDMA in VSAT network, On board processing.

**Spread Spectrum Modulation:** CDMA, Spread spectrum transmission and reception, DSSS - CDMA – Capacity.

### UNIT IV (12)

**Low Earth Orbit and Geo-Stationary Satellite Systems:** Orbit consideration, Coverage and Frequency considerations, Delay & Throughput considerations, System considerations, Operational NGSO constellation Design.

**Satellite Navigation & The Global Positioning System:** Radio and Satellite Navigation, GPS Position Location principles, GPS Receivers and codes, Satellite signal acquisition, GPS Navigation Message, GPS signal levels, GPS receiver operation, Differential GPS.

**Text Books:**

1. Timothy Pratt, Charles Bastian and Jeremy Allnutt. "Satellite Communications", *John Wiley Publications, 2nd Edition,* 2008 ***(Chapters 1-4, 6, 9, 10, 12).***

**Reference Books:**


1. Dennis Roddy, "Satellite Communications", *McGraw Hill, 2nd Edition,1996*
2. D.C Agarwal, "Satellite Communications", *Khanna Publications,* 5th Edition, *2014*
3. K.N. Raja Rao , "Fundamentals of Satellite Communications ", PHI, 3rd edition,2006
4. Pritchend and Sciulli, "Satellite communication systems engineering", *PHI learning,1986*


**Web Resources:**

1. http://nptel.iitm.ac.in/courses.php?branch=Ece
2. http://www.isro.org/satellites/satelliteshome.aspx
3. www.intelsat.com
4. www.asca.org.

**Course Learning Outcomes:**

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

*CO1: illustrate communication satellites and its position with respect to Earth station.*
*CO2: describe satellite subsystems and satellite link design*
*CO3: explain different Multiple Access techniques.*
*CO4: analyze GPS principles and applications*

## U14EC 703B DATA COMMUNICATION NETWORKS

*(Professional Elective II)*

**Class:** B.Tech. VII-Semester **Branch:** Electronics & Communication 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 fundamental concepts of computer networking*
*LO2: internet protocols such as HTTP, TCP/IP,UDP etc*
*LO3: various types of routing algorithms*
*LO4: data Security and high speed data transfer methods*

### UNIT- I (12)

**Introduction:** Data Communication, Networks, Protocols and Standards, Topology, Categories of Networks, OSI & TCP/IP Protocol suites
**Physical layer**: Transmission modes, DTE-DCE Interface, Modems, Guided media, Unguided media, Performance, Multiplexing, Switching, DSL, FTTC.

### UNIT- II (12)

**Data link layer:** Data Link Control - Line discipline, Flow control, Error control; Data Link protocols – Asynchronous Protocols, Synchronous protocols, Character oriented protocols, Bit oriented protocols, Link Access Procedures

**LANs and MANs:** Project 802, Ethernet, Token Bus, Token Ring, FDDI, Fast Ethernet, Gigabit Ethernet, DQDB, SMDS, PPP, IEEE 803.11, WiFi, WLANs, WiMAX , Bluetooth

### UNIT- III (12)

**Network layer**: Repeaters, Bridges, Hubs, Switches, Routers, Gateways, Routing algorithms - Shortest path routing, Distance vector routing, Link state routing; X.25 layers and protocols, Congestion control - Leaky bucket algorithm, TCP/IP Protocol Suite- IP protocol, IP addresses, Subnetting, ARP, RARP; ICMP, ISDN Services and channels, Broadband ISDN, ATM- Design goals, architecture and layers
**Session layer:** Design issues, Remote procedure cell.

### UNIT -IV (12)

**Presentation layer:** Data compression techniques, Cryptography techniques
**Transport layer:** Duties of Transport layer, Transport connection, OSI Transport protocol, TCP, UDP

**Application layer:** BOOTP and DHCP, DNS, TELNET, FTP, SMTP, HTTP, WWW, VoIP, Four aspects of Network security, Firewalls, Privacy, Digital Signatures

**Text Books :**

1. Behrouz A. Forouzan " Data Communications and Networking " , 5th edition, Tata McGraw-Hill, New Delhi, 2012

**Reference:**

1. Andrew S. Tanenbaum, "Computer Networks " , 4th edition , Prentice-Hall of India, New Delhi, 2000
2. Willium Stallings, " Data and Computer Communications " , 6th edition, Prentice Hall of India, New Delhi
3. Douglas E Comer," Computer Networks and Internet " , Pearson Education Asia, 2000.

**Course Learning Outcomes (CO):**

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

*CO1: identify the various issues and challenges in the architecture of a computer network*
*CO2: analyze the ISO/OSI seven layers in a network*
*CO3: realize protocols at different layers of a network hierarchy*
*CO4: evaluate security issues in a network*

## U14EC 703C SMART ANTENNAS

*(Professional Elective-II)*

**Class:** B.Tech., **VII**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: smart antennas, advantages and disadvantages*
*LO2: DOA estimation techniques- ML estimation, Maximum entropy method*
*LO3: beam forming methods- maximum SNR beamformer, MMSE,DMI and LCMV*
*LO4: space time processing, ISI and CCI suppression*

### UNIT – I (12)

**Introduction to smart antennas:** Need for smart antennas, Smart antenna configurations, Switched beam antennas, Adaptive antenna approach, Space Division Multiple Access (SDMA); Architecture of a smart antenna system - Receiver, Transmitter, Benefits and drawbacks, Mutual coupling effects.

### UNIT – II (12)

**DOA estimation:** Conventional and Subspace methods, ML estimation techniques, Estimation of the number of sources using eigen decomposition, Direction finding and true ranging PL systems, Elliptic and Hyperbolic PL systems, TDOA estimation techniques.

### UNIT – III (12)

**Beamforming fundamentals**: Classical beamformer - Statistically optimum beamforming weight vectors; The maximum SNR beamformer, Multiple side lobe canceller and the maximum SINR beamformer – Minimum Mean Square Error (MMSE), Direct Matrix Inversion(DMI), Linearly Constrained Minimum Variance(LCMV).

### UNIT – IV (12)

**Space Time Processing**: Introduction, Discrete space time channel and signal models, Space time beamforming, Intersymbol and Co-channel suppression, ISI suppression, CCI suppression, Joint ISI ,Space time processing for DS-CDMA.

****

**Text Books:**

1) Constantine A Balanis,Panayiotis I. Loannides,"Introduction to smart antennas " *Morgan and Claypool publishers,1st Edition,2007.(Chapters 1,2,5,6,8)*

**Reference Books:**


1) M.J. Bronzel ,"Smart antennas",*John wiley*,1st edition,1984
2) T.S.Rappaport and J.C.Liberti, "Smart antennas for wireless communication", *Prentice Hall*,1st edition,1999
3) R.Janaswamy, "Radio wave propagation and smart antennas for wireless communication", *springer* ,1st edition(*Illustrated)*, 2001.


**Course Learning Outcomes:**

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

*CO1: explain smart antenna systems, transmitter, receiver and SDMA.*
*CO2: illustrate the DOA Techniques, ML estimation and PL systems.*
*CO3: analyze maximum SNR beamformer, MMSE,DMI and LCMV.*
*CO4: describe space time processing, ISI and CCI suppression.*

## U14EC 704A CELLULAR AND MOBILE COMMUNICATIONS

(Professional Elective-III)

**Class:** B.Tech.,VII-Semester **Branch:** Electronics & Communication 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:**

This course will develop students' knowledge in/on…

*LO1: fundamental concepts of Analog cellular system.*
*LO2: co-channel and Non-co-channel interferences.*
*LO3: frequency management and channel assignment schemes.*
*LO4: cell coverage and Digital Cellular Systems.*

### UNIT-I (9+3)

**Introduction to Cellular Mobile Systems**: Basic Cellular System, Operation of Cellular Systems, Performance criteria, Limitations of conventional Mobile Telephone System, Uniqueness of Mobile Radio environment.

**Elements of Cellular Radio System Design:** Concept of Frequency reuse channels, Maximum Number of Calls per hour, Maximum Number of frequency channels per cell, Co-channel Interference Reduction factor, Cell Splitting, Trunking efficiency degradation factor.

### UNIT-II (9+3)

**Co-Channel Interference Reduction:** Co-Channel Interference, Exploring Co-Channel interference Areas in a system, Design of an Omni directional Antenna system (worst case), Design of Directional Antenna System, Reduction of Co-Channel Interference by means of a Notch in the tilted antenna pattern, Effect of antenna height on Co-Channel Interference.

**Types of Non Co-Channel Interference:** Adjacent Channel Interference, Near-End-Far-End Interference, Power control mechanism, Interference between two cellular systems, Cross-talk phenomenon, Effect of cell site components.

### UNIT-III (9+3)

**Frequency Management and Channel Assignment:** Frequency Management, Set-Up Channels, Definition of Channel Assignment, Fixed channel Assignment, Non- Fixed Channel Assignment Algorithms.

**Handoffs and Dropped Calls:** Purpose of Handoff, Types of Handoffs, Initiation of a Handoff, Delaying a Handoff, Forced Handoffs, Power-Difference Handoffs, Mobile Assisted Handoff (MAHO) and Soft Hand off, Cell-site Handoff only, Intersystem Handoff, Introduction to dropped calls.

### UNIT-IV (9+3)

**Cell Coverage for Signal and Traffic**: Signal reflection in flat and hilly terrain, Effect of human made structures, Phase difference between direct and reflected paths, Constant standard deviation, Land-to-mobile transmission model, Near-in and Long distance propagation.

**Digital Cellular Systems:** GSM-Functional Architecture and principal interfaces, Channel structure, CDMA.

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**Text Book:**

1. William C.Y.Lee,"Mobile Cellular Telecommunications (Analog and Digital)", *McGraw-Hill*, 2nd Edition, 1995***(Chapters 1,2,4,6,7,8,9,10 and 11)***

**Reference Books:**

1. William C.Y.Lee,"Mobile Communications Design Fundamentals", *Mc Graw Hill,* 2nd Edition, 1999.
2. William C.Y.Lee,"Mobile Communications Engineering (Theory and Application)", *Mc Graw Hill*, 2nd Edition, 2015.
3. Rappaport, "Wireless Communication" , *Pearson Education*, 2nd Edition, 2002.

**Course Learning Outcomes:**

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

*CO1: explain the concepts of Analog cellular system.*
*CO2: analyze the basics of co-channel and Non co-channel interference.*
*CO3: describe frequency management and channel assignment schemes.*
*CO4: discuss Cell coverage and Digital Cellular Systems.*

## U14EC 704B DSP PROCESSORS

*(Professional Elective-III)*

**Class:** B.Tech., **VII**-Semester **Branch:** Electronics & Communications Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: architectural features of DSP processors.*
*LO2: computational accuracy in DSP implementations.*
*LO3: implementation of basic DSP algorithms usingTMS320C54XX DSP processor*
*LO4: interfacing of memory and I/O peripherals.*

### UNIT – I (12)

**Introduction to Digital Signal Processing:** Digital signal processing system, Sampling process, Discrete time sequences, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation, Analysis and Design tools for DSP.

**Computational Accuracy in DSP Implementations:** Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

### UNIT – II (12)

**Architectures for Programmable DSP Devices:** Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

**Execution Control and Pipelining:** Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, and Pipeline Programming models.

### UNIT – III (12)

**Programmable Digital Signal Processors:** Commercial Digital signal processing Devices; TMS320C54XX Processor -Data Addressing modes, Memory space, Program Control, Instructions and Programming; On-Chip Peripherals, Interrupts, Pipeline operation. **Implementations of Basic DSP Algorithms:** Q-notation; Filters- FIR, IIR; Interpolation, Decimation, Adaptive Filters, PID Controller, 2-D Signal Processing.

### UNIT – IV (12)

**Implementation of FFT Algorithms:** FFT Algorithm for DFT Computation, Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

**Interfacing Memory and I/O Peripherals to Programmable DSP Devices:** Memory space organization; External bus interfacing signals- Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct Memory Access (DMA); Multichannel Buffered Serial Port (McBSP), McBSP Programming; CODEC interface circuit, CODEC programming, CODEC-DSP interface example.

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**Text Books:**

1. Avtar Singh and S. Srinivasan ,"Digital Signal Processing", *Thomson Publications*, 2004. *(chapter 2,3,4,5,7,8,910)*
2. Lapsley et al. S. Chand & Co.,"DSP Processor Fundamentals, Architectures & Features", 2000.*(chapter 8,9)*

**Reference Books:**

1. Jonatham Stein, ,"Digital Signal Processing", *John Wiley*, 2005
2. B. Venkata Ramani and M. Bhaskar,"Digital Signal Processors, Architecture, Programming and Applications", *TMH*, 2004.

**Course Learning Outcomes:**

After completion of this course, students will be able to

*CO1: describe various architectural features of DSP processor.*
*CO2: analyze computational accuracy in DSP implementations.*
*CO3: design and Implement the DSP algorithms.*
*CO4: explain the interfacing of memory and various peripherals*

## U14EC 704C INDUSTRIAL ELECTRONICS

*(Professional Elective III)*

**Class:** B.Tech., **VII**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: characteristics of different power electronic switches*
*LO2: switching behavior and design of power electronic circuits.*
*LO3: mathematical, scientific and computational skills to solve power electronics problems*
*LO4: theory and applications of power electronics systems*

### UNIT – I (12)

**Introduction to Power Electronic Devices:** V-I characteristics, Structure, Switching Performance and Application of SCR, DIAC, TRIAC, PUT, GTO, Power MOSFETs, IGBT and LASCR; SCR - Two transistor modes, Protection circuits of SCR against over voltage, over current, Voltage transients, Current transients, Series, Parallel operation of SCRs, String efficiency.

### UNIT – II (12)

**Phase Controlled Rectifiers**: Operation, Analysis of single phase half-wave and full-wave controlled rectifier, Three phase half-wave and full-wave controlled rectifier, With resistive load and Inductive load, Effect of freewheeling diode.

**Dual Converters:** Basic principle of ideal and practical dual converters; Dual converter - Without circulating current operation, With circulating current operation.

### UNIT – III (12)

**Choppers:** Basic circuit, Principles of Step-up, Step-down Chopper; Classification of Choppers - Class A, Class B, Class C, Class D and Class E.

**Inverters:** Classification of inverters, Single phase half-bridge and full-bridge voltage source inverters, Performance parameters.

### UNIT – IV (12)

**Series Inverters**: Basic series inverter, Modified series inverter, High frequency inverter, Self commutated inverter, Parallel series inverter and Current series inverter.

**Cycloconverters:** Basic principle; Single phase to Single phase; Three phase to Single phase; Three phase to Three phase Cycloconverters.

**Applications**: Uninterruptible Power Supply (UPS) and Switched Mode Power Supply (SMPS).

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**Text Book:**

1. M.D. Singh and K.B. Kanchandani,"Power Electronics", 2nd edition, 2007, *McGraw Hill education*, New Delhi.( Chapter 1,2,3,4,5,6,7,8,9,10,16)

**Reference Books:**

1. M.H. Rashid," Power Electronics", 3rd edition, 2012, Prentice Hall of India, New Delhi
2. P.S. Bhimbra," Power Electronics", Khanna Publishers, 5th edition, 2012, New Delhi.
3. P.C. Sen, "Power Electronics", Tata McGraw Hill, Twenty fourth reprint, 2005, New Delhi.

**Course Learning Outcomes:**

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

*CO1: analyze the operational characteristics of various power devices like SCR, GTO, power MOSFET and IGBT.*

*CO2: explain the operation and design aspects of converters.*

*CO3: design power stages and feedback controllers for various applications.*

*CO4: solve power electronics engineering problems.*

## U14EC706 ECAD LABORATORY

**Class:** B. Tech., VII-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This laboratory course will develop students' knowledge in/on

*LO1: Electronic Computer Aided Design (ECAD) Tools, FPGA Boards and Design Flow of Xilinx ISE.*
*LO2: hardware description languages.*
*LO3: simulation of VHDL models using Xilinx ISE.*
*LO4: synthesis and Implementation of Digital Electronic Designs on FPGA Boards.*

### LIST OF EXPERIMENTS

**Part - 1: Combinational Logic:**

1. Basic Gates (NOT, AND, OR, NAND, NOR, XOR, XNOR)
2. Adders/Subtractors/Multipliers
3. Multiplexers/ De-multiplexers
4. Decoders/Encoders
5. Parity generator.
6. ALU.

**Part – II Sequential Logic:**

7. Flip Flops (D, SR, JK, T)
8. Asynchronous Counters.
9. Synchronous Counters.
10. Shift Registers.
11. Johnson Counter & Ring Counter.

**Part-III Layout Design**

12. Inverter, NAND & NOR.

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**Laboratory Manual:**

1. Laboratory Manual for "ECAD Laboratory", *prepared by the department of ECE faculty*

**Text Books:**

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", Prentice Hall Series, 4th edition, 2009.

**Course Learning Outcomes:**

After completion of this laboratory course, students' will be able to

*CO1: demonstrate the various phases of Electronic Computer Aided Design (ECAD) tools, FPGA Boards and Design Flow of Xilinx ISE.*
*CO2: design Digital Electronic Circuits using VHDL.*
*CO3: analyze the behavior of Digital Electronic Circuits.*
*CO4: implement Digital Electronic Designs on FPGA Boards.*

## U14CS710 OPERATING SYSTEMS LABORATORY

**Class**: B.Tech., VII-Semester **Branch**: Electronics & Communication 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: UNIX environment and basic UNIX commands*
*LO2: fundamentals of shell programming.*
*LO3: implementing different CPU scheduling algorithms, page replacement algorithms and dead lock avoidance algorithm*
*LO4: different types of file organization techniques*

**Experiment -I**

1. Basic UNIX commands:
   General utility commands - *login, cal, date, who, uname, echo, passwd, pwd, exit*;
   File and directory related commands - *ls, cd, mkdir, rmdir, cat, cp, rm, mv, wc, comm, diff, split, ln, touch, chmod, chown, chgrp*.
2. Practice the following examples.
   a) Display the contents of file (filenames starting with 'a' and ending with 'X')
   b) Copy the contents of directory1 to directory2.
   c) Remove all the C files from current directory.
   d) Merge given three different files into single one.
   e) Display the list of files in given directory.
   f) Set given file as read only.

**Experiment – II**

1. Filters: (Data processing commands) *more, head, tail, cut, paste, sort, uniq, nl, tr*.
2. Communication commands: *write, mail, talk, finger, news*.

**Experiment – III**

1. Process related commands: *ps, kill, nice, at* and *batch.*
2. Pattern searching commands: *grep, egrep, fgrep*.
3. Write the programs for the following
   a) Display the details of all users those who are working on the system.
   b) Display the details of all users in an order they logged on to system (based on time) who are working on the system.

**Experiment – IV**

1. Practicing the Vi editor commands.
2. Shell script related commands: *sh, read,* command line args - *($1), $* and *& $*; set, exit,* status *($?);* logical operator - *||, &&; exit, if, sleep, wait, case, while, until, for, export, expr*.

**Experiment – V**

1. Write programs for the following
   a) Reading a character and displaying it on the screen.
   b) Display the name and class of a student in separate line.
   c) To check the given two characters are equal or not.

2. Write programs for the following
   a) Display the given character in its binary form.
   b) To check given number is even or odd.
   c) Write a shell script to accept login name as command line argument and find out at how many terminals the user has logged in.

**Experiment – VI**

1. Write a shell script which gets executed at login time and displays a blinking message *Good morning/Good Afternoon / Good Evening* depending upon the time at which the user logs in.
2. Write a shell script to check the given character is vowel or not.
3. Write a shell script to perform all arithmetic operations using switch statement.
4. Write a menu driven program which has the following options
   a) contents of a given file
   b) list of users who have currently logged in
   c) present working directory
   d) exit

**Experiment -VII**

1. Write the shell programs for the following
   a) Print the Fibonacci series
   b) Check the given number is prime or not
   c) Print the following format

```
1
1  2
1  2  3
1  2  3   4
…..
```

**Experiment -VIII**

1. Write a shell script to display the given string in reverse order.
2. Write a shell script to find minimum and maximum elements in the given array of integers.
3. Write a shell script function for finding factorial of a given number.

**Experiment -IX**

1. Implement the following CPU Scheduling Algorithms.

   a) First come first serve  b) Round robin
   c) Shortest job first  d) Priority scheduling

**Experiment -X**

1. Implement the banker's algorithm for deadlock avoidance.

**Experiment -XI**

1. Implement the following page replacement algorithms
   a) FIFO  b) LRU

**Experiment -XII**

1. Implement the following directory structures.
   a) Single level directory  b) Two level directory

**Laboratory Manual:**

1. Operating System Laboratory Manual , Prepared by the faculty of Department of Computer Science.

**Text Books:**


1. Operating System Laboratory Manual, prepared by the faculty of Department of Computer Science.
2. Sumitabha Das, "Your UNIX: The Ultimate Guide", *3rd Edition, Mc-Graw Hill*, ISBN 0-07-053475-6, 2005.


**Course Learning Outcomes:**

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

*CO1: acquire the knowledge of UNIX commands*
*CO2: apply the shell programming concepts for developing applications.*
*CO3: debug and document programs in Shell scripts*
*CO4: implement the operating system concepts like CPU scheduling algorithms, page replacement algorithms, dead lock avoidance algorithm and directory structures implementation*

## U14EC711 MAJOR PROJECT WORK PHASE-I

**Class**: B.Tech. VII-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 7 | 4 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation | 100 marks |
| End Semester Examination | - |

**Course Learning Objectives (LOs):**
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 (COs):**
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 OF TECHNOLOGY & SCIENCE: WARANGAL-15**

*(An Autonomous Institute under Kakatiya University)*

**SCHEME OF INSTRUCTION AND EVALUATION**

**VIII SEMESTER OF 4-YEAR B.TECH. DEGREE PROGRAMME**

**ELECTRONICS & COMMUNICATION ENGINEERING**

| S.No | Course Category | Course code | Course Name | Periods | | | Credits | Evaluation Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CIE | | | ESE | Total Marks |
| | | | | L | T | P | | TA | MSE | Total | | |
| 1 | OE | U14OE801 | Open Elective-II | 4 | - | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 2 | PC | U14EC802 | Micro Wave Engineering | 3 | 1 | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 3 | PE | U14EC803 | Professional Elective -IV | 4 | - | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 4 | PE | U14EC804 | Professional Elective -V | 4 | - | - | 4 | 15 | 25 | 40 | 60 | 100 |
| 5 | PC | U14EC805 | Micro Wave and Optical Communication Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 6 | PC | U14EC806 | Simulation Laboratory | - | - | 3 | 2 | 40 | - | 40 | 60 | 100 |
| 7 | PR | U14EC807 | Major Project Work *Phase-II* | - | - | 13 | 7 | 40 | - | 40 | 60 | 100 |
| | | | **Total** | 15 | 1 | 19 | 27 | - | - | 280 | 420 | 700 |

Student Contact hours/week : 35; Total Credits : 27

**Open Elective-II**

U14OE 801A: Operation Research
U14OE 801B: Management Information Systems
U14OE 801C: Entrepreneurship Development
U14OE 801D: Forex and Foreign Trade

**Professional Elective-IV**

U14EC 803A: TV and Radar Engineering
U14EC 803B: Optical Fiber Communication Systems
U14EC 803C: Telecommunication Switching Systems

**Professional Elective –V**

U14EC 804A: Digital System Design
U14EC 804B: Embedded System Design
U14EC 804C: Robotics and Computer Vision

**U14EC 801A OPERATION RESEARCH**

*(Open Elective-II)*

**Class:** B.Tech. VIII semester **Branch:** E&I, EEE, IT and ECE

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation | 40 marks |
| End Semester Examination | 60 marks |

**Course Learning Objectives (LOs):**

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 (COs):**

After 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*

## U14OE 801B MANAGEMENT INFORMATION SYSTEM

*(Open Elective-II)*

**Class:** B. Tech VIII-Semester **Branch:** EEE, ECE, EIE,IT

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation | 40 marks |
| End Semester Examination | 60 marks |

**Course Learning Objectives(LOs):**

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(COs):**

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 801C ENTREPRENEURSHIP DEVELOPMENT**

*(Open Elective-II)*

**Class**: B. Tech. VIII Semester **Branch:** E&I, EEE, IT and ECE

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation | 40 marks |
| End Semester Examination | 60 marks |

**Course Learning Objectives(LOs):**

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*

**U14OE 801D FOREX & FOREIGN TRADE**

*(Open Elective-II)*

**Class:** B.Tech. VIII semester **Branch:** EIE, EEE, IT and ECE

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation | 40 marks |
| End Semester Examination | 60 marks |

**Course Learning Objectives (LOs):**

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 (COs):**

After 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*

## U14EC802 MICROWAVE ENGINEERING

**Class:** B.Tech. VIII Semester **Branch:** Electronics & Communication 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:**
This course will develop students' knowledge on
*LO1: various microwave tubes and slow wave structures.*
*LO2:M-type microwave tubes and Transferred Electronic Devices.*
*LO3: waveguide components and scattering matrix.*
*LO4: measurement of various microwave parameters.*

### UNIT-I (9+3)

**Microwave Tubes:** Introduction to Microwaves, Microwave region and bands, Applications of microwaves, Limitations of conventional tubes at High frequencies, Classification of Microwave tubes; O-type tubes - Two cavity Klystron Amplifier construction, Velocity modulation, Applegate diagram, Principle of working and Expressions for output power and efficiency, Reflex Klystron Oscillator construction, Velocity modulation, Applegate diagram, Principle of working and Expressions for output power and efficiency; Electronic admittance, Effect of repeller voltage on output power, Oscillating modes, Output characteristics, Electronic and Mechanical tuning.
**Slow Wave Structures:** Significance & types; Travelling Wave Tube – Construction, Principle of Amplification, Suppression of oscillations; O-type Backward Wave Oscillator – Construction, Principle of working and Voltage tunability.

### UNIT-II (9+3)

**M-Type tubes:** 8 cavity cylindrical Magnetron – Construction, Mechanism of Oscillations, Hull cut-off condition, PI-mode and output characteristics.
**Microwave Solid State Devices:** Classification; Gunn diode – Operating Principle, RWH theory, Modes of operation and Characteristics; Avalanche Transit Time devices – IMPATT and TRAPATT diodes; Parametric amplifier and its applications.

### UNIT-III (9+3)

**Waveguide Components:** Coupling probes & loops, Waveguide windows, Tuning Screws & Posts, Waveguide phase shifters and Attenuators.
**Microwave Hybrid Circuits:** Scattering Matrix – Significance, formulation and properties; Waveguide Junctions - E-plane Tee, H-plane Tee, Magic Tee, Rat race junctions and Directional couplers; Ferrites – Composition, Characteristics, Faraday rotation; Ferrite components – Circulator, Isolator and Gyrator.

### UNIT-IV (9+3)

**Microwave Measurements:** Description of Microwave Bench – Different blocks and their features, Precautions; Microwave Power Measurement, Attenuation Measurement, Frequency measurement, VSWR measurement and Impedance Measurement.

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**Text Books:**

1. Samuel Y. Liao, "Microwave Devices and Circuits", *PHI*, 2nd edition, 1990. (*Chapter 0, 4, 7, 8, 9, 10)*

**Reference Books:**

1. M. Kulkarni, "Microwave and Radar Engineering", *Umesh Publications*, 3rd edition, 2003.
2. Annapurna Das and Sisir. K. Das, "Microwave Engineering", *Tata McGraw Hill*, 3rd edition, 2015.
3. Sushrut Das, "Microwave Engineering", *Oxford University Press*, 1st edition, 2014.

**Course Learning Outcomes:**

After completion of this course student will be able to

*CO1: explain the construction, operating principle and mathematical analysis of microwave tubes.*

*CO2: describe the construction and operating principle of an 8-cavity magnetron, Gunn diode, IMPATT and TRAPATT.*

*CO3: calculate the scattering parameters for various microwave junctions.*

*CO4: measure various microwave parameters using a microwave bench set-up.*

**U14EC 803A TV AND RADAR ENGINEERING**

*(Professional Elective-IV)*

**Class:** B.Tech**, VIII-**Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: composite Video Signal representation.*
*LO2: monochrome and Color TV systems.*
*LO3: block diagram of RADAR and its operation.*
*LO4: FMCW radar and different types of tracking radar systems.*

## UNIT-I (12)

**Introduction to TV**: Basic Television Systems, Vision characteristics and scanning systems, Aspect ratio, Image Continuity, Number of scanning lines, Interlaced Scanning and Picture resolution; Composite Video Signal - Horizontal and Vertical sync details, Channel bandwidth; CCIR-B Television Standards (Indian)-625 lines system.

**TV Camera & Picture Tubes:** Camera tube types – Image Orthicon, Vidicon and Plumbicon picture tube.

## UNIT- II (12)

**TV Transmitters & Receivers:** Block Schematic Diagram – Visual Exciter, Aural Exciter, Duplexer; Monochrome TV Receiver- RF Tuner, IF Subsystem, Video Amplifier, Sound Section, Sync Separation, Deflection Circuits, Keyed AGC.

**Color TV:** Color response of human eye, Three color theory, Additive mixing of colors, Chromaticity diagram, Luminance and Chrominance, Color difference signal and its generation, Color Camera Tubes, Color Picture Tubes, Color TV Systems – NTSC, PAL, SECAM.

## UNIT – III (12)

**Introduction to Radar:** RADAR- Nature, Maximum Unambiguous Range, Block Diagram and Operation, Frequencies, Applications (Civilian and Military); Simple form of Radar Equation, Minimum detectable signal, Probability of false alarm and Threshold detection, Integration of Radar Pulses, Radar Cross-Section(RCS), Related Problems.

**Continuous Wave (CW) Radar:** Doppler Effect; CW Radar – Block Diagram, Applications.

## UNIT – IV (12)

**Frequency Modulated CW (FM–CW) Radar:** FM–CW RADAR - Range, Doppler Measurement, Block diagram and Characteristics (Approaching/ Receding Targets); FM–CW altimeter; Pulse Radar-MTI Radar, Delay Line Canceller(DLC), Blind Speed.

**Tracking Radar:** Tracking with radar, Sequential lobing, Conical Scan; Mono Pulse Radar - Amplitude Comparison (one and two coordinates), Phase Comparison; Radomes, Electronic Counter Measures (ECM) & Electronic Counter Counter Measures (ECCM).

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**Text Books:**

1. R.R. Gulati, "Monochrome and Color TV" , *New Age International Publication ,2nd Edition(revised), 2002 (Chapters 1,2,3,,5,6,78,13,14,15,16,17,25,26)*
2. M.I. Skolink, "Introduction to Radar Systems", *McGraw Hill, 2nd Edition,1981 (Chapters 1,2,3,4,5,9,14 )*

**Reference Books:**

1. S.P. Bali, "Color Television and Practice", *McGraw Hill,1994.*
2. A.M. Dhake, "Television and Video Engineering", *McGraw Hill, 2nd Edition*,2004
3. B. Grob and C.E. Herndon, "Basic Television and Video Systems" , *McGraw Hill,* 1999
4. Simon Kingsley and Shaun Quegan, "Understanding RADAR Systems", *McGraw Hill Book Co.,* 1993

**Web Resources**

1. http://nptel.iitm.ac.in/courses.php?branch=Ece
2. http://www.radartutorial.eu/07.waves/wa04.en.html

**Course Learning Outcomes:**

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

*CO1: illustrate the working principle of a basic television system.*
*CO2: describe the various color picture tubes and color TV systems.*
*CO3: explain the working principle of a radar system and determine its mathematical model.*
*CO4: analyze and interpret the target echo information with FMCW and MTI radar.*

**U14EC 803B OPTICAL FIBER COMMUNICATION SYSTEMS**

*(Professional Elective-IV)*

**Class-** B.Tech., **VIII-**Semester **Branch** Electronics & Communication Engineering

**Teaching Scheme-**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme-**

| | |
|---|---|
| Continuous Internal Evaluation | 40 marks |
| End Semester Examination | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: optical Fiber structures, Wave guiding and Signal degradation in optical fibers*
*LO2: optical Sources, Power Launching and Coupling, Fiber splicing and Photo detectors*
*LO3: optical Receiver operation and Analog Links.*
*LO4: basic applications and types of optical amplifiers-general applications*

## UNIT – I (12)

**Optical Fibers- structures, Wave-guiding:** Major elements of an optical fiber link, The nature of light, Basic optical laws and definitions, Fiber modes and configurations, Mode theory of circular waveguides, Single mode fibers, Graded index fiber structure, Fiber materials.

**Signal degradation:** Attenuation- units, Absorption, Scattering losses, Bending losses, Core and Cladding losses, Signal distortion in fibers, Characteristics of single mode fibers.

## UNIT – II (12)

**Optical Sources:** Introduction to semiconductor physics, Light Emitting Diodes (LED), Laser diodes.

**Power Launching and Coupling:** Source to fiber power launching, Source output patterns, Power coupling calculation, Fiber to fiber joints, Mechanical misalignment, Fiber related losses, Fiber End-Face preparation.

**Fiber Splicing:** Splicing techniques; Optical fiber connectors - Connector types, Connector return loss.

**Photo detectors:** PiN photo detector, Avalanche photodiodes, Photo detector noise, Detector response time, Depletion layer photo current, Response time, Avalanche multiplication noise.

## UNIT – III (12)

**Optical Receiver operation:** Fundamental receiver operation, Digital signal transmission, Error sources, Front end amplifier, Digital receiver performance, Probability of error, Receiver sensitivity, The quantum limit, Eye diagrams, Eye pattern features, BER and Q-factor measurements, Coherent detection, Analog receivers; Point to point links - Link power budget, Rise-time budget, Power penalties.

**Analog Links:** Carrier to noise ratio, Carrier power, Photo detector and Preamplifier noises, Relative Intensity Noise (RIN), Reflection effects on RIN, Limiting conditions; Multichannel transmission techniques; Overview of WDM- Operational principle, Standards; Dense WDM.

## UNIT – IV (12)

**Basic Applications and Types of Optical Amplifiers - General Applications**: Amplifier types; Semiconductor optical amplifiers - External pumping, Amplifier gain; Erbium doped fiber amplifiers (EDFA) - Amplification mechanism, EDFA architecture, EDFA power conversion efficiency and Gain; Amplifier noise, Optical SNR.

**Network concepts**: Network topology, Network categories, Network layers, Optical layer, Network topologies, Performance of passive linear buses, Star architecture, SONET/SDH-transmission formats and speeds, Optical interface, Rings, Networks, High speed light wave links, Links operating at 10 Gb/s, 40Gb/s, 160Gb/s, Optical switching, WDM network examples.

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**Text Books:**

1. Gerd Keiser, "Optical fiber communications", *The McGraw Hill companies, New Delhi,* 4th edition, 2008. ***(Chapters 1,2,3,4,5,6,7,8,9,10,11,13)***

**Reference Books:**

1. John. M Senior, "Optical Fiber Communications- Principles and Practice", *Pearson India, New Delhi*, 3rd edition, 2010.
2. Govind P.Agrawal, "Fiber Optic Communication Systems"**,***John wiley & Sons,* 3rd edition, 2002.

**Course Learning Outcomes:**

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

*CO1: discuss the nature of light and waveguide equations*
*CO2: explain the operation of LED and Laser.*
*CO3: explain digital signal transmission in optical receiver analog link.*
*CO4: discuss erbium doped fiber amplifier and SONET/SDH*

**U14EC 803C TELECOMMUNICATION SWITCHING SYSTEMS**

*(Professional Elective - IV)*

**Class:** B.Tech., VIII Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: various concepts of Telecommunication switching systems*
*LO2: telecommunication networks and its parameters*
*LO3: telecommunication signaling types*
*LO4: performance of switching architectures for voice and data transmission*

## UNIT I (12)

**Telecommunication Switching Systems:** Basics of Switching Systems, Manual Switching Systems, Principles of Cross Bar Switching.
**Electronic Space Division Switching:** Stored Program Control – Centralized, Distributed; Two Stage Networks, Three Stage Networks, N Stage Networks.
**Time Division Switching:** Basic Time Division - Space Switching, Time Switching; Time Multiplexed - Space Switching, Time Switching; Combination Switching- Three Stage, N-Stage.

## UNIT II (12)

**Telephone Networks:** Subscriber Loop Systems, Switching Hierarchy and Routing, Transmission Plan, Numbering Plan and Charging Plans, Signaling Techniques, In Channel, Common Channel.

## UNIT III (12)

**Traffic Engineering:** Network Traffic Load and Parameters, Grade of Service, Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking Models and Loss Estimates, Delay systems.
**Integrated Services Digital Network (ISDN):** Motivation for ISDN, Network & Protocol Architecture, Transmission Channels, User Network Interfaces, Signaling, Numbering, Addressing, ISDN Standards, Broadband ISDN.

## UNIT IV (12)

**Data Networks:** Data transmission in PSTNs, Switching techniques for data transmission, Data communication architecture, Link-to-Link layers, End-to-End layers, Local Area Networks, Metropolitan Area Networks, Data Network Standards, Protocol Stacks, Internetworking.

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**Text Book:**

1. Thyagarajan Viswanath, "Telecommunication Switching Systems and Networks", *PHI*, 1st Edition, 2000,**(**Chapter 1,2,3,4,5,6,8,9,10,11).

**Reference Books:**

1. Wayne Tomasi ,"Advanced electronic communications systems" , PHI, 5th Edition, 2004
2. J. Bellamy, "Digital telephony", John Wiley, 2nd Edition, 2001.
3. B.A. Forouzan, "Data Communication & Networking", *TMH,* 3rd Edition, 2004.

**Web Resources:**

1. http://www.newagepublishers.com/samplechapter/000969.pdf
2. http:://www.bits-pilani.ac.in:12354/qp1-9-10/EEE_C414_851_C_2009_1.pdf

**Course Learning Outcomes:**

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

*CO1: summarize modern switching systems.*
*CO2: design telecommunication switching system for given specifications.*
*CO3: analyze performance of telephone networks.*
*CO4: implement the signaling techniques in communication network.*

## U14EC 804A DIGITAL SYSTEM DESIGN

*(Professional Elective –V)*

**Class:** B. Tech. VIII Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | | |
|---|---|---|
| Continuous Internal Evaluation | : | 40 marks |
| End Semester Examination | : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: computer aided minimization procedure (CAMP).*
*LO2: fault classes & models and fault detection techniques in combinational circuits.*
*LO3: fault diagnosis techniques and fault detection experiment in sequential circuits.*
*LO4: pla minimization and folding.*

### UNIT-I (12)

**Computer Aided Minimization Procedure**: Degree of adjacency and Essential Prime Cubes, CAMP algorithm, Introduction to cube based Algorithms, Cubical operations.

**Logic Synthesis**: Multiplexers, Read-Only Memories, Programmable Logic Arrays, System Level Logic Synthesis - Semicustom Design Approach.

### UNIT-II (12)

**Fault Diagnosis in Combinational Circuits**: Fault Classes and Models, Fault Diagnosis and Testing, Test Generation Methods - Fault Table Method, Path Sensitization Method, Boolean Difference Method and Kohavi algorithm; Fault Tolerance Techniques; Fault-Tolerant VLSI Processor Arrays.

### UNIT-III (12)

**Fault Diagnosis in Sequential Circuits**: Introduction, Circuit test approach, Initial State Identification, Successor Tree, Distinguishing Sequence, Final State Identification, Homing Sequence, Synchronizing Sequence and Design of Fault-detection experiments for diagnosable Machines.

### UNIT-IV (12)

**Programmable Logic arrays:** PLA minimization, Essential Prime Cube Theorem and PLA folding, Foldable Compatibility Matrix, Practical PLAs, Faults in PLAs, DFT Schemes, Built in Self Test.

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**Text Books:**


1. N. N. Biswas, "Logic Design Theory", *PHI Learning Private Limited*, 1st Edition,1993. *(Chapters 4,5,6,7,8)*
2. Samuel C. Lee, "Digital Circuits and Logic Design", *PHI Learning Private Limited*, 1st Edition,1976. *(Chapter 8)*


**Reference Books:**


1. Zvi. Kohavi, "Switching and Finite Automata Theory", *Cambridge University Press* 3rd Edition, 2009.
2. M. Morris Mano, Michael D.Ciletti,"Digital Design",*Prentice Hall Series*, 4th Edition,2009.


**Course Learning Outcomes:**

After completion of this course, students will be able to

*CO1: describe computer aided minimization procedure (CAMP) to minimize boolean functions.*
*CO2: explain fault classes and fault detection techniques for combinational circuits.*
*CO3: apply fault diagnosis techniques and conduct a fault detection experiment in sequential circuits.*
*CO4: design area efficient PLAs using PLA minimization and folding techniques.*

## U14EC 804B EMBEDDED SYSTEM DESIGN

*(Professional Elective-V)*

**Class:** B.Tech., **VIII**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: concepts of embedded systems.*
*LO2: general Purpose and Domain Specific Processors.*
*LO3: embedded firmware.*
LO4: *RTOS& Task Communication.*

### UNIT I (9+3)

**Introduction to Embedded Systems:** Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major application areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

### UNIT –II (9+3)

**Typical Embedded System:** Core of the Embedded System, General Purpose and Domain Specific Processors, ASICs, PLDs, Commercial Off-The-Shelf Components (COTS); Memory - ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface, Onboard and External Communication Interfaces.

### UNIT –III (9+3)

**Embedded Firmware**: Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

### UNIT –IV (9+3)

**RTOS Based Embedded System Design:** Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.
**Task Communication:** Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization, Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

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**Text Books:**

1. Shibu K.V, "Introduction to Embedded Systems", *Mc Graw Hill* ,2014 ***Chapters (1, 2, 9, 10).***

**Reference Books:**

1. Raj Kamal ,"Embedded Systems", *TMH*.
2. Frank Vahid, Tony Givargis ,"Embedded System Design", *John Wiley*.
3. Lyla,"Embedded Systems ",*Pearso*n *Education*, 2013
4. David E. Simon ,"An Embedded Software Primer",*Pearson Education*..

***Course Learning Outcomes:***

After completion of this course the student will be able to…

*CO1: explain Embedded systems.*
*CO2: describe General Purpose and Domain Specific Processors.*
*CO3: discuss Embedded firmware.*
*CO4: explain RTOS& Task Communication.*

**U14EC 804C ROBOTICS AND COMPUTER VISION**

*(Professional Elective-V)*

**Class:** B.Tech., **VIII**-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| 4 | - | - | 4 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**

This course will develop students' knowledge in/on

*LO1: basic concepts & the various drives & control systems for robots*
*LO2: kinematics in robotics& interfacing of robot to computer using RS 232.*
*LO3: image feature extraction.*
*LO4: segmentation & Object recognition.*

**UNIT I (12)**

**Basic Concepts in Robotics**: Classification of Robots, Advantages and Applications of Robots; Different joints - Revolute, Prismatic 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 matrices for rotations - Combined rotations, Transformation between co-ordinate systems; Denavit-Hartenberg representation; Interfacing computers to Robots - RS 232 Interface, Hardware Handshaking and Software Handshaking.

**UNIT III (12)**

**Image Processing and Feature Extraction:** Digital image representation, Mathematical operations on images, Image gradient, Edge detection; Edge detection operators - First and Second order, Edge linking using local and global processing techniques, Canny edge detection.

**Motion Estimation:** Regularization theory, Optical computation, Stereo vision, Motion estimation, Structure from motion.

**UNIT IV (12)**

**Shape Representation and Segmentation:** Deformable curves and surfaces, Snakes and active contours, Level set representations, Fourier and wavelet descriptors, Medial representations, Multi-resolution analysis.

**Object recognition**: Hough transforms and other simple object recognition methods, Shape correspondence and Shape matching, Principal Component analysis, Shape priors for recognition.

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**Text Books:**

1. K.S.Fu, R.C. Gonzalez, C.S.G.Lee, "Robotics Control, Sensing, Vision, and Intelligence", McGraw-Hill Incs. 2010. *(Chapters 2, 3, 4, 5).*
2. Marc Pomplun, "Hands-On Computer Vision ",(*University of Massachusetts Boston, USA*). *(Chapter 4,5,6,7,8,9,10,11,12).*

**Reference Books:**

1. B. K. P. Horn, "Robot Vision", McGraw-Hill.
2. E. Trucco and A.Verri, "Introductory Techniques for 3D Computer Vision", Prentice Hall.
3. P.A.Jananki Raman, "Robotics and Image Processing", Tata McGraw Hill 1991.
4. D. Forsyth and J. Ponce "Computer Vision - A modern approach " Prentice Hall.

***Course Learning Outcomes:***

After completion of this course the student will be able to…

*CO1:describe the classification of robotics & transform equations.*
*CO2:analyze kinematics of manipulators.*
*CO3: discuss image properties & feature extraction.*
*CO4:explain image segmentation & object recognition.*

## U14EC805 MICROWAVE AND OPTICAL COMMUNICATION LABORATORY

Class: B.Tech. VIII Semester  Branch: Electronics & Communication Engineering

**Teaching Scheme:**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme:**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination: | 60 marks |

**Course Learning Objectives:**

This laboratory course will develop students' knowledge in/on

*LO1: characteristics of Reflex Klystron oscillator.*
*LO2: measurement of frequency, wavelength, VSWR, reflection coefficient and impedance.*
*LO3: calculation of various parameters of an optical fiber.*
*LO4: misalignments and losses in an optical fiber.*

### LIST OF EXPERIMENTS

1. Mode characteristics of Reflex Klystron
2. Study of Gunn Oscillator
3. Measurement of Frequency and Wave length
4. Measurement of VSWR and Reflection Coefficient
5. Measurement of Impedance
6. Study of Multi Hole Directional Coupler
7. Study of Magic Tee
8. Study of Isolator and Circulator
9. Study of Numerical Aperture in optical fiber
10. Study of Misalignments in optical fiber
11. Study of losses in optical fiber
12. Study of Eye Pattern for optical link
13. Measurement of Bit Error Rate for optical communication link

**Laboratory Manual:**

1. Manual for "Microwave and Optical Communication Laboratory", *prepared by the department of ECE*

**Text Books:**

1. Samuel Y. Liao, "Microwave Devices and Circuits", *PHI*, 2nd edition, 1990. (*Chapter 0, 4, 7, 8, 9, 10)*

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**Course Learning Outcomes:**

After completion of this laboratory course student will be able to…

*CO1: analyze the various modes of a Reflex Klystron.*
*CO2: measure various microwave parameters using a microwave bench set-up.*
*CO3: calculate Bit Error Rate of an optical communication link.*
*CO4: determine various losses in an optical fiber.*

## U14EC806 SIMULATION LABORATORY

Class: B.Tech. VIII-Semester  Branch: Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 3 | 2 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation: | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives:**
This laboratory course will develop students' knowledge in/on

*LO1: histograms of gray scale and color images using IMAQ block*
*LO2: different Image compression and Image Transformation techniques*
*LO3: frequency response of transistor amplifiers*
*LO4: observe the waveforms of Astable, Mono stable and Bistable Multivibrator*

### LIST OF EXPERIMENTS

**Simulation using NI LABVIEW:**

1 Histogram Equalization
2 Convolution
3 Linear and Nonlinear filtering
4 Edge Detection using prewitt, sobel and cany edge detector techniques
5 HSI Enhancement
6 Frequency Domain filtering
7 Image Compression
8 Color Thresholding
9 DFT and FFT Computation
10 Image Fusion

**Simulation using PSPICE:**

11 Common Emitter (CE) amplifier
12 Common Source (CS) amplifier
13 Half wave and full wave rectifier
14 Design of wein bridge oscillator
15 Astable, Monostable and Bistable Multivibrator

### Laboratory Manual:

1. Manual for "Simulation laboratory", *prepared by the department of ECE faculty*

### Text books:

1. R.C. Gonzalez and R.E. Woods, "Digital Image processing", *Pearson Education*, 2nd edition New Delhi. 2004. *(Chapters 1, 2, 3, 4, 5, 6, 8, 9, 10)*

**Course Learning Outcomes:**
After completion of this laboratory course, students will be able to

*CO1: determine the convolution of images*
*CO2: examine image fusion*
*CO3: illustrate the frequency response of different types of amplifiers*
*CO4: draw the output waveforms for various types of multivibrators*

## U14EC807 MAJOR PROJECT WORK PHASE-II

**Class**: B.Tech. VIII-Semester **Branch:** Electronics & Communication Engineering

**Teaching Scheme :**

| L | T | P | C |
|---|---|---|---|
| - | - | 13 | 7 |

**Examination Scheme :**

| | |
|---|---|
| Continuous Internal Evaluation : | 40 marks |
| End Semester Examination : | 60 marks |

**Course Learning Objectives (LOs):**
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 (COs):**
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*