COURSE STRUCTURE

AND

DETAILED SYLLABUS

R-16

ELECTRONICS AND COMMUNICATION ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted for the Academic Year 2016-17)

(I-IV Year Syllabus)

RAJIV GANDHI UNIVERSITYR OF KNOWLEDGE TECHNOLOGIES

Basar, Nirmal, Telangana State – 504107, India.

COURSE STRUCTURE: ELECTRONICS AND COMMUNICATION ENGINEERING

B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

I YEAR
I SEMISTER

Code	Subject	L-T	P	C
EC1101	Network Analysis	4	-	4
PH1001	Engineering Physics	4	-	4
MA1101	Mathematics-1	4	-	4
CS1101	Programming in C	4	-	4
HS1001	English	4	-	3
EC1701	Network Analysis Lab	-	3	2
PH1601	Engineering Physics Lab	-	3	2
CS1701	Programming in C Lab	-	3	2
HS1101	Communication Skills-I	2	-	1
	Total	**22**	**9**	**26**

EC1101 Network Analysis

Externals: 60Marks **(For ECE & CSE-E1S1)** **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To provide the knowledge of basic components of circuit and their relations in various forms of connection.
2. To provide the knowledge of D.C analysis of circuits.
3. To understand concept and various parameters of single-phase AC circuits.
4. To understand concept of resonance and various theorems.
5. To give the knowledge of two port network and Graphs in circuit theory.

Course Outcomes:

Upon completion of course the student

1. Will be able to articulate in working of various components of a circuit.
2. Will be familiar with solving DC circuits.
3. Will have ability to analyze AC circuit and measure related parameters.
4. To solve the given circuit with various theorems and methods.
5. Ability to Express given Electrical Circuit in terms of A, B, C, D and Z, Y Parameter Model and Solve the circuits
6. To distinguish between tie set and cut set methods for solving various circuits.

UNIT- I: DC CIRCUIT ANALYSIS

R-L-C Parameters, Voltage and Current Independent and Dependent Sources, Source Transformation – V–I relationship for Passive elements, Kirchhoff's Laws, Network reduction techniques – series, parallel, series parallel, star–to-delta, delta-to-star transformation, Nodal Analysis

UNIT- II: DC TRANSIENTS

DC Transients: RL, RC and RLC, Laplace transforms and their adaptation to networks

UNIT- III: SINGLE PHASE AC CIRCUITS

Single Phase AC Circuits - R.M.S. and Average values, Form Factor, steady state analysis of series, Parallel and Series parallel Combinations of R, L and C with Sinusoidal excitation, concept of reactance, Impedance, Susceptance and Admittance – phase and phase difference, Concept of Power Factor, j-notation, complex and Polar forms of representation.

UNIT- IV: RESONANCE and NETWORK THEOREMS

Resonance – Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.

Network Theorems - The venin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, Tellegen's, Millman's and Compensation theorems for DC and AC excitations.

UNIT- V: TWO PORT NETWORKS and GRAPH THEORY

Two port networks: Z, Y, h and ABCD parameters

Graphs: Paths, connectedness, circuits, cutsets, trees; Matrix representation of directed graphs: incidence, cutset and circuit matrices; Methods of analysis of linear networks: nodal-cutset-mesh- and loop-analysis.**Transfer functions:** poles and zeros; Elements of Filter Theory.

TEXT BOOKS:

1. Network Theory by N.Sreenivasulu, REEM Publications
2. Circuits & Networks by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill
3. Electric Circuits- Schuam Series

REFERENCE BOOKS:

1. Network Analysis by M.E Van Valkenberg, Prantice Hall India, 3rd Edition.
2. Electric circuit Analysis by C.L. Wadhwa, New Age international
3. Electric circuits by David A. Bell, Oxford University press

PH 1001 ENGINEERING PHYSICS

Externals: 60Marks **L-T-P-C***

Internals: 40Marks **4-0-0-4**

Course Objectives:

1. To inculcate in the Students a sense of yearning to learn the basic Physics behind the applications that we look around in day to day life.

2. To deliver the basic Principles of Physics that forms the basis for the development of Technology.

3. The basic details of Solid state Physics, Optics and Electrodynamics and Quantum Physics provided in a subtle fashion dealt in finer details to have strong basics in these areas.

Course Outcomes:

1. The Students would be in a position to understand the innate Physics principles that go into the day to day phenomenon specifical to Optical domain.
2. The Students would get hold of the basic Electro magnetic Wave concepts that are crucial in understanding the Communication Phenomenon.
3. The Students would have realized the difference between the Newtonian Domain(Classical Physics) and quantum domain(Quantum Mechanics) and get to know the Physics that happens at the Quantum Domain.
4. The Students would be equipped with concepts in understanding the crystals and materials from a basic point of view which form a backbone in understanding the properties exhibited by these materials.

UNIT – I

MATHEMATICAL PHYSICS (3)

1. Gradient, Divergence, Curl and their physical significance

   Scalar and Vector point Functions, Differential operator, Gradient , Physical significance, Divergence, Significance, Curl, Physical Significance, Vector Identities

1.2 Stokes theorem & Gauss theorem

Vector Integral Theorems, Line Integral, Surface and Volume Integrals, Stokes Theorem, Gauss-Divergence Theorem, Application

1.3 Curvilinear coordinates

Types of Coordinate systems, Polar coordinates, Cylindrical and Spherical coordinates, Equations Relating Cartesian, Spherical and Cylindrical coordinate

UNIT – II
ELECTRODYNAMICS (6)

2.1 Maxwell's Equations

Electrodynamics before Maxwell, Fixing of Ampere's Law, Maxwell Equation in matter, Boundary Conditions.

2.2 Poynting theorem and conservation laws

Continuity Equation, Poynting Theorem, Conservation Law Newton Third law in Electrodynamics

2.3 Wave equation

Wave equation, wave form Boundary conditions, Reflection and Transmission for a string

2.4 Electro Magnetic Waves in vacuum

Wave equation for E and B, Monochromatic Plane Waves, Energy and Momentum in EM Waves in vacuum

2.5 Electro Magnetic waves in Matter

Propagation in Linear Media, Reflection and Transmission at Normal Incidence Oblique Incidence

2.6 EM wave in conducting surface.

Reference Books :

1. Electrodyamics by David j.Griffiths

UNIT – III
OPTICS (12)

1. Interference by division of wave front (Biprism)

Introduction , Interference of Light Waves, Interference Pattern , Intensity Distribution, Fresnel Biprism

3.2 Interference by division of amplitude (Newton's rings)

Interference by Plane parallel Wave, Cosine Law, Interference by a film with Non-Parallel reflecting surface, Wedge, Newton's Rings.

3.3 Michelson's interferometer

Interference by Plane film illuminated by a point source, Michelson's Interferometer.

3.4 Fraunhoffer diffration (Single slit)

Introduction, Types of Diffraction,Single Slit Frauhoffer Diffraction, Position of Maxima and Minima,Graphical Method for determining roots

3.5 Frauhoffer diffraction Double slit & multiple slits

Double slit Fraunhoffer diffraction by N- Parallel slits

3.6 Diffraction Gratings, Grating and Resolving Power

Diffraction Grating, Construction of Grating, Grating Spectrum, Resolution, Resolving Power of a diffraction Grating

3.7 Fresnel diffraction and Zone Plate

Types of Diffraction, Fresnel diffraction, Fresnel Half Period zones, Zone plate Application of Zone, Lens

3.8 Production of Plane Polarised light & double refraction

Introduction , Polarisation of Light waves, Representation of various types of light, Polarization by Reflection,Brewster's Law, Laws of Malus and proof, Geometry of Calcite Crystal, Double Refraction, Nicol's Prism, Applications.

3.9 Quarter & Half – wave plate, elliptical & circular polarized lights

Huygen's Theory of Double Refraction, Quarter Wave plate, Half Wave Plate, Elliptically and Circularly Polarised light.

3.10 Production & detection of elliptical & circular Polarised lights

Elliptically polarised Light, Circularly polarised light, Conversion of Elliptically polarized light to Circularly polarised light, Analysis of polarized light of Different Kinds.

3.11 Theory of Laser

Introduction, Spontaneous Emission, Stimulated Emission, Relation between Spontaneous and Stimulated emission Probabilities, Population Inversion, Pumping, Active systems.

3.12 Different kinds of Lasers

Ruby laser Working Semiconductor laser,He-Ne laser ,Application of Laser.

Reference Books :

1. Engineering Physics By Malik and Singh
2. Optics by Ajoy Ghatak
3. Optics by Pedrotti and Pedrotti.

UNIT – IV

QUANTUM MECHANICS (6)

4.1 Failures of classical physics

Limitations of classical physics, Blackbody Radiation, Spectral Lines, Photoelectric Effect, Planck's Quantum Hypothesis, Einstein's Theory of photoelectric Effect, Compton effect, Existence of stationary states, Stern-Gerlach Experiment

4.2 DeBroglie waves & Uncertainity Principle

Introduction, Matter waves Electron Diffraction Experiment Standing waves of an electron in orbit, Uncertainity Principle Single Slit Experiment, Application of Uncertainty Principle.

4.3 Wave function, Schrodinger Equation & probablity interpretation

Time Dependent Schrodinger Equation ,1- D Equation for a free particle, extension to 2-D, Inclusion of forces, Probability current Density

4.4 Operators , expectation values & Time independent Schrodinger Equation

Operators ,Expectation Value, Ehrenfest Theorem, time independent schrodinger Equation and Admissibility Conditions on Wave function.

4.5 Solution for generalised potential

Motion of a particle in a Potential – Classical view .

4.6 Particle in a box

Square well potential with Rigid walls, Energies and Wave functions

Reference Books:

1. Modern Physics by A. Beiser
2. Quantum Mechanics by Aruldhas.

UNIT – V

CONDENSED MATTER PHYSICS (6)

5.1 CRYSTALLOGRAPHY-I

Introduction, Crystal ,Single, poly and Amorphous state, Lattice Points and Space Lattice, Unit cell, Primitive Unit Cell in 2-D ,Non-primitive Unit Cell in 2-D lattice ,Primitive unit cell in 3-D ,Non Primitive unit cell in 3-D,Bravais Lattice and crystal systems, Atomic Packing, Crystal structure

5.2 Crystallography-II

Miller Indices, Positions, Directions, Planes Obtaining Miller indices, Important Cubic crystal structures, SC, BCC, FCC, Closed Packed structures, Packing fraction, NaCl Structure, Diamond, ZnS Structure.

5.3 X-ray diffraction

Introduction, Bragg's Law, Diffraction Direction Experimental Methods of x-Ray Diffraction, Powder method Debye - Scherrer Method Measurement of Bragg Angle

5.4 Defects in crystals

Introduction, Classification of Imperfections, Point Defects, vacancies, Schottky defects, Intersitial, Frenkel defects, Impurities, Colour centres, Line defect Planar Defects, Volume Defects, Thermodynamical consideration for Existence of Defect equilibrium concentration of Schottky defects in metals, Equilibrium concentration of schottky defects in Ionic crystals, Frenkel defect in metals, Frenkel defects in ionic crystals

5.5 Electron theory of metals

Important properties of metals, electron theory of solids, classical free elecrtron theory, DC Electrical Conductivity, Gains of Drude Model, Sommerfeld quantum Model, Fermi Energy, Density of Energy States, carrier Concentration, Drawbacks of Sommerfeld Theroy

5.6 Band theory of solids

Introduction, Formation of Energy Bands in Crystals, Characteristics, Bonding, Classification, Intrinsic and Extrinsic Semiconductors, Band structure, Energy Bands, Fermi Level and Fermi Energy, Carrier Concentration, Density of electrons in Conduction band, Position of Fermi level, Hall Effect, Applications

Reference Books:

1. Solid state Physics by Dekker
2. Solid state Physics By C.Kittel

MA1101 **MATHEMATICS - I**

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **4-0-0-4**

Course Objectives:

- To give a thorough explanation of real sequences and series.
- To introduce the concepts of Euclidean space and the behavior of functions in them.
- To emphasize the applications of differentiation on real functions and their geometrical inferences.
- Introduction to Numerical analysis.
- To Introduce Fourier series and it's applications.

Course Outcomes:

At the end of the course student will be able to

- Explain concept of limit of function of two variables
- Understand the two path criterion to show that a limit does not exist and apply it to solve problems about limits
- Memorize definition of partial derivative and illustrate geometric meaning withthe aid of sketches.
- Provide geometrical meaning of second partial derivative with respect to onevariable
- Calculate directional derivatives and gradients &Apply it to solve problems involving steepest ascent and normal vectors to level curves.
- Apply the method of Lagrange Multipliers to solve such constrained optimization problems.
- Understand & apply various theorems like, Rolle's theorem.Lagrange's Mean value theorem, Cauchy Mean Value theorem in Calculus.
- Understand & Apply various tests for convergence of sequences & series
- Find the find the fourier series of periodic functions
- Find the Fourier sine and cosine series for functions defined on an interval.
- Use to numerical methods in modern scientific computing
- Find the roots of various types of equations using Numerical methods & find the area under the curve using Trapezoidal Rule, Simpson $\frac{1}{3}$ Rule, Simpson $\frac{3}{8}$ Rule

UNIT-I

Sequence: Definition of sequence, convergence, limit of a sequence, divergence, oscillation, bounded and monotonic sequences, Bounded sequences, Sandwich theorem, Algebra of limits, L'Hospital Rule in sequences, subsequences and its limit.

Series: Infinite series, partial sum, convergence, divergence, oscillation, Geometric series, Telescoping series, Algebra of Limits, n^{th}- term test, Comparison test, Comparison test (Limit Form), Integral test, D'Alembert's Ratio test, Cauchy's Root test, Alternating series, Leibnitz's

Rule, Absolute convergence, Conditional convergence, Power series, Radius of convergence for a power series.

UNIT-II

Differential calculus: Rolle's theorem, Lagrange's mean value theorem, Cauchy's Mean-value theorem, Taylor's Theorem and Expansion, Maclaurin's Theorem and Expansion, Indeterminate forms and application of L'Hospital Rule. Radius of curvature, Envelope, Increasing and decreasing functions, concavity, convexity and point of inflexion, Asymptotes-Curve Tracing(Sketching)

UNIT-III

Functions of Several Variable Calculus:

Definition of continuity and differentiability in single variable, n-dimensional Euclidean space, Neighborhood of a point in n-dimensional Euclidean space, Functions in n-variables, Functions in 2 & 3 variables, Interior points, Boundary points, open and closed regions, Limit and continuity, Two-path test, Discontinuities, Partial Differentiation, Clairaut's theorem(for mixed Partial Derivatives), Laplace equation, Homogeneous functions , Euler's theorem for Homogeneous functions, Differentials and derivatives, Derivatives of composite functions, Chain Rule, Jacobians, Taylor's Theorem, Maxima and minima, Lagrange's method of multipliers.

UNIT-IV:

Fourier Series:

Definition of Fourier Series, Fourier Series representation of function, Limit of Convergence of Fourier Series, Even & Odd functions, Gibb's Phenomenon, Sine and Cosine Series, Limit of Convergence of Sine & Cosine Series. Integration and Differentiation of Fourier Series, Bessel's Inequalities, Parseval's Theorem.

UNIT-V

Numerical Methods:

Introduction: True value, Approximate Value, Error, Error percentage, Application of Numerical Analysis in various fields.

Numerical Analysis in solving Algebraic equations: Algebraic equations, Transcendental equations, Bisection Method, Regula -Falsi Method, Newton-Raphson Method.

Numerical Integration: Trapezoidal Rule, Simpson $\frac{1}{3}$ Rule, Simpson $\frac{3}{8}$ Rule

Text Books:

1. Thomas Calculus, Maurice D.Wier, Joel Hass Eleventh Edition, Pearson Education ,2008

2. R.K. Jain & S.R.K.Iyengar, Advanced Engineering Mathematics, Third Edition, Narosa publications, 2007.

3. Erwin Kreyszig, Advanced Engineering Mathematics, 8th Edition, John Wiley & Sons Ltd 2006.

Suggested References:

1. B.S. Grewal and J.S. Grewal, "Higher Engineering Mathematics",(40th Edition), Khanna Publishers,2007
2. S.S. Sastry ,Introductory Methods of Numerical Analysis ,Third Edition, Prentice Hall India

*L-T-P-C stands for number of lectures, tutorials, practices and credits

CS1101 PROGRAMMING IN C

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Prerequisites

1. No prerequisites
2. Requires analytical skills and logical reasoning.

Course Objectives

This course starts from the basics of computers and program development

- It covers various concepts of C programming language
- To learn how to write modular and readable C Programs
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures

Course Outcomes

1.Develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings and Implement searching and sorting algorithms

UNIT – I

Introduction to Computer Programming: Computing Environments, Computer Languages, Creating and
Running Programs. Algorithms and Flow charts : Definition of Algorithms, examples, Symbols used in
Flow chart, examples. Introduction to C Language - Background, C Identifiers, Data Types, Operators,
Variables, Constants, Input / Output, Expressions, C Programs, Precedence and Associativity, Evaluating
Expressions, Type Conversion, Statements, Bitwise Operators.

UNIT-II

Selection: Logical Data and Operators, if-else, switch Statements, Standard Functions. Repetition: loops, while, for, do-while statements, Loop examples, break, continue, go to. Arrays - Concepts, Using Arrays in C, Array Applications, Two- Dimensional Arrays, Multidimensional Arrays, Linear and Binary Search, Selection, Bubble, Insertion Sorts.

UNIT – III

Functions: Designing Structured Programs, Functions Basics, User Defined Functions, Inter Function Communication, Standard Functions, Scope, Storage Classes-auto, Register,

Static, Extern, Scope Rules, and Type Qualifiers. Recursion- Recursive Functions, Preprocessor Commands. Strings - Concepts, C Strings, String Input / Output Functions, Arrays of Strings, String Manipulation Functions.

UNIT – IV

Pointers - Introduction, Pointers to Pointers, Compatibility, void Pointers, Arrays and Pointers, Pointer
constants, Pointers and Strings, Pointers to Functions, Point ers to Constant Objects, Constant Pointers,
Pointer Arithmetic.Call-by-reference: Pointers for Inter-Function Communication, Passing Arrays to a Function.Dynamic Memory Allocation: Memory Allocation Functions, Programming Applications,
Command-line Arguments.

UNIT – V

The Type Definition (type def), Enumerated Types Structure: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions. Input and Output: Files, Streams, Standard library Input Output Functions, Character Input Output Functions.

Suggested Reading:

1. Rajaraman V, The Fundamentals of Computer, 4th Edition, Prentice Hall of India, 2006
Kernighan BW and Ritchie DM, The C Programming Language, 2nd Edition, Prentice Hall of India, 2006.
2. J.R. Hanly and E.B. Koffman, Problem Solving and Program Design in C, Pearson Education, 2007.

HS1001 English for Communication

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-3**

Course Objectives:

- To complement the comprehensibility of the Technical subjects in a better way.
- To make them competent to attempt and qualify in various tests.
- To develop the study skills in formal and informal situations.

Course Outcomes:

Students will be able

* To learn the impacts of technology on language and personal life.
* To pronounce better and enhance their reference skills.
* To appreciate the aesthetic understanding and pleasure reading.
* To improve analysis skills through movies.
* To strengthen public speaking skills.
* To refine their comprehensive writing skills

UNIT-I

A Road Not Taken by Robert Frost: Understanding the Poem- Importance of the poem – Figures of Speech –Simile- Metaphor- Alliteration- Onomatopoeia - Invictus (2009)

UNIT-II

Phonetics: Commonly Mispronounced Words - Consonants - Vowels – Voiced & voiceless - BBC Phonetic Transcription – Syllabification - Word Stress - Tongue Twisters – The King's Speech (2010) – My Fair Lady (1968)

UNIT-III

What's Up? An Excerpt from The Hindu (September 29, 2015) – Binomials and Portmanteau - Common errors in English Usage

UNIT-IV

Malala's Speech: An Excerpt from www.noble.org (10 December 2014): Self-Introduction - One Word Substitutes - Homophones, Homonyms and Homographs - Debate - Group Discussion – Girl Rising (2013)

UNIT-V

The Nightingale and the Rose by Oscar Wilde: - Skimming and Scanning - Dialogue writing:

Seeking Permission, Requesting, and Interrupting – Tangled (2010)

UNIT –VI

Anand's Super 30 for IIT - JEE : An Excerpt from The India Today (July 11,15): Letter Writing - Formal Letter - Informal Letter - Notice Writing - Email writing – Freedom Writers (2007)

UNIT –VII

Education and Technology - Burj Khalifa : www.natgeotv.com : Burj Khalifa (Documentary Video)- JAM/PPT Presentations - Essay Writing

UNIT –VIII

A Missile Man – Dr. APJ Kalam: An Excerpt from The Hindu (Sept 25, 2006) – Interviews - Curriculum Vitae or Resume preparation – I am Kalam (2010)
FURTHER STUDIES (SELF STUDY): U-I: Capitalization, Punctuation (commas, full stop, inverted marks) - U-II: Words often Confused, Affixes (Prefixes and Suffixes), Commonly Mispronounced Words, Tongue Twisters - U-III: Articles - Prepositions, Spotting the Error –

UIV: Index –Grammar (Additional Information)

Tenses – U-V: Active and Passive, Direct and Indirect Speech – U-VI: Understanding the rules of spelling Part1&2 – U-VII: Commonly Used Phrasal Verbs & Idioms – U-VIII: Antonyms and synonyms

Suggested References:

1. Meenakshi Raman, Sangeetha Sharma. "***Effective Technical Communication***." Oxford: Oxford University, New Delhi, 2015.
2. Murali Krishna, ***"English for Engineers."*** Pearson Education, Inc. New Delhi, 2015.
3. 3. E. Suresh Kumar, P. Sreehari and J. Savithi***. "English for Success."*** Foundation Books, Inc. New Delhi, 2014.
4. 4. Ashraf. M. Rizvi, ***"Effective Technical Communication."*** Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2015.
5. 5. Hari Mohan Prasad and Rajnish Mohan, ***"How to prepare for Group for Group Discussion and Interview."*** 2nd Edition, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2015.
6. 6. R.P Bhatnagar and Bhargava Rajal, ***"English for Competitive Examinations".*** McMillan India limited, 1989.
7. 7. Upendran. S, ***"Foundation Course in Spoken English Part I".*** McMillan India limited, 1989.
8. 8. Upendran. S, ***"Foundation Course in Spoken English Part II".*** McMillan India

limited,1989.

Web sources:

1. www.usingenglish.com
2. www.talkenglish.com
3. www.oxforduniversity.com
4. www.wikipedia.com
5. www.about.com

For Literature:

1. www.cliffsnotes.com
2. www.sparksnotes.com
3. www.gradesaver.com

www.nofearshakespeare.com

HS1101 Communication Skills- I

Externals: 60 Marks **L-T-P-C***

Internals: 40 Marks **2-0-0-1**

Course Objectives:

1. To make the students efficient communicators via experiential learning.

2. To enhance learners' analytical and creative skills, so that they will be capable to address a wide variety of challenges in their professional lives.

3. To help learners to improve the leadership qualities and professional etiquette

4. To expose learners to an effective communicative environments.

Course Outcomes:

Students will be able to:

1. Develop interpersonal communication, small group interactions and public speaking.

2. Exercise the writing assignments, precise writing for informational, persuasive and creative purposes.

3. Apply right form of structural usage of sentences in their written and oral communication.

4. Develop confidence and skills related reading comprehension.

5. Improve a logical framework for the critical analysis of spoken, written, visual and mediated messages upon a diverse platforms.

6. demonstrate the ability to apply vocabulary in practical situations.

Unit I – Introduction to communication

Introduction – Importance of Communication Skills – Definition – Scope and Nature – Verbal and Nonverbal communication

Unit II – Reading Skills

Reading Comprehension of unseen passage – Prose – News Paper Reading and Analysis (Editorial)

Unit III - Grammar

1. Parts of Speech
2. Subject and predicate
3. Articles – Determiners
4. Conjunctions (Linkers; connectors; cohesive devices)
5. Verbs – Transitive and Intransitive - Finite and Infinite - Regular and Irregular - Modals
6. Tenses
7. Prepositions/ Prepositional verbs
8. Adverbs – types and their order in sentences
9. Adjectives
10. Including Degrees of Comparison and also Quantifiers

Unit IV – Enhancing Vocabulary

Developing Professional vocabulary – Using Dictionary: Spelling – Grammar and Usage

Unit V - Composition

Paragraph – Essay - Expansion - Describing the Pictures – Giving Directions – Situational Dialogue writing – Social and Professional Etiquette – Telephone Etiquette

Suggested References:

1. Joseph Mylal Biswas book of English Grammar

2. R. Murphy -Cambridge Press

3. Wren and Martin

4. The Good Grammar book by OUP

5. Communication skills by M. Raman and Sangeeta Sharma

6. How to Win Friends and Influence people by Dale Carnigie

7. How to Read and Write Better by Norman Lewis

8. Better English by Norman Lewis

9. Use of English Collocations by OUP

10. www.humptiesgrammar.com

11.www.bbcenglisgh.com

12.www.gingersoftware.com

13. www.pintest.com

EC1701 Network Analysis Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives

1. To make the students capable of analyzing any given electrical network.
2. To make the students learn how to synthesize an electrical network from a given impedance/admittance function.

Course Outcomes

1. Students will be able to analyze the various electrical and electronic networks using the techniques they learn.
2. Students will be able to construct a circuit to suit the need.

LIST OF EXPERIMENTS:

1. Study of amplifier using transistor and analysis of harmonic distortion of it.

2. Making of inductor with and without ferrite core and study of its behavior.

3. Study of circuit under Eigen excitation incase of symmetrical and non symmetrical networks.

4. Study of transfer characteristic of circuits containing diodes to find cut-in voltage.

5. Study of relative amplitude of first and second harmonics of half wave rectified output of diode.

6. Maximum Power Transfer Theorem

7. Transient and frequency response of RLC series circuit

8. Measurement of Z, Y, and ABCD parameters of a two port network.

PH 1601 ENGINEERING PHYSICS LAB

Externals: 60Marks **L-T-P-C***

Internals: 40Marks **0-0-3-2**

Course Objectives:

* To sensitize students to their communication skills.
* To make the students practice the language skills (L, S, R, W).

Course Outcomes:

1. Students will be able to write essays and paragraphs that demonstrate proper usage of grammar.
2. Students will demonstrate the ability to critique their grammar assignments.
3. Students will be able to assess their pronunciation of words.
4. Students will analyze the forms of different expressions in English Language that reflect the individual, social, and cultural values.
5. Students will demonstrate the proficiency in oral and written communication.

UNIT-I –

Grammar – Adjectives – Comparatives and Superlatives – Adverbs – Countable and Uncountable Nouns – Pronouns – Simple present – Present continuous – Simple past- Conjunctions – Prepositions – Plurals – Articles a, an, the – Infinitive or –ing – Questions and Negatives -1 - Questions and Negatives -2

UNIT-II

Pronunciation – Pill/Fill – Buy/My – Tie/Die – Ship/Chip – Yet/ Jet – Game/ Came – Wail/Veil – Think/Sink – There/Dare – Price/ Prize – Asia/ Hard – Ran/Rang – Right/Light – Ship/Sheep – Head/Had- Schwa – Luck/ Look - Hat/Heart – But/Boot – Who/ Her – Pot/Port – Hair/ Hear – Pay/Pie – Boy/Buy – Know/ Now

UNIT-III

Writing – Writing a Thank You Letter – Writing about your life – Writing Instructions – Writing a Story – Writing an Essay – Writing a Business Letter – Writing a Film Review – Writing a Biography – Writing a Complaint Letter – Writing a Covering Letter - Writing a Pen friend Post - Writing about a Special Day - Writing an E-mail of Apology - Writing a Short Report - Writing a Post Card

UNIT – IV

Reading - The diamond thief – The guru and sweets – Taking a course – Reading a story - Using a dictionary – Making a journey – Reading a newspaper – Making friends – Reading an email – Finding information – A pen friend letter – The doctor says…- Choosing a holiday – Struck by lightning – Health matters :Yoga

UNIT – V

Listening – What shall we play? – An exciting weekend – A school outing – The morning assembly – Instructions on planting – Excuse me, can you lend me…- Manish's summer – Vignesh's hobby – What can I do for you? – What are you doing Ramesh? – I've got a few questions…- Geetha's day – Anil's new purchase – What are we having tonight? – What is the problem?

Suggested References:

1. Clarity English Success - Software
2. http://www.clarityenglish.com/program/practicalwriting/
3. http://www.clarityenglish.com/program/roadtoielts/
4. http://www.clarityenglish.com/program/clearpronunciation1/

http://www.clarityenglish.com/program/resultsmanager/

CS1701 Programming in C Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

1. Able to have fundamental concept on basics commands in Linux.

2. Able to write, compile and debug programs in C language.

3. Able to formulate problems and implement algorithms in C.

4. Able to effectively choose programming components that efficiently solve computing problems in real-world

Experiments:

Suggested assignments to be conducted on a 3-hour slot. It will be conducted in tandem with the theory course so that the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should be appropriately sequenced for synchronization with the laboratory. A sample sequence of topics and lab classes for the topic are given below:

1. Familiarization of a computer and the environment and execution of sample programs
2. Expression evaluation
3. Conditionals and branching
4. Iteration
5. Functions
6. Recursion
7. Arrays
8. Structures
9. Files

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS1101 can be substituted

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Rajiv Gandhi University of Knowledge Technologies

Basar, Nirmal – 504107

B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

I YEAR II SEMISTER

Subject Code	Subject Name	L-T	P	C
EE1201	Electrical technology	4	-	4
CY1001	Chemistry	4	-	4
MA1201	Mathematics-II	4	-	4
CS1201	Scripting languages	4	-	3
HS1201	Communication Skills-II	2	-	1
CE1601	Engineering drawing	4	-	4
EE1801	Electrical technology Lab	-	3	2
HS1601	English Lab	-	2	2
CY1601	Chemistry Lab	-	3	2
	TOTAL	**22**	**8**	**27**

EE1201 Electrical Technology

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To acquire the basic concepts of AC and DC Machines
2. To learn the basics of Alternators, Transformers.
3. To learn the measurement characteristics of Voltmeter, Ammeter, Wattmeter and Energy meter.

UNIT- I: THREE PHASE AC CIRCUITS

Three phase EMF generation, delta and Y connections, line and phase quantities, solution of three phase circuits, balanced supply voltage and balanced load, phasor diagram, measurement of power in three phase circuits, Three phase four wire circuits.

UNIT -II: TRANSFORMERS

Magnetic Circuits :

Ampere's circuital law, B- H curve, solution of magnetic circuits, hysteresis and eddy current losses, relays, an application of magnetic force, basic principles of stepper motor.

Transformers :

Construction, EMF equation, ratings, phasor diagram on no load and full load, equivalent circuit, regulation and efficiency calculations, open and short circuit tests, auto-transformers.

UNIT -III: INDUCTION MOTORS

The revolving magnetic field, principle of orientation, ratings, equivalent circuit, Torque-speed characteristics, starters for cage and wound rotor type induction motors.

UNIT -IV: DC MACHINES

Construction, EMF and Torque equations, Characteristics of DC generators and motors, speed control of DC motors and DC motor starters.

UNIT- V: ELECTRICAL MEASURING INSTRUMENTS

DC PMMC instruments, shunt and multipliers, multimeters, Moving iron ammeters and voltmeters, dynamometer, wattmeter, AC watthour meter, extension of instrument ranges.

TEXT BOOKS:

1. Electric machinery - A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw Hill Companies, 5th edition
2. Electrical machines-PS Bhimbra, Khanna Publishers.
3. Electromechanics – II , by Kamakshaiah

REFERENCE BOOKS:

1. Performance and Design of AC Machines by MG.Say, BPB Publishers

2. Theory of Alternating Current Machinery- by Langsdorf, Tata McGraw-Hill Companies, 2nd edition.
3. Electric Machines –by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7th Edition.2005
4. Fundamentals of Electric Machines by B. R. Gupta, Vandana singhal, 3rd Edition, New age international Publishers
5. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition,
Reem Publications.
6. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications.

CY1001 ENGINEERING CHEMISTRY

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **4-0-0-4**

Course Objectives:

1. To understand the basic concepts of phase rule and catalysis with examples
2. To understand the importance of the spectroscopy in determining the structures of chemical compounds
3. To understand the importance of electrochemistry in technical filed
4. To understand the corrosion and types of corrosion
5. To understand the rates of some of the reactions and derivation of their rate laws
6. To understand the basic concepts of polymers, lubricants, and nanomaterials

Course Outcomes:

1. Will be able to understand the structural elucidation of organic compounds using spectroscopy.
2. Will gain knowledge on basic electrochemical reactions, corrosion and prevention of corrosion.

3. Will gain knowledge on rate law, kinetic reactivity of complex reactions and phase rule.

4. Will gain necessary knowledge in catalysis.

5. Will understand the basic concepts of polymers, lubricants, and nanomaterials, essential for engineering graduates

Unit 1: Phase Rule & Catalysis (7 classes)

Phase Rule: Terminology, One component system (H_2O system and CO_2 – system), two components system, Simple eutectic system (Pb – Ag), system with congruent melting point (Zn – Mg), system with incongruent melting point (Na_2SO_4 –H_2O), Cooling curves.

Catalysis : Mechanism of catalytic reactions: catalyst definition, characteristics and types of catalysis, theories of catalysis, intermediate compound formation theory with examples and mechanism, drawbacks of intermediate compound formation theory, adsorption or contact theory with examples and mechanisms, enzyme catalysis, characteristics and mechanism of enzyme catalysis, concepts of promotors, inhibitors, and poisioners.

Unit 2: Spectroscopy (7 classes)

Introduction to spectroscopy, electromagnetic radiations, different types of spectroscopy, principle of spectroscopy, spectrophotometer Microwave spectroscopy: principle, microwave spectra of diatomic molecules, selection rules for microwave spectra, applications of microwave spectroscopy: determination of bond length, dipole moment measurement, determination of isotopic mass of an element. Infrared spectroscopy: introduction and principles of IR, types of vibrations: bending and stretching, Hooke's law for stretching vibrations, characteristic frequencies of common functional groups, IR instrumentation, interpretation and applications of IR spectrum with examples. Ultra-violet spectroscopy: Introduction and principle of UV spectroscopy, color interpretation with VBT and MOT, types of electronic transitions, selection rules, chromophores and auxochromes with examples, conjugation effect, absorption and intensity shifts, applications of UV spectroscopy.

Unit 3: Electrochemistry (8 classes)

Types of electrodes: introduction, metal-metal ion electrodes, metal-insoluble salt-anion electrodes, calomel electrode, gas-ion electrodes, hydrogen and chlorine electrodes, oxidation-reduction electrodes, amalgam electrodes. Types of cells: classification into chemical and concentration cells, chemical cells with transference and without transference, classification of concentration cells into electrolyte and electrode concentration cells, electrolyte concentration cells with and without transference, amalgam and gas concentration cells, examples for these cells. EMF and applications of EMF: determination of pH, determination of the valency of the ions, potentiometric titrations. pH: definition of pH and determination of pH by various methods, acid-base titrations. Thermodynamic data: enthalpy and entropy of cell reactions, Gibbs-Helmholtz equation and applications.

Unit 4: Corrosion and its prevention (4 classes)

Mechanism of Dry and wet corrosion (rusting of iron), Types of corrosion, galvanic corrosion, differential aeration corrosion, stress corrosion. Factors affecting corrosion, preventive measures (proper design, Cathodic and Anodic protection, Electroplating , tinning, galvanization).

Unit 5: Chemical kinetics (6 classes)

Complex reactions: definition and classification of complex reactions, definition of reversible reactions with examples, rate law derivation for reversible reactions. Consecutive reactions: definition, rate law derivation and examples of consecutive reactions. Parallel reactions: definition, rate law derivation and examples of parallel reactions. Steady-state approximation: introduction, kinetic rate law derivation by applying steady state approximation in case of the oxidation of NO and pyrolysis of methane. Chain reactions: introduction, types and mechanism of chain reactions, stationary and non-stationary chain reactions with examples, deriving the kinetic rate equation using a general chain reaction. Photochemical reactions: introduction, Stark-Einstein law of photochemical equivalence, photophysical processes: IC, ISC, fluorescence and phosphorescence with examples, kinetic rate law derivation incase of photochemical decomposition of HI and photochemical combination of H_2 and Br_2.

Unit 6: Engineering Materials (8 classes)

Polymers: Types of polymerization (chain & step growth). Plastics: Thermoplastic & Thermo setting resins; preparation, properties, engineering applications of PVC, Teflon and Bakelite. Conducting polymers: polyacetylene, polyaniline, mechanism of conduction, doping; applications of conducting polymers.

Cement: composition of portland cement, setting & hardening of cement (reactions). **Lubricants**: Classification with examples-Characteristics of a good lubricant & mechanism of lubrication (thick film, thin film and extreme pressure) –properties of lubricants: viscosity, cloud point, flash and fire points.

Refractories: Classification, characteristics of a good refractory and applications. **Nanomaterials:** Introduction, preparation by sol-gel & chemical vapour deposition methods, applications of nanomaterials.

Reference Books

1. Chemistry for Engineers, B. K. Ambasta
2. Engineering Chemistry, H. C. Srivastava
3. Applied Chemistry – A textbook for engineers and technologist by H.D. Gesser
4. Engineering Chemistry: by P C Jain & Monika Jain
5. A Text Book of Engineering Chemistry: by Shashi Chawla
6. Fundamental of Organic Spectroscopy by Y. R. Sharma
7. Introduction to spectroscopy by Pavia, Lampman, Kriz

MA1201 Mathematics - II

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To learn the concepts of Eigen values, Eigen vectors, vector spaces and its basis.
- Toprovideanoverviewofordinary differentialequations
- To study the methods of solving improper integrals and the concepts of multiple integrals
- To studyvectordifferentialandintegralcalculus

Course Outcomes:

At the end of the course student will be able to

- Understand the definitions of Vector Spaces, Basis and Dimension of Vector Space.
- Understand the concept Linear Transforms and related theorems.
- Find the Eigen values & Eigen vectors of a given Matrix
- Apply Cayley Hamilton theorem for problems in Matrices
- Identify an ordinary differential equation and its order
- Classify ordinary differential equations into linear and nonlinear equations
- Model radioactive decay, compound interest, and mixing problems using first order equations
- Solve first order linear differential equations and special non linear first order equations like Bernouli , Riccati &Clairaut's equations
- Find the general solution of second order linear homogeneous equations with constant coefficients
- Use the method of undetermined coefficients to solve second order, linear homogeneous equations with constant coefficients
- Use the method of variation of parameters to find particular solutions of second order, linear homogeneous equations
- Compute double integrals over rectangles and \type I and II" regions in the plane
- Compute double integrals over a sector of an annulus using polar coordinates
- Memorize the statement of the change of variables theorem for double integrals, illustrate its geometric meaning with the aid of sketches, and apply it to computeintegrals over regions that are neither type I nor type II.
- Explain the concept of a vector field andmake sketches of simple vector fields inthe plane.
- Memorize statement and understand proof of Fundamental Theorem of Calculusfor functions on curves.
- Explain concept of a conservative vector field, state and apply theorems that give necessary and sufficient conditions for when a vector field is conservative, and describe applications to physics
- Memorize Green's Theorem, and make sketch illustrating it. Explain how Green's Theorem is a generalization of the Fundamental Theorem of Calculus.

- Recognize the statements of Stokes' Theorem and the Divergence Theorem and understand how they are generalizations of the Fundamental Theorem of Calculus.Be aware of applications of these theorems in Physics and Mechanical Engineering.

UNIT-I

Linear Algebra: System of Linear equations ,Vector spaces, Subspaces, Linear combination of vectors, linear dependence and independence of vectors, Basis and Dimension of Vector Space.

Linear transformations, Range and Kernel of Linear Transformations, Rank-Nullity theorem. Matrix representations of Linear Transformation.Eigenvalues and Eigenvectors of a Linear Transformation and their properties , Cayley - Hamilton Theorem, Hermitian and skew Hermitian matrices. Quadratic forms, reduction of quadratic form to canonical form by orthogonal transformation.

UNIT-II

Ordinary Differential Equations of first order: Exact first order differential equation, finding integrating factors, linear differential equations, Bernoulli's , Riccati , Clairaut's differential equations, finding orthogonal trajectory of family of curves, Newton's Law of Cooling, Law of Natural growth or decay.

UNIT-III

Ordinary Differential Equations of higher order: Linear dependence and independence of functions, Wronskian of n- functions to determine Linear Independence and dependence of functions, Solutions of Second and higher order differential equations (homogeneous & non-homogeneous) with constant coefficients, Method of variation of parameters, Euler-Cauchy equation.

UNIT-IV

Integral Calculus : Convergence of improper integrals, tests of convergence, Beta and Gamma functions - elementary properties, differentiation under integral sign, differentiation of integrals with variable limits - Leibnitz rule. Rectification, double and triple integrals, computations of surface and volumes, change of variables in double integrals - Jacobians of transformations, integrals dependent on parameters – applications.

UNIT-V

Vector Calculus : Scalar and vector fields, level surfaces, directional derivative, Gradient, Curl, Divergence, Laplacian, line and surface integrals, theorems of Green, Gauss and Stokes.

Text Books:

1.Advanced Engineering Mathematics (3rd Edition) by R. K. Jain and S. R. K. Iyengar, Narosa Publishing House, New Delhi

Suggested References:

1. Advanced Engineering Mathematics (8th Edition) by Erwin Kreyszig, Wiley-India.

2. Dr. M.D. Raisinghania, Ordinary and Partial differential equations, S.CHAND, 17th Edition 2014.

*L-T-P-C stands for number of lectures, tutorials, practices and credits

CS1201 Scripting Languages

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-3**

Prerequisites

1. Programming in C and Data Structures.

Course Objectives

1. To learn scripting languages- Python, Perl, PHP

Course Outcomes;

1. Student will be able to write dynamic web pages and will also be able to build a basic search engine using python and also search through text files using Perl.

UNIT-I

Python - Introduction-Variables, Strings, numbers, comments, Lists- introducing list, lists and looping, common list operations, removing items from list, numerical lists, list comprehensions, strings as lists, tuples, file I/O, functions, conditional statements and iterative statements.

UNIT –II

Python - Dictionaries, common operations with dictionaries, looping through dictionaries, nesting, classes, inheritance, modules and classes, exceptions and testing. Exceptions, sorting, introduction to standard libraries, building a Search Engine using all the above concepts.

UNIT-III

Perl – Data types, scalar functions, Quoting Basics, Functions, Control Structures, Inputs, Error Handling.

UNIT-IV

Perl – File input output, text processing functions, Hashes, DBM Databases, Regular Expressions.

UNIT- V

HTML – Styles, links, images, Static and Dynamic pages, Paragraphs and Fonts, Lists, CSS introduction, Introduction to HTML5 and semantics. PHP – Loops, String Functions, Email function, Data and time, Image Uploading, Error Handling.

Text Books:-

2. Programming Python, 4th Edition Powerful Object-Oriented Programming By Mark Lutz
3. Learning Perl, Randal L Schwartz.
4. Web Programming, building internet applications, Chris Bates 2nd edition, WILEY Dreamtech

HS1201 **Communication Skills- II**

Externals: 60Marks **L-T-P-C***
Internals: 40Marks **2-0-0-1**

Course Objectives:

- To develop the learners ability to read fluently and critically.
- To make awareness of the common punctuation marks and the importance of it in writing
- To build academic vocabulary of the learners
- To offer the learners opportunity to practice creative writing
- To make the learners apply the skills and strategies of a successful listener

Course Outcomes:

The learners will be able to:

- make use of contextual clues to infer meanings of unfamiliar words from context and make inferences and predictions based on comprehension of a text
- punctuate simple sentences correctly
- produce appropriate vocabulary and correct word forms;
- Write creatively and accurately. They will also have a critical awareness of their writing in terms of unity, content, coherence and linguistic accuracy (grammatical structure and choice of vocabulary).
- Comprehend the talks and presentations, take organized notes on lectures and listening passages

Unit I - Reading

Reading Skills – Importance - Definition –Types -Techniques and strategies

Unit II – Punctuation and Capitalization

Punctuation - Use of Capital Letters

Unit III – Vocabulary

1. Antonyms
2. Synonyms
3. Affixation
4. Vocabulary in context
5. Proverbs /Collocations
6. One word substitutes
7. Idioms and Phrasal verbs

Unit IV – Writing Skills

Creative writing – Story Writing – Precise - Letter writing

Unit V - Listening

Listening Skills – Academic Listening – Listening to Talks and Presentations – Note Taking

References:

1. Meenakshi Raman and Sangeeta Sharma ***"Communication skills"*** Oxford University press, 2013
2. Wren and Martin, NDV Prasad Rao. *"**High School English Grammar and Composition***" S. Chand& Compay Ltd, 2012
3. Michael Swan, ***"Practical English Usage"*** 3rd edition: guide to problems in English, Oxford University press, 2011
4. Edgar Thorpe and Showick Thorpe, ***"Objective English"*** 3rd Edition, Pearson, 2010

CE1601 ENGINEERING DRAWING

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **4-0-0-4**

Course Objectives:

- To understand the basic concepts of drawing and use of drafter.
- To draw the basic geometrical constructions and curves used in engineering.
- To understand and draw the projections of points, lines, planes and solids.
- To know about isometric projections.

Course outcomes:

- **Ability to draw the 3 dimensional structure by using isometric and perspective views**
- **Ability to draw the section elevation of a structure**

Concepts and conventions: Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning

UNIT-1

Plane curves and free hand sketching: Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales. Visualization concepts and Free Hand sketching: Visualization principles – Representation of three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT-II

Projection of points, lines and plane surfaces: Orthographic projection- principles- Principal planes- First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces - Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method

UNIT-III

Projection of solids: Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method

and auxiliary plane method.

UNIT-IV

Projection of sectioned solids and development of surfaces: Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V

Isometric and perspective projections: Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method.

Computer aided drafting (demonstration only)

Introduction to drafting packages and demonstration of their use.

Suggested Readings:

1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50 Edition, 2010.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age publications
3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff,John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern EconomyEdition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age

EE1801 Electrical Technology Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

List of Experiments:

1. Characteristics of Fluorescent and Incandescent Lamp
2. Verification of Network Theorems
3. R-L-C Series Circuit
4. Three phase power measurement by two Wattmeter method
5. Single Phase Energy Meter
6. OC and SC Test of Single Phase Transformer
7. OCC of separately excited DC Shunt Generator
8. Load test of Three Phase Induction Motor

HS1601 English For Communication Lab

Externals: 60 Marks **L-T-P-C***

Internals: 40 Marks **0-0-3-2**

Course Objectives:

- To sensitize students to their communication skills.
- To make the students practice the language skills (L, S, R, W).

Course Outcomes:

- Students will be able to write essays and paragraphs that demonstrate proper usage of grammar.
- Students will demonstrate the ability to critique their grammar assignments.
- Students will be able to assess their pronunciation of words.
- Students will analyze the forms of different expressions in English Language that reflect the individual, social, and cultural values.
- Students will demonstrate the proficiency in oral and written communication.

UNIT-I –

Grammar – Adjectives – Comparatives and Superlatives – Adverbs – Countable and Uncountable Nouns – Pronouns – Simple present – Present continuous – Simple past- Conjunctions – Prepositions – Plurals – Articles a, an, the – Infinitive or –ing – Questions and Negatives -1 - Questions and Negatives -2

UNIT-II

Pronunciation – Pill/Fill – Buy/My – Tie/Die – Ship/Chip – Yet/ Jet – Game/ Came – Wail/Veil – Think/Sink – There/Dare – Price/ Prize – Asia/ Hard – Ran/Rang – Right/Light – Ship/Sheep – Head/Had- Schwa – Luck/ Look - Hat/Heart – But/Boot – Who/ Her – Pot/Port – Hair/ Hear – Pay/Pie – Boy/Buy – Know/ Now

UNIT-III

Writing – Writing a Thank You Letter – Writing about your life – Writing Instructions – Writing a Story – Writing an Essay – Writing a Business Letter – Writing a Film Review – Writing a Biography – Writing a Complaint Letter – Writing a Covering Letter - Writing a Pen

friend Post - Writing about a Special Day - Writing an E-mail of Apology - Writing a Short Report - Writing a Post Card

UNIT – IV

Reading - The diamond thief – The guru and sweets – Taking a course – Reading a story - Using a dictionary – Making a journey – Reading a newspaper – Making friends – Reading an email – Finding information – A pen friend letter – The doctor says…- Choosing a holiday – Struck by lightning – Health matters :Yoga

UNIT – V

Listening – What shall we play? – An exciting weekend – A school outing – The morning assembly – Instructions on planting – Excuse me, can you lend me…- Manish's summer – Vignesh's hobby – What can I do for you? – What are you doing Ramesh? – I've got a few questions…- Geetha's day – Anil's new purchase – What are we having tonight? – What is the problem?

Suggested References:

5. Clarity English Success - Software
6. http://www.clarityenglish.com/program/practicalwriting/
7. http://www.clarityenglish.com/program/roadtoielts/
8. http://www.clarityenglish.com/program/clearpronunciation1/
9. http://www.clarityenglish.com/program/resultsmanager/

CY1601 ENGINEERING CHEMISTRY LABORATORY

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **0-0-3-2**
Course Objectives:

1. To learn the preparation of organic compounds in the laboratory
2. To estimate the hardness and alkalinity of the given sample of water
3. To understand the Job's method for determining the composition
4. Learns how to use the pH meter and polarimeter

Course Outcomes:

Minimum knowledge on basic synthesis, quantitative and qualitative analysis is being imp

1. **Synthesis**
   i. Synthesis of soap from cheap oil.
   ii. Synthesis of Thiokol rubber

2. **Volumetric analysis**
   i. Estimation of alkalinity of water
   ii. Estimation of total hardness of water by EDTA method

3. **Job's method**
   i. Determination of composition of Ferric-Thiocyanate complex by Job's method

4. **pH meter**
   i. Estimation of the strength of a weak acid by pH metry

5. **Polarimeter**
   i. Determination of specific rotation of sucrose by polarimeter

Reference books:

1. College Practical Chemistry by V K Ahluwalia, Sunita Dhingra, Adarsh Gulati
2. Practical Engineering Chemistry by K Mukkanti
3. A Text Book of Engineering Chemistry: by Shashi Chawla
4. Essentials of Experimental Engineering Chemistry by Shashi Chawla
5. Comprehensive Practical Organic Chemistry – Preparation and Quantitative analysis byV K Ahluwalia, Renu Aggarwal

EC1201 Basic Electronics

Externals: 60Marks **(For CSE-E1S2)** **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To introduce the fundamental concepts of semiconductor devices.
2. To understand the operation of different types of electronic devices and their corresponding applications.
3. Introduce the analysis techniques of the electronic circuits to enable the students to design simple circuits.
4. To understand the different types of operations for OP-AMP.
5. To introduce the fundamental concepts of Digital electronics**.**

Course Outcomes:

1. Understand the basics of PN junction diodes, transistors and their applications.
2. Understand BJT and Design and analyze BJT amplifiers.
3. Understand MOSFET and its application.
4. Learn how to bias the transistors for their application as amplifiers.
5. Ability to design simple electronic circuits to meet a practical requirement.

Unit-I: Introduction to Electronics

Introduction to Electronics and Electronic systems, Theory of Semiconductors, pn Junction Diode, Rectifiers: Half Wave Rectifier, Full Wave Rectifier, LEDs, Photo Diodes, Silicon Controlled Rectifier.

Unit-2:Transistors

Bipolar Junction Transistor, Transistor in CB and CE Configurations, Junction Field Effect Transistor, JFET Characteristics, MOSFET, Biasing of Transistors, Biasing of JFET.

Unit-3:Amplifiers and Transister models

Introduction to Amplifiers, Transistor Re Model, Transistor h parameter model, BJT Small Signal Analysis, JFET Signal Analysis, feedback Amplifiers, Phase Shift Oscillators, Wein Bridge Oscillators

Unit-4:Operational Amplifiers

Differential Amplifiers, operational amplifiers, applications of operational amplifiers:, Constant-Gain Multiplier , Voltage Summing , Voltage Buffer , Controller Sources, Instrumentation Circuits ,Active Filters .

Unit-5:Digital Electronics:

Logic gates, realization of logic gates, flip-flops, registers and counters.

TEXT BOOKS:

1. Electronic Devices and Circuit Theory – Robert L.Boylestad, Louis Nashelsky, 9th edition, 2008 PE
2. Electronic Devices and Circuits- David A. Bell- 5th Edition, Oxford University Press.

REFERENCE BOOKS:

1. Electronic Circuits Analysis and Design – Donald A Neamen, Third Edition, Tata McGraw-Hill, 2007.
2. Introductory Electronic Devices and Circuits- Robert T. Paynter, 7th edition, 2009, PEI.
3. Microelectric circuits- sedra/ Smith- 5th edition, 2009, Oxford University Press.

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B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

II YEAR I SEMISTER

Code	Subject	L-T	P	C
EC2101	Electronic Circuits	4	-	4
EC2102	Semiconductor Devices	4	-	4
EC2103	Signals and Systems	4	-	4
EC2104	Electromagnetic theory	4	-	4
BSBE 2001/3001	Environmental science	4	-	3
HS2101	Soft Skills-I	2	-	1
EC2701	Electronic Circuits Lab	-	3	2
EC2702	Semiconductor Devices Lab	-	3	2
EC2901	Seminar-1	1	-	1
	Total	**23**	**6**	**25**

EC2101 Electronic Circuits

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To introduce the fundamental concepts of semiconductor devices.
- To understand the operation of different types of electronic devices and their corresponding applications.
- Introduce the analysis techniques of the electronic circuits to enable the students to design simple circuits.
- To understand the different types of operations for OP-AMP.
- To introduce the fundamental concepts of Digital electronics**.**

Course Outcomes:

- Understand the basics of PN junction diodes, transistors and their applications.
- Understand BJT and Design and analyze BJT amplifiers.
- Understand MOSFET and its application.
- Learn how to bias the transistors for their application as amplifiers.
- Ability to design simple electronic circuits to meet a practical requirement.

Unit-I: Introduction to Electronics

Introduction to Electronics and Electronic systems, Theory of Semiconductors, pn Junction Diode, Rectifiers: Half Wave Rectifier, Full Wave Rectifier, LEDs, Photo Diodes, Silicon Controlled Rectifier.

Unit-2:Transistors

Bipolar Junction Transistor, Transistor in CB and CE Configurations, Junction Field Effect Transistor, JFET Characteristics, MOSFET, Biasing of Transistors, Biasing of JFET.

Unit-3:Amplifiers and Transister models

Introduction to Amplifiers, Transistor Re Model, Transistor h parameter model, BJT Small Signal Analysis, JFET Signal Analysis, feedback Amplifiers, Phase Shift Oscillators, Wein Bridge Oscillators

Unit-4:Operational Amplifiers

Differential Amplifiers, operational amplifiers, applications of operational amplifiers:, Constant-Gain Multiplier , Voltage Summing , Voltage Buffer , Controller Sources, Instrumentation Circuits ,Active Filters .

Unit-5:Digital Electronics:

Logic gates, realization of logic gates, flip-flops, registers and counters.

TEXT BOOKS:

1. Electronic Devices and Circuit Theory – Robert L.Boylestad, Louis Nashelsky, 9th edition, 2008 PE
2. Electronic Devices and Circuits- David A. Bell- 5th Edition, Oxford University Press.

REFERENCE BOOKS:

1. Electronic Circuits Analysis and Design – Donald A Neamen, Third Edition, Tata McGraw-Hill, 2007.
2. Introductory Electronic Devices and Circuits- Robert T. Paynter, 7th edition, 2009, PEI.
3. Microelectric circuits- sedra/ Smith- 5th edition, 2009, Oxford University Press.

EC2102 Semiconductor Devices

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To introduce the fundamental concepts of semiconductor materials and its characteristics.
- Identify the whether the semiconductor material is p-type or n-type by using Hall Effect.
- To understand the basic structure of p-n junction diode and Tunnel diode it's working principles.
- To understand the applications of Bipolar Junction Transistor and Unipolar Junction Transistor and its different modes of operation.
- To understand the basics of optical electronics like Photo detectors, Photoluminescence, Electroluminescence, Led and laser.

Course Outcomes:

- Students will be good at fundamental concepts of semiconductor materials and its characteristics.
- Students will be ability to identify the whether the semiconductor material is p-type or n-type by using Hall Effect.
- Students will be good at the basic structure of p-n junction diode and Tunnel diode it's working principles.
- Students will know the applications of Bipolar Junction Transistor and Unipolar Junction Transistor and its different modes of operation.
- Students will be good at the basics of optical electronics like Photo detectors, Photoluminescence, Electroluminescence, Led and laser.

UNIT -I: Introduction:

Evolution of semiconductor technology, Types of semiconductors (intrinsic & Extrinsic), mass action law, Concept of fermilevel, carrier transport phenomena: Carrier drift, Carrier diffusion, Einstein relation, hall effect.

UNIT -II:Diodes:

Basic structure of pn-junction, operation of pn-diode, non uniformly doped pn-junctions, small signal model of pn-junction, Generation-Recombination currents, Junction breakdowns, diode transients, Tunnel diode, Impatt diode.

UNIT -III:BJT:

Basic BJT action: Principle of operation, modes of operation, Amplification with BJT. Non ideal effects of BJT: Base width modulation, Emitter band gap narrowing, non uniform base doping, breakdown voltage.

UNIT -IV: MOSFET:

C-V characteristics of MOSFET, The MOSFET operation: MOSFET structure, current-voltage relationship (Mathematical), substrate bias effects, small signal equivalent model, short channel & narrow channel effects, Radiation and hot electron effect.

UNIT -V:Optical devices:

Photo detectors, Photoluminescence ,Electroluminescence ,Led and laser

TEXT BOOKS:

1. Electronic Devices and Circuits - J. Millman, Christos C. Halkias, 1991 edition, 2008, TMH.
2. Electronic Devices and Circuits- R.L. Boylestad and Louis Nashelsky, 9th edition, 2006, PHI.
3. Electronic Devices and Circuits – David A. Bell, Fifth Edition, 2008, Oxford University press.

REFERENCES:

1. Integrated Electronic - J.Millman and C.C.Halkias, Satyabratajit, 2nd edition, 1998, TMH.
2. Electronic Devices and Circuits - K. Lal kishore, 2nd edition, 2005, BSP.
3. Introduction to Electronic Devices and Circuits – Rober T. Paynter, PE
4. Electronic Devices and Circuits – S. Salivahana, N.Suresh Kumar.

EE2103 Signals and Systems

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To explain signals and systems representations/classifications and also describe the time and frequency domain analysis of continuous time signals with Fourier series, Fourier transforms and Laplace transforms.
- To teach Sampling theorem, describe the time and frequency domain analysis of discrete time signals with DTFS, DTFT and Z-Transform.
- To present the concepts of convolution and correlation integrals and also understand the properties in the context of signals/systems.
- To represent periodic signals using Fourier series.
- To analyze continuous signals using Laplace transform. To analyze discrete signals using z- transforms.

Course Outcomes:

- Identify different types of signal and systems properties that are commonly used in engineering.
- To mathematically represent and analyze the signals in time and frequency domains.
- Apply the Laplace Transform to the calculation of time responses of LTI systems.
- Evaluate convolution and correlation integrals and understand the signal comparison techniques and properties.
- Analyze the effect of the gain parameter of a closed-loop system on the stability of the system and the steady state error.

UNIT – I:**Introduction**

Classification of signals, Continuous-time signals and systems, signal characteristics; common signals, random signals, systems, and applications.

UNIT – II:Signal parameters and Continuous LTI systems:

Signal parameters, The representation of signal in terms of impulses, LTI properties of continuous-time systems, impulse response, convolution, linear constant coefficient differential equations

UNIT – III:Fourier series and Fourier Transforms

Fourier series, Fourier and Laplace transforms, spectrum, statistical description of random signals, Properties of auto and cross-correlation, Ensemble averages, signal simulation.

UNIT – IV:Filter designing

System analysis, frequency response, Properties of power spectral density, analog filters, analog filter design, Butterworth filters, filtering of deterministic and random signals, system simulation, State-space analysis for continuous-time systems .

UNIT – V:Discrete time signals and systems

Discrete-time signals and systems, sampling, convolution, difference equations and digitization.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, 2009,BS Publications.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
3. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition .

REFERENCES:

1. Signals and Systems – A. Ramakrishna Rao - 2008, TMH.
2. Linear Systems and Signals – B. P. Lathi, Second Edition, Oxford University press, 2008.
3. Fundamentals of Signals and Systems Michel J. Robert, MGH International Edition, 2008.
4. Signals, Systems and Transforms - C. L. Philips, J. M. Parr and EveA. Riskin, Pearson education.3rd

EC2104 Electromagnetic Theory

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To explain the mathematical fundamentals necessary for understanding the electromagnetic theory.
- To teach the electrostatics and magnetic fields along with Maxwell's equations for EM Waves.
- To explain EM wave characteristics for understanding wave propagation.
- To explain wave guide concepts.
- To present the concepts of transmission lines, and this is a prerequisite course for "Antennas". To explain antenna parameters for characterizing its performance.

Course Outcomes:

- Students can understand physical interpretation of gradient, divergence and curl concepts and their applications for electromagnetic theory.
- students can able to understand relations between electric and magnetic field parameters from Maxwell's equations.
- They can understand uniform plane wave characteristics in lossy and lossless medium.
- They can understand impedance matching techniques and standing waves.
- They can understand basic parameters of antenna.

Unit I:

Maxwell's equations, displacement current, equation of continuity, boundary conditions.

Unit II:

Propagation of uniform plane waves in perfect dielectric and in lossy medium, polarization and poynting vector, reflection, refraction, phase and group velocities,

Unit III:

Transmission line: evaluation of line parameters, design concepts, cutoff frequency, attenuation, dispersion, power handling capacity.

Unit IV:

Travelling waves, standing waves, Smith chart and matching techniques, pulse propagation.

Unit V:

Radiation concept: elementary dipole, half wave dipole, radiation patterns, gain, pattern multiplication, basic antenna types.

TEXT BOOKS:

1. "Elements of Electromagnetics", Matthew N.O. Sadiku, 4thedition, 2008, Oxford University Press

2. "Engineering Electromagnetics", William H. Hayt Jr. and John A. Buck, 7thedition, 2006, TMH
3. "Networks Lines and Fields", John D. Ryder, 2ndedition, 1999, PHI

REFERENCE BOOKS:

1. "Electromagnetic Waves and Radiating Systems", E.C. Jordan and K.G. Balmain, 2ndedition.,2000, PHI
2. "Transmission Lines and Networks", Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi

BSBE 2001/3001 ENVIRONMENTAL SCIENCES

Externals: 60 Marks **(L-T)-P-C**
Internals: 40 Marks **4-0-3**

Course Objectives:

- To study the sources of water,floods and its impact on environment
- To know about the ecosystem and energy resource system
- To understand the Biodiversity concept and its advantages
- To study different types of pollution and its impact on environment
- To know the social and environment related issues and their preventive measures

Course outcomes:

- To get the idea about the relation between biotic and abiotic environment in nature
- To get the idea about the nature and the pollutants
- To get opportunity to know the value of bio diversity and threats of bio diversity
- To know about the conservation of biodiversity
- Ability to know the environmental impact

Unit - I

Environmental studies: Definition, scope and importance, need for public awareness.

Natural resources: Water resources; use and over utilization of surface and ground water, Floods, drought, conflicts over water, dams-benefits and problems. Effects of modern Agriculture, fertilizer-pesticide problems, water logging and salinity.

Unit - II

Ecosystems: Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in ecosystem, food chains, ecological pyramids, aquatic ecosystem(ponds, streams, lakes, rivers, oceans, estuaries).

Energy resources: Growing energy needs renewable and non-renewable energy sources.

Land resources.land as resource, land degradation, soil erosion and desertification.

Unit - III

Biodiversity: Genetic species and ecosystem diversity, bio-geographical classification of India. Value of biodiversity, threats to biodiversity, endangered and endemic species of India, conservation of biodiversity.

Unit - IV

Environmental pollution: Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and solid and liquid waste management.

Environment protection act: Air, water, forest and wild life Acts, enforcement of Environmental legislation.

Unit - V

Social Issues and the Environment: Water conservation, watershed management, and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

Environmental Disaster management: Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology, disaster management cycle, and disaster management in India.

Suggested readings:

1. A.K De, Environmental Chemistry,Wiley Eastern Ltd.

2. E.P. Odum, Fundamentals of Ecology,W.B. Sunders Co., USA.

3. M.N, Rao and A.K. Datta, Waste Water Treatment Oxford and IBK Publications.

4.Benny Joseph, Environmental Studies, Tata McGraw Hill, 2005.

5. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, Delhi, 1999.

Reference:

1. Green Buildings Council of India, Teri Document.

2. GL. Karia and R.A. Christian, Waste Water Treatment, Concepts and Design Approach, Prentice Hall of Indian, 2005

HS2101 Soft Skills I

EXTERNAL: 60MARKS **L-T-P-C***
INTERNAL: 40MARKS **2-0-0-1**

Course Objectives:

1. To make the students to understand the pattern of the Various Competitive Exams

2. To make them to enhance Grammar, Comprehension and Vocabulary to appear for the Exams

3. To make them practice the sentence building, correct usage, comprehension, and composition

Course Outcomes:

1. Students will be able to get the clarity of various exams of SSC, AEE, TSPSC and UPSC

2. Students will be able to improve their Grammar, Comprehension and Vocabulary

3. Students will be able to get the confidence enough to appear for the Exams

Unit – I – Grammar-I

1. Previous question papers of AEE/TSPSC/SSC/Banking
2. Error Correction and Sentence Rearrangement
3. Clauses (Noun Clauses – Adjective Clauses; Adverbial Clauses) and Phrases (Noun phrases; verb phrases; adverbial phrases), If clauses
4. Types of sentences Positive/Negative/Interrogative/Negative interrogative
5. Transformations (Simple, Complex and Compound)

Unit – II – Grammar-II

1. Voice
2. Direct and Indirect Speech
3. Infinitives; Gerunds; Participles
4. Phrasal verbs; Idioms; Prepositional phrases
5. Forming Questions and Question Tags

Unit – III - Pronunciation

Aspects of Pronunciation

1. Consonant, Vowel Sounds and Diphthongs
2. Syllabification – Stress - Word Stress
3. Intonation: Falling – Raising – Falling and Raising

Unit – IV – Appreciation of poetry

Critical Appreciation of Selected Poems

Unit – V – Essay Writing

Opinion Essay – Argumentative Essay – Article Writing – Report Writing

REFERENCES:

5. R.P Bhatnagar and Bhargava Rajal, ***"English for Competitive Examinations".*** McMillan India limited, 2016.
6. Wren and Martin, NDV Prasad Rao. "***High School English Grammar and Composition***" S. Chand& Compay Ltd, New Delhi.
7. Murali Krishna, ***"English for Engineers."***Pearson Education, Inc. New Delhi, 2015.
8. E. Suresh Kumar, P. Sreehari and J. Savithi***. "English for Success."*** Foundation Books, Inc. New Delhi, 2014.
9. RS Agarwal, Vikas Agarwal, ***"Objective English"***S. Chand & Compay Ltd, New Delhi, 2016

1. http://www.bankexamstoday.com/2015/09/bank-exams-question-papers.html

EC2701 Electronic Circuits Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

1. To study the electronics components and devices.
2. To study frequency response of RC circuits.
3. To study simple rectifiers circuits.
4. To study integrated circuits.
5. To study Logic Gates.

Course Outcomes:

- Understand the knowledge regarding electronic components and equipment.
- Understand Function Generator & CRO and its Applications.
- Design various filters.
- Design various rectifiers and regulators.
- Design of an amplifier.
- Verify the operation of Op-amp for various applications.
- Understand integrated circuits and Logic gates.
- Design various timers.

LIST OF EXPERIMENTS:

1. Familiarization with electronic components and usage of multimeter (measurement of resistance, classification of capacitors, diode testing)

2. Familiarization with Oscilloscope, signal generator and further usage of multimeters

3. Frequency response and square wave resting of R-C, C-R and R-L networks

4. Half-wave and full-wave rectifiers, rectification with capacitive filters, zener diode and IC regulation

5. Studies on CE amplifiers

6. Studies on Analog Circuits using OP-AMP

7. Studies on logic gates

8. Studies on 555 circuits, J-K flip-flop, counters and shift registers

EC2702 Semiconductor Devices Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

1. Fundamental concepts of semiconductor diodes and transistors.
2. Applications of various semi-conductor devices.
3. V-I Characteristics of special devices.
4. Transistor circuit behavior and their characteristics.
5. Electronic circuit design and simulation.

Course Outcomes:

1. Understand Characteristics of Diodes and Zener diodes.
2. Understand Characteristics of Transistors (CE&CB&CC).
3. Understand Characteristics of MOSFET.
4. Understand Characteristics of SCR/TRIAC.
5. Semiconductor Device Simulation.

LIST OF EXPERIMENTS:

1. JFET Characterization

2. Diode Breakdown Characteristics

3. Capacitance-Voltage characteristics of a PN junction (Doping Profile)

4. High frequency characteristics of BJT

5. SCR/TRIAC Characteristics

6. Hall Effect

7. MOS Capacitor Characterization

8. MOSFET Characterization

9. Bipolar Device Characterization

10. Semiconductor Device Simulation

11. MOS Capacitor Fabrication

EC2703 Basic Electronics Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

- To study the electronics components and devices.
- To study frequency response of RC circuits.
- To study simple rectifiers circuits.
- To study integrated circuits.
- To study Logic Gates.

Course Outcomes:

- Understand the knowledge regarding electronic components and equipment.
- Understand Function Generator & CRO and its Applications.
- Design various filters.
- Design various rectifiers and regulators.
- Design of an amplifier.
- Verify the operation of Op-amp for various applications.
- Understand integrated circuits and Logic gates.
- Design various timers.

LIST OF EXPERIMENTS:

1. Familiarization with electronic components and usage of multimeter (measurement of resistance, classification of capacitors, diode testing)

2. Familiarization with Oscilloscope, signal generator and further usage of multimeters

3. Frequency response and square wave resting of R-C, C-R and R-L networks

4. Half-wave and full-wave rectifiers, rectification with capacitive filters, zener diode and IC regulation

5. Studies on CE amplifiers

6. Studies on Analog Circuits using OP-AMP

7. Studies on logic gates

8. Studies on 555 circuits, J-K flip-flop, counters and shift registers

EC2901 Seminar - I

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **1-0-1**

Scheme of Internal Exam : 25 Marks
Credits : 1

Course Objectives:

Objective of the project seminar is to actively involve the students in preparation of the final year project with regard to following components:

- Problem definition and specification
- Literature survey, familiarity with research journals
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of graphs, bar (activity) charts and analyzing the results.
- Presentation - oral and written.

The evaluation is purely internal and will be conducted as follows:

Preliminary Report on progress of the work and viva	05 marks
Final report	05 marks
Presentation and Defence before a departmental committee consisting of Head, a senior faculty and supervisor	15 marks

Rajiv Gandhi University of Knowledge Technologies

Basar, Nirmal – 504107

B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

II YEAR II SEMISTER

Code	Subject	L-T	P	C
EC2201	Analog electronic Circuits	4	-	4
EC2202	Digital Electronics Circuits	4	-	4
EE2202	Linear Control System Engineering	4	-	4
MA2203	Probability Theory and stochastic process	4	-	4
CS2201	Computer Organization and Architecture	4	-	4
BM2201	Personality Development-I	2	-	1
EC2801	Analog electronic Circuits Lab	-	3	2
EC2802	Digital Electronics Circuits Lab	-	3	2
CS2801	Computer Organization and Architecture Lab	-	3	2
EC2902	Seminar-II	1	-	1
	Total	**23**	**9**	**28**

EC2201 Analog Electronics Circuits

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. The concepts of small signal equivalent circuits of BJT, FET and its frequency response.
2. The concept of multistage amplifiers, differential amplifiers and current mirrors for high input impedence.
3. The fundamental concepts of positive and negative feedback and their applications.
4. The performance analysis of Operational amplifiers and it's applictions.
5. The concept of large signal amplifiers and radio frequency amplifiers.

Course outcomes:

1. An ability to design and analyze the BJT & FET amplifiers at low frequency, mid frequency and high frequency regions.
2. An ability to design and perform the cascade amplifiers (i.e. multistage amplifiers) and its frequency response.
3. An ability to analyze a given differential amplifier or design a differential amplifier to meet the given specifications with constant current bias circuit.
4. An ability to design and analyze the positive feedback and negative feedback amplifiers for given specifications.
5. An ability to design and perform op-amp based circuits and it's applications for a given specifications.
6. An ability to understand the large signal amplifiers (i.e. power amplifiers) and its efficiency calculations.
7. An ability to understand the waveform generators, timers, ADCs, DACs and switched capacitor.

UNIT-I:Transistor Models:

Equivalent circuits using transconductance parameter for low and high frequency operation of BJTs and FETs, Ebers-Moll model view.

UNIT-II:**Multistage Amplifiers:**

Design and analysis of single and multistage amplifiers, wideband and narrowband amplifiers differential amplifiers ; current mirror- different configurations, Current source and Current sink.

UNIT-III:Feedback:

Feedback amplifiers, Y feedback, h and g negative feedback, oscillators and waveform generators, timers.

UNIT-IV:Operational Amplifiers:

Op-amp design: different stages of op-amp-a case study, active filter design, switched capacitor circuits , ADC , DAC.

UNIT-V: Power amplifiers:

Class AB/class B push-pull/class C

TEXT BOOKS:

1. Integrated Electronics – Jacob Millman, Christos C Halkias, Mc Grawhill.
2. Electronic Devices and Circuit Theory – Robert L.Boylestad, Louis Nashelsky, 9th edition, 2008 PE
3. Electronic Devices and Circuits- David A. Bell- 5th Edition, Oxford University Press.
4. Design of Analog CMOS Integrated Circuits – Behzad Razavi, 2008

REFERENCE BOOKS:

1. Electronic Circuits Analysis and Design – Donald A Neamen, Third Edition, Tata McGraw-Hill, 2007.
2. Introductory Electronic Devices and Circuits- Robert T. Paynter, 7th edition, 2009, PEI.
3. Microelectric circuits- sedra/ Smith- 5th edition, 2009, Oxford University Press.
4. Electronic Circuit Analysis- K.Lal Kishore, 2004, BSP.
5. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A. Vallavaraj, 2nd edition, 2009

EC2202 Digital Electronic Circuits

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To understand the concepts of Number System and digital Conversion.
2. To understand the concepts of Boolean Algebra.
3. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
4. To understand the concepts of various combinational and sequential circuits.
5. To learn various techniques for logic circuit reduction.

Course Outcomes:

1. Convert decimal number into binary, octal and hexa decimal system and also to apply them for real life problems.
2. Design simple logical operations.
3. Design efficient combinational and sequential circuits from functional description of digital system
4. The ability to identify and prevent various hazards and timing problems in a digital design.
5. Design the circuits for any real life problems with the knowledge of digital systems.

UNIT-I: **INTRODUCTION**

Digital & analog signals, Number System, BCD & its arithmetic, Binary, Decimal, Hexadecimal, Negative numbers& its arithmetic, Number base conversions, Octal

UNIT-II**: BOOLEAN ALGEBRA&SIMPLIFICATION TECHNIQUES**

Duality Principals & Canonical Form, K-Maps

UNIT-I**II: LOGIC GATES**

All Logic Gates & Implementations

UNIT-IV: **COMBINATIONAL LOGICS**

Adders, Array Multiplier Code Converters, Comparators, Decoders (DeMultiplexers), Encoders, Multiplexers, Parity Generators Checkers,Subtractors

UNIT-V:**SEQUENTIAL LOGIC CIRCUITS**

Asynchronous Circuits, Synchronous Circuits, Flip-Flops, Master SlaveOperation Flip-Flop, Counters, State Machine, Pattern Identifier

TEXTBOOKS:

1. Switching & Finite Automata theory – Zvi Kohavi, TMH,2nd Edition.

2. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.

3. Switching Theory and Logic Design-A.Anand kumar, 2008.

REFERENCES:

1. An Engineering Approach to Digital Design – Fletcher, PHI.

2. Fundamentals of Logic Design – Charles H. Roth, 5th Edition, 2004, Thomson Publications.

3. Digital Logic Applications and Design – John M. Yarbrough, 2006.

EE2202 Linear Control System Engineering

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. The ability to understand the characteristics of various types of nonlinearities present in physical systems.
2. The ability to carry out the stability analysis of non-linear control systems.
3. The ability to carry out the analysis and design of digital control systems.
4. The ability to represent digital control systems using state space models.
5. The ability to analyze the effect sampling on stability, controllability and observability.

Course outcome:

1. The ability to understand the characteristics of various types of nonlinearities present in physical systems.
2. The ability to carry out the stability analysis of non-linear control systems.
3. The ability to design compensators for digital control system to achieve desired specifications.
4. The ability to represent digital control systems using state space models.
5. The ability to analyze the effect sampling on stability, controllability.

UNIT – I: INTRODUCTION

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects ofFeedback, Mathematical modeling of physical systems: Differential equation and Transfer functions , Examples of modeling different types (e.g. electrical, mechanical, chemical, biological, social etc.) of systems, Equivalence between the elements of different types of systems. Block diagram algebra –Signal flow graph -Reduction using Mason‘s gain formula.

UNIT -II : CHARACTERIZATION OF SYSTEMS

Time Domain Analysis: Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications, Steady state response - Steady state errors and error constants, Frequency domain response -- Transfer function and its interpretation in terms of frequency responses peak and peaking frequency, bandwidth and cut-off rate; Link between time and frequency domain response features. Advantages of closed loop operation: Sensitivity and complementary sensitivity, Disturbance and noise reduction. Effects of proportional, integral, derivative Controls.

UNIT – III: STABILITY ANALYSIS IN S-DOMAIN

The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci- and relative stability using root-locus approach ,effects of adding poles and zeros to G(s)H(s) on the root loci.

UNIT – IV: STABILITY ANALYSIS IN FREQUENCY DOMAIN

Polar Plots-Nyquist Plots-Stability Analysis. Bode diagrams- Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots. P, PD, PI, PID Controllers and Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain,

UNIT – V: STATE SPACE ANALYSIS OF LINEAR CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties.

TEXTBOOKS:

1. Automatic Control Systems– by B. C. Kuo and Farid Golnaraghi – John wiley and son's, 8th edition, 2003.
2. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited,Publishers, 5th edition, 2007.

REFERENCE BOOKS:

1. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. Control Systems Engineering - by NISE 5th Edition – John wiley.

MA2203 Probability Theory and Stochastic Processes

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To understand the concepts of random variables, expectation, Variance.
- To learn various distributions and their applications.
- To study the properties of convergence of random variables and Central Limit theorem.
- To learn the concept stochastic process and study various types of stochastic processes.

Course Outcomes:

- Use basic counting techniques (multiplication rule, combinations, permutations) to compute probability and odds.
- Compute conditional probabilities directly and using Bayes' theorem, and check for independence of events.
- Set up and work with discrete random variables. In particular, understand the Bernoulli, binomial, geometric and Poisson ,Negative Binomial, Hyper-geometric distributions
- Work with continuous random variables. In particular, know the properties of uniform, normal and exponential distributions.
- Know what expectation and variance mean and be able to compute them.
- Understand the law of large numbers and the central limit theorem.
- Compute the covariance and correlation between jointly distributed variables.
- Evaluate and apply moments & characteristic functions and understand the concept of inequalities and probabilistic limits.
- Understand the concept of random processes and determine covariance and spectral density of stationary random processes.
- Demonstrate the specific applications to Poisson and Gaussian processes and representation of low pass and band pass noise models.

UNIT-I

Basic concepts of Probability**:** Random experiment. Sample space.Mutually exclusive events. . Problems based on probability. Properties based on axiomatic definition of probability. Conditional probability.Independent events.

Random Variables**:** Definition of random variables. Properties of discrete and continuous random variables. Definition and properties of probability mass function and probability density function. Definition of cumulative distribution function and its properties for discrete and continuous distributions.

Multivariate Distributions:Definition and properties of multivariate distribution (continuous and discrete). Joint probability distributions.Marginal probability distributions.Conditional probability distributions.

Mathematical Expectation:Concept of mathematical expectation of functions of random variables and their significance.

UNIT-II

Discrete Distributions: Properties of various discrete distributions: Binomial, Poisson, Negative Binomial, Geometric, Hypergeometric and Discrete uniform distributions.
Continuous Distributions: Properties of various continuous distributions: Uniform, Exponential, Normal, Gamma distributions.

Functions of Random Variables: Evaluating probability distribution of functions of random variables using CDF technique. Determination of joint probability distribution of functions of random variables using transformations.Using transformations to evaluate the distribution of functions of random variables.

UNIT –III

Moments and MomentGenerating Functions: Moments about origin, Central moments. Moment generating functions of random variables and its properties.

Covariance and Correlation: Definition and properties of covariance and correlation. Definition of bivariate normal distributions.Properties of its marginal distributions.

Inequalities : Chebychev's inequality, Cauchy Schwarz inequality. Convergence in probability.

UNIT-IV

Ordered Statistics: Probability distributions of ordered statistics and their properties.
Various types of Convergence of random Variables, Weak law of Large numbers(WLLN), Strong Law of large numbers (SLLN),Central Limit theorem

Stochastic Process
Definition of Stochastic process, Classification (Discrete & Continuous),Methods of Description of Stochastic Process(First order, distribution,density,2^{nd} order distribution and density),Special classes of Stochastic process, Markov process, Process with independent increaments,Stationary process.

Mean Auto Correlation function and its Properties, Auto Covariance function, Strict Sense Stationary, Wide Sense Stationary, Ergodic and Gaussian Random Processes.
Cross Correlation and Cross Co variance

UNIT-V

Stationary Stochastic Processes, Power spectral density, Examples of speech signals, Wiener-Kinchine theorem, White Noise.

Special Stochastic Processes, Poisson Process, Gaussian process, Markov Chains Process depending on stationary Gaussian process.

Text Books:

1. A. Papoulis: Probability, Random Variables and Stochastic Processes
2. Gupta, S.C., Kapoor V.K., Fundamentals of Mathematical Statistics (11th Edition), Sultan Chand & Sons, 2002.
3. Ross, S.M., Introduction to Probability and Statistics for Engineers and Scientists (4th Edition), Academic Press, 2011.

References:

1. E. Parzen, Introduction to Probability
2. H.L. Van Trees Detection, Estimation and Modulation Theory Part-I,Wiley, 1968
3. J.B. Thomas, Introduction to Probability Springer Verlag 1986
4. W.B. Davenport Jr. Probability and Random Processes: An Introduction to Applied Scientists and Engineers Mc-Graw Hill 1970
5. C.W. Helstrom Probability and Stochastic Processes for Engineers, 2nd ed,Macmillan 1990
6. Scott L. Miller and Donald Childers, Probability and Random processes, Elsevier 2011.
7. George R. Cooper and Clare D. McGillen, Probabilistic Methods of Signal and System analysis, Oxford University Press, 2009.
8. Oliver C. Ibe, Fundamentals of Applied probability and Random processes, Academic press (an imprint of Elsevier), 2010.

CS2201 Computer Organization & Architecture

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To understand how Computer Systems work & its basic principles
- To learn how to analyze the system performance.
- To understand the concepts behind advanced pipelining techniques.
- To learn the current state of art in memory system design
- To understand how I/O devices are being accessed and its principles.
- To provide the knowledge on Instruction Level Parallelism

Course Outcomes:

- Understand the major components of a computer including CPU, memory, I/O and storage.
- Understand the basic components of the CPU including the ALU and control unit.
- Understand complete instruction set of a processor.
- Understand the uses for cache memory.
- Understand a wide variety of memory technologies both internal and external.
- Understand the role of the operating system in interfacing with the computer hardware.
- Will have a basic understanding of assembly programming.
- Design principles in instruction set design including RISC architectures.
- Understand parallelism both in terms of a single processor and multiple processors.

Unit I:

Basic functional blocks of a computer, Basic Functional blocks - CPU, Memory, Input-output, Control unit, Instructions and Instruction execution cycle, Instruction set architecture-Elements of machine instructions, Instruction representation, Instruction types, classification based on number of addresses, Data types, Types of operations-Data transfer, Arithmetic, Logical, Conversion, Input-output, system, Control and transfer of control operations, Addressing modes, Case study of 8086 instruction set.

Unit II :

Data representation and Arithmetic Data Representation: signed number representation, fixed and floating point representations, character representation. Converting between different b it lengths, Integer arithmetic: Negation, integer addition and subtraction, ripple carry adder, carry look-ahead adder, etc. multiplication shift-and-add, and Booth multiplier Division nonrestoring and restoring techniques, floating point : floating point representation and floating point arithmetic: Addition, Subtraction, Division, Multiplication

Unit III :

CPU control unit design Micro operations : fetch, indirect, interrupt, execute, Instruction cycle, Control Signals: inputs and outputs, Hard Wired Control Unit, Micro instructions: horizontal and vertical instruction formats, Micro program, Micro programmed control unit, Advantages and Disadvantages of hardwired and Micro programmed control unit Pipelining: Basic concepts of pipelining, throughput and speedup, pipeline hazards

Unit IV :

Input-output organization External devices, Input -output Interface: I/O Bus and interface Modules, I/O Versus memory Bus, I/O Modules structure and their functions, Modes of Transfer: Programmed I/O, Interrupt driven I/O, Direct Memory Access: DMA Controller and Transfer, DMA Configurations, Privileged and Non-privileged instructions, Software Interrupts and exceptions, Processor modes: User mode and kernel mode.

Unit V :

Semi-conductor main memory & Memory organization Memory Hierarchy, Main Memory: Semiconductor main memory, Organization of memory cell, RAM: DRAM, SRAM and ROM Chips, Memory Connection to CPU. Auxiliary memory: Disks, Read and write mechanisms, Data organization and formatting, Physical Characteristics, Disk performance parameters, Overview of optical discs, Memory Organization: Memory Interleaving, Cache memory, Cache memory principles, Mapping functions: Direct mapping, Associative mapping function,Set-Associative mapping function, Replacement Algorithms, Write policy.

Suggested Reading:

1. William Stallings, Computer Organization & Architecture, 6thdition, Pearson Education Asia

2. M.Morris Mano, Computer System Architecture,3rd edition, Pearson Education Asia

3. V.Carl Hamacher, Z.G.Vranesic, S.G.Zaky, Computer organization, McGraw Hill.

BM2201 PERSONALITY DEVELOPMENT 1

EXTERNAL: 60MARKS **L-T-P-C***
INTERNAL: 40MARKS **2-0-0-1**

Guidelines: Learning approach is based on Real time case studies with class room activities

Course Objectives:

1. To develop interpersonal skills and be an effective goal oriented team player.
2. To develop professionals with idealistic, practical and moral values.
3. To develop communication and problem solving skills.
4. To re-engineer attitude and understand its influence on behavior.
5. To enhance holistic development of students and improve their employability skills.

Course Outcomes:

After the successful completion of this course, the learner will be able to know:

1. Self analysis and self analysis techniques there by learning the various aspects of their personality.
2. SWOT Analysis, and use SWOT in their life for various opportunities.
3. Set Goals and prioritize their resources to achieve them.
4. Diversify career risk and optimize results.
5. Understand; realize the importance of team work.
6. Upgrade their interpersonal skills.
7. Overcome fear of public speaking and effective group participation.
8. How to think in a creative way and rationalization of ideas.

UNIT I-SELF ANALYSIS

SWOT Analysis, Who am I, Personality Traits, Importance of Self Confidence, Self Esteem.

UNIT II-GOALS SETTINGS

Short term , Long term goal settings, SMART concept

Diversifying Risk and Optimizing Returns

UNIT III- Team Dynamics with Interpersonal Skills

Team Dynamics, Team Work, Interpersonal Skills

Behavioral Skills GD, PI, Body Language Public Speaking, Verbal, Non Verbal Communications

UNIT IV-CREATIVITY and Rationality

Out of Box thinking, Idea Generation with creativity

Brain Storming, Effective group meetings, Rationalization of ideas and way to effective implementation

Note: Class room activities coupled with group tasks will be taken depending upon time availability

EC2801 Analog Electronic Circuits Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

1. To Design and Characterize of small signal equivalent circuits of BJT, FET/MOSFET and its frequency response.
2. To Design of multistage amplifiers, differential amplifiers and current mirrors for high input impedance.
3. To Design of positive and negative feedback and their applications.
4. To Design of Simple and Cascode current mirror circuits using BJT and MOSFET
5. To Design and test various types of oscillators
6. To Design the Power amplifier circuit and its applications

Course Outcomes:

1. An Ability to compute the parameters from the characteristics of JFET and MOSFET devices and its application
2. Ability to Design, test and evaluate BJT amplifiers in CE, CB, CC configuration and its application
3. An ability to Design and test JFET/MOSFET amplifiers and its application
4. An ability to Design and test a power amplifier and its application
5. An ability to Design and test various types of oscillators and its application
6. An ability to Design and test various types of filters and its application
7. An ability to Design and test various types of Timers and its application

LIST OF EXPERIMENTS:

1. D.C. characterization and finding ac model parameters of a BJT.
2. D.C. characterization and finding ac model parameters of a MOSFET.
3. Design of feedback amplifiers with BJT.
4. Design of amplifiers with MOSFET.
5. Design and characterization of simple current mirror circuits using BJT and MOSFET.
6. Design and characterization of cascode current mirror circuits using BJT and MOSFET.
7. Design of Common collector amplifier
8. Design of differential amplifier using BJT with resistive load.
9. Design of differential amplifier using MOSFET with active load.
10. Design of R-C and L-C oscillators (phase shift/Colpitt/Hartley).
11. Design of a tuned amplifier.
12. Design of a second order active filter (low pass/high pass/band pass)
13. Design of a timer.

EC2802 Digital Electronic Circuits Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

1. To learn differences between analog systems and digital systems.
2. To learn basic techniques for the design of digital circuits.
3. To understand fundamental concepts used in the design of digital systems.
4. To understand the concepts of various combinational and sequential circuits.
5. To learn various techniques for logic circuit reduction.

Course Outcomes:

1. Design, Analysis, Implementation and testing of logic gates and functions.
2. An ability toanalyze, implement and testing of combinational circuits.
3. Design, Analysis, Implementation and testing of flip-flops and registers.
4. An ability to analyze, implement and testing of counters.
5. Design, Analysis, Implementation of application level projects.

LIST OF EXPERIMENTS:

1. Functioning of monoshot, shift register, master slave flip flop, ALU

2. Design of a counter asynchronous and synchronous

3. I/O characteristics of a NAND gate

4. Design of a digital comparator

5. Design of a full adder circuit

6. Design of a multiplexer

7. Design of a 7-segment LED display

8. Design of an ALU.

CS2801 Computer Organization & Architecture Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

This course concentrates on the practical part of Computer Organization by using Assembly language. This course allows students to practice writing programs based on the concepts the will learn through the course by giving the students different types of problems to be solved using an emulator.

Course Objectives:

- Teach students basic principles about computer architecture, machine language, and low-level programming.
- Teach students enough assembly language to enhance their knowledge on today's most widely used microcomputer family.
- Improving students systems programming skills through programming exercises carried out by students.
- Students are expected to implement solutions to problems using the concepts they will take through the course.

Course Outcomes:

- Understand the concepts of microprocessors and internal architecture of 8086 microprocessor
- Understand the difference between High level languages and machine language.
- Design the programs to perform simple arithmetic and Logical operations
- Apply the concepts of arrays and procedures to design efficient programs

Experiments:

1. Basic Concepts
2. Assembly Language Fundamentals
3. Data Transfers, Addressing, and Arithmetic
4. Procedures
5. Conditional Processing
6. Integer Arithmetic
7. Strings and Arrays
8. 16-Bit MS-DOS Programming

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS2201 can be substituted

EC2902 Seminar - II

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **1-0-1**

Scheme of Internal Exam : 25 Marks
Credits : 1

Course Objectives:

Objective of the project seminar is to actively involve the students in preparation of the final year project with regard to following components:

- Problem definition and specification
- Literature survey, familiarity with research journals
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of graphs, bar (activity) charts and analyzing the results.
- Presentation - oral and written.

The evaluation is purely internal and will be conducted as follows:

Preliminary Report on progress of the work and viva	05 marks
Final report	05 marks
Presentation and Defence before a departmental committee consisting of Head, a senior faculty and supervisor	15 marks

Rajiv Gandhi University of Knowledge and Technology

Basar, Mudhole, Adilabad – 504107

B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

III YEAR
I SEMISTER

Code	Subject	L-T	P	C
EC3101	Analog communications	4	-	4
EC3102	RF and Microwave Engineering	4	-	4
EC3103	Digital Signal Processing	4	-	4
EC3104	VLSI Engineering	4	-	4
BM3001/4001	Managerial Economics and Financial Analysis	4	-	3
BM3101	Personality Development-II	2	-	1
EC3701	Analog communications Lab	-	3	2
EC3702	RF and Microwave Engineering Lab	-	3	2
EC3703	Digital Signal Processing Lab	-	3	2
EC3901	Seminar-III	1	-	1
	Total	**23**	**9**	**27**

EC3101 Analog Communications

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To introduce information source, basic communication channels, and some basic mathematical background for bandpass signal representation.
2. To introduce the basic components of communication system.
3. The design procedure of AM and FM transmitters and receivers.
4. To learn the random variables and random processes, needed for noise analysis.
5. Performance analysis of analog communication systems in the presence of noise, by using SNR and Figure of merit as measures of performance.

Course Outcomes:

1. Students will get awareness of communication system components like, source, transmitter, channel, receiver.
2. Students will get strong mathematical background needed for theoretical analysis of analog communication systems.
3. Students will learn how to design AM and FM transmitters and receivers.
4. Students will learn basics of analog television transmission and stereo FM broadcasting.
5. Students will learn how to analyze the performance of analog communication systems like FM, AM.

UNIT-I: INTRODUCTION

Types of information sources, communication channel, Hilbert transform Analytical representation of band pass signals

UNIT-II: MODULATION TECHNIQUES

Fundamentals of analog signals transmission, AM, SSB, DSB-SC, VSB, Ring modulator, FM, PM

UNIT – III: FEEDBACK DEMODULATORS

Phase locked loop (PLL), Frequency compressor feedback demodulation, FM receivers

UNIT – IV:RANDOM PROCESS

Review of probability theory and random process

UNIT – V:BHEHAVIOUR OF COMMUNICATION SYSTEM IN THE PRESENCE OF NOISE

Performance of AM system in noise, Noise in AM and Angle modulation system, Noise in PM and FM modulation system

TEXT BOOKS:

1. A. Bruce Carlson, & Paul B. Crilly, ―Communication Systems – An Introduction to Signals & Noise in Electrical Communication‖, McGraw-Hill International Edition, 5th Edition, 2010.

2. Sham Shanmugam, ―Digital and Analog Communication Systems‖, Wiley-India edition, 2006.

REFERENCES:

1. Simon Haykin, ―Communication Systems‖, Wiley-India edition, 3rd edition, 2010.
2. B.P. Lathi, & Zhi Ding, ―Modern Digital & Analog Communication Systems‖, Oxford University Press, International 4th edition, 2010.
3. Herbert Taub & Donald L Schilling, ―Principles of Communication Systems‖, Tata McGraw-Hill, 3rd Edition, 2009.
4. R.E. Ziemer & W.H. Tranter, ―Principles of Communication- Systems Modulation & Noise‖, Jaico Publishing House, 2001.
5. George Kennedy and Bernard Davis, ―Electronics & Communication System‖, TMH, 2004

EC3102 RF AND MICROWAVE ENGINEERING

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To prepare students to understand basic principle of microwave and its frequency bands & it's utilities.
2. To prepare students to understand different microwave components & transmission lines and analyzing different type of junctions used in microwave engineering.
3. To teach the students about various microwave sources and their characteristics.
4. To teach the students about various microwave solid-state devices and their characteristics.
5. To understand microwave filter design concepts, wave propagation and microwave applications.

Course Outcomes:

1. Become proficient with microwave measurement of power, frequency and VSWR, impedance for analysis of circuits.
2. Understand the principles of operation of waveguide, isolator attenuator etc. and obtain scattering matrix for various junctions like E-plane, H plane, Circulator, Direction Coupler.
3. Ability to analyze the working principle and characteristics of microwave sources.
4. Ability to analyze the microwave solid state devices and it's characteristics & analyze avalanche transit devices.
5. Ability to design microwave filter and analyze the microwave propagation and its applications.

UNIT-I:MICROWAVE BANDS & MEASUREMENTS

Introduction, Microwave radiation spectrum and bands, Phase variation, Transit time effect, Microwave test bench setup, measurement of power, frequency, phase, attenuation, impedance, quality factor & VSWR.

UNIT-II:MICROWAVE TRANSMISSION & COMPONENTS

Microwave Transmission Lines: Rectangular waveguide & circular waveguide. Cavity resonators, E-plane, H-plane Tee junctions and E-H plane (hybrid or Magic) Tee, Directional couplers, Faraday rotation principle,isolator, circulator.Scattering matrix-significance, formulation and properties. S-matrix for: E-plane, H-plane Tees, Magic Tee, circulator and isolator.

UNIT-III:MICROWAVE SOURCES

Microwave tubes: O-type and M-type classifications.Construction, theory of operation and applications of Two-cavity klystron and Reflex Klystron.Construction principle of operation and applications of Helix TWT and cavity magnetron (qualitative treatment).

UNIT-IV:MICROWAVE SOLID STATE DEVICES

Introduction, Transferred Electron Devices (TED's): Gunn Effect devices, domain formation, transit time Domain mode, Delayed and Quenched Domain mode, Limited space charge accumulation mode, construction of Gunn diode, typical characteristics, Gunn Diode oscillator and applications of Gunn diode. Principal of operation of: IMPATT Diode, TRAPATT Diode and BARITT Diode.

UNIT-V: STRIP LINES &MICROWAVE FILTER DESIGN

Strip lines and microwave filter design: Image parameter method & insertion loss method. Microwave propagation and applications of microwave engineering.

TEXT BOOKS:

1. Microwave devices and circuits-Samuel Y. Liao, Pearson, 3rd Edition, 2003.

2. Microwave principles-Herbert J.Reich, J.G.Skalnik, P.F.Ordung and H.L.Krauss, CBS publishers and distributors, New Delhi, 2004.

3.Microwave engineering- David M. Pozar, fourth edition, john wiley& Sons Inc. publications.

REFERENCES:

1. Foundations for microwave engineering-R.E.Collin, IEEE press, John Wiley, 2nd edition, 2002.

2. Microwave circuits and passive devices-M.L.Sisodia and G.S.Raghuvanshi,Wiley Eastern Ltd., New age International publishers Ltd., 1995.

3. Microwave engineering passive circuits-Peter A.Rizzi, PHI, 1999.

4. Electronic and Radio Engineering-F.E.Terman, McGraw-Hill, 4th Edition, 1995.

5.Microwave and Radar engineering- Dr. M. Kulakarni, Umesh publications, fifth edition, 2015

EC3103 Digital Signal Processing

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To learn DFT, FFT and convolution concepts.
2. To learn the basics of Multirate digital signal processing and its applications.
3. To get the response of linear phase systems and all pass systems.
4. To design digital IIR and FIR filters for the given specifications.
5. To learn the DSP processor architecture for the efficient implementation of digital filters.

Course outcomes:

1. Understand DFT and convolution concepts and transformations.
2. Understand and develop Multirate digital signal processing systems.
3. Get the response of linear phase systems and all pass systems.
4. Design and implement digital finite impulse response (FIR) & infinite impulse response (IIR)filters.
5. Analyze discrete-time systems in both time & transform domain and also through pole-zero placement.

UNIT-I Discrete signals and Systems:

Discrete signals and Systems in time domain, typical signals, sampling process, discrete time systems(DTS), time domain characterizations of LTI ,DTS classification of LTI, DTS , Discrete time signals in frequency domain -DTFT DFT ,computation of DFT, linear convolution using DFT Z-transform

UNIT-II:

LTI & DTS in the frequency domain transfer functions, frequency response, simple digital filters, all pass functions, complementary transfer functions, digital two pairs, sampling and reconstruction

UNIT-III:

Digital filter structures-Direct, parallel, cascade ladder and lattice for IIR, possible realizations for FIR including polyphase, all pass structures, tunable filters

UNIT-IV:

Digital filter design – IIR using impulse invariant and bilinear transformations, spectral transformations, FIR design using windowing, frequency sampling and computer aids,

UNIT-V:

Implementation considerations

TEXT BOOKS:

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 4th ed., 2007.

2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata Mcgraw Hill, 3rd edition, 2009.

3. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, 2nd ed., PHI.

REFERENCES:

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.

2. A Text book on Digital Signal processing – R S Kaler, M Kulkarni,, Umesh Gupta, I K International Publisthing House Pvt. Ltd.

3. Digital signal processing: M H Hayes, Schaum‘s outlines, TATA Mc-Graw Hill, 2007.

EC3104 VLSI Engineering

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To study the MOS transistors with their characteristics succeeded by the fabrication process.
2. Making aware of VLSI design flow and gaining knowledge on protocols required to obtain the digital logic layout designs.
3. Understanding various subsystem design concepts by realizing Circuits design in terms of System design.
4. Acquiring the knowledge in basic concepts of VHDL and its abstraction levels followed by simulation and synthesis.
5. To understand the need for testing a chip by applying their Engineering skills in VLSI design to the challenges in industry.

Course Outcomes:

1. Students will be Analyzed with various processing steps involved in IC on monolithic devices followed by understanding MOSFETS electrical properties.
2. Applying the knowledge of layout, stick diagrams, static and switching characteristics of inverters by CMOS technology for designing a sequential circuit.
3. Students will be good at Realizing CMOS as a switch and its technology for designing a combinational circuit by implementing it using transmission gate/PLD's.
4. Students will be knowing the ability to identify, formulate, and analyze by creating an ability to use the techniques, skills and modern EDA tools necessary for design and test of VLSI circuits by keeping aware of contemporary issues.
5. Students will be good at designing VLSI systems by keeping a view on the design for testability concepts.

UNIT I: INTRODUCTION

Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &BiCMOS technologies-Oxidation, Lithography, Diffusion, Ion implantation, Metallisation, Encapsulation, Probe testing, Integrated Resistors and Capacitors. Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, figure of merit o; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT II: VLSI CIRCUIT DESIGN PROCESSES

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2 m CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS

Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT III :GATE LEVEL DESIGN

Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Basic circuit concepts, Sheet Resistance RS and its concept to MOS, Area Capacitance Units, Calculations – - Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out,Choice of layersSUBSYSTEM DESIGN : Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators,Comparators, Zero/One Detectors, Counters, High Density Memory Elements.

UNIT IV :SEMICONDUCTOR INTEGRATED CIRCUIT DESIGN

PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach. VHDL SYNTHESIS : VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools, Test Principles.

UNIT V:CMOS TESTING

CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chiplevel Test Techniques, System-level Test Techniques, Layout Design for improved Testability.

TEXTBOOKS :

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, EshraghianDougles and A. Pucknell, PHI, 2005 Edition.
2. Principles of CMOS VLSI Design – Weste and Eshraghian, Pearson Education, 1999.

REFERENCES :

1. Chip Design for Submicron VLSI: CMOS Layout & Simulation, – John P. Uyemura, Thomson Learning.
2. Introduction to VLSI Circuits and Systems – John .P. Uyemura, JohnWiley, 2003.
3. Digital Integrated Circuits – John M. Rabaey, PHI, EEE, 1997.
4. Modern VLSI Design – Wayne Wolf, Pearson Education, 3rd Edition, 1997.
5. VLSI Technology – S.M. SZE, 2nd Edition, TMH, 2003.

BM3001/4001 Managerial Economics and Financial Analysis

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-3**

Course Objective:

- Enable the students to learn managerial economics principles applied in industries and equip them to handle the tasks in their career by making a real sense of what is happening economically in the organization.
- The course describes the Nature and Scope of Managerial Economics. It gives complete study on the demand and elasticity of demand and methods of demand forecasting.
- It provides a detailed structure on the pricing strategies and shows clear picture methods and sources of raising finance.
- It gives clear cut information of preparing final accounts and capital Budgeting techniques.

Course Outcome:

After the successful completion of this course, the learner will be able to know:

1. The dynamic game of demand and supply, and how the trinity of Economics i.e. Demand, Supply and Scarcity make the things move around the globe.
2. Principles of Microeconomics applied to industries.
3. Concept of forecasting and applying forecasting techniques to address the challenges and opportunities in the organization they work.
4. Cost and Production analysis, Break-Even analysis, Opportunity Cost, how to optimize organizational resources and how to minimize cost and maximize production, revenue and profit
5. Different pricing structure and discount mechanism suitable for business firms.
6. Market structure and how to exploit market structure for optimizing the benefits of organization.
7. Capital requirements and sources of capital.

UNIT I: Introduction to Managerial Economics:

Definition, Nature and Scope of Managerial Economics-Demand Analysis: Demand Determinants, Law of Demand and its exceptions. Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting.

UNIT II: Theory of Production and Cost Analysis:

Production Function - Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs. Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts, Opportunity cost. Fixed vs. Variable costs, Explicit costs Vs. Implicit costs. Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)- Managerial Significance and limitations of BEA.

UNIT III: Markets & Pricing Policies:

Market structures: Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. Objectives and Policies of Pricing- Methods of Pricing: Cost Plus Pricing. Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing.

UNIT IV: Introduction to Financial Accounting: Introduction to Financial Accounting: Double entry Book Keeping, Journal, Ledger, Trail Balance and Final Accounts (Trading account, Profit and Loss Account and Balance sheet with simple adjustments).

UNIT V: Capital and Capital Budgeting:

Capital and Capital Budgeting: Capital and its significance. Types of Capital. Estimation of Fixed and Working capital requirements. Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals. Methods of Capital Budgeting: Payback Method. Accounting Rate of Return (ARR) and Net Present Value Method, Internal Rate of Return (IRR).

Reference Books:

1. Aryasri: Managerial Economics and Financial Analysis, TMH,2009.
2. Varshney & Maheswari : Managerial Economics, Sulthan Chand,2009.
3. Raghunatha Reddy & Narasimhachary: Managerial Economics& Financial Analysis, Scitech. 2009.
4. V.Rajasekarn & R.Lalitha. Financial Accounting, Pearson Education. New Delhi. 2010
5. Suma Damodaran, Managerial Economics, Oxford University Press. 2009.

BM3101 PERSONALITY DEVELOPMENT –I I 2-0-1

Guidelines: Learning approach is based on Real time case studies with class room activities

Course Objectives:

1. To develop interpersonal skills and be an effective goal oriented team player.
2. To develop professionals with idealistic, practical and moral values.
3. To develop communication and problem solving skills.
4. To re-engineer attitude and understand its influence on behavior.
5. To enhance holistic development of students and improve their employability skills.

Course Outcomes:

After the successful completion of this course, the learner will be able to know:

1. Students will bring out optimistic aspects of their personality whereas suppress pessimistic one.
2. Internal and External motivating factors to keep themselves motivated in testing times.
3. Learn different leadership styles and choose one which suits them.
4. Communicate effectively and can act as change agent in the fast moving dynamic world.
5. Would identify the crisis and problems, and be able to address them through suitable channel.

.UNIT I-ATTITUDE

Factors influencing attitude, Challenges and lessons from Attitude, Etiquette and Confidence.

UNIT II-MOTIVATION

Motivation Theories, Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

Maslow's Motivation Theory, Herzberg theory, Hygiene theory, XY theory.

UNIT III-LEADERSHIP

Leadership Styles, Skills for a good Leader, Assessment of Leadership Skills.

UNIT IV- Communication Management, Change Management, Crisis Management Meaning, Types of communication, Barriers to effective communication, using communication skills to manage conflicts. Change Management: Internal, External parameters, Business communication. e-mail writing, Presentations, Report writing , Letters etc…Feedback System

Class room activities coupled with group tasks will be taken depending upon time availability

EC3701 Analog Communications Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

1. To design and implement the modulation and demodulation circuits used in analog communication systems.
2. To get the feel of frequency division multiplexing.

Course Outcomes:

After completing this lab, students will learn:

1. How to design basic analog communication system components like amplitude modulators and demodulators, filters, AGC and understanding frequency modulation and demodulation and carrier recovery circuits.
2. Frequency division multiplexing and de-multiplexing of analog signals.

LIST OF EXPERIMENTS:

1. Amplitude Modulation and Demodulation
2. Frequency Modulation and Demodulation
3. Six diode sampler setup for DAM
4. Single Side band setup
5. Double side band setup
6. Automatic gain control setup
7. Mixer setup
8. Carrier recovery setup
9. Pulse width modulation setup
10. Pulse frequency modulation setup
11. Frequency modulation (VCO & PLL) setup
12. Design and implementation of AM with fc = 1MHz and fm = 1KHz
13. Design and implementation of frequency multiplier circuit
14. Design and implementation of carrier recovery circuit
15. Design and implementation of DSB-SC
16. Design and implementation of mixer
17. Design and implementation of PWM, PFM.

EC3702 RF and Microwave Engineering Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

1. The goal of this course is to introduce students to the concepts and principles of the advanced microwave engineering.
2. To study the characteristics of RKO and Gunn oscillator.
3. Measurement of frequency and wavelengths would be learnt by the student.
4. VSWR various TEES, MHD and Circulator would be understood by the student.
5. Radiation pattern would be learnt by the student for horn antenna.
6. To study the usage of hand held Vector Network Analyzer, Spectrum Analyzer, Advanced Microwave Integrated Circuits.

Course Outcomes:

1. Gain knowledge and understanding of microwave analysis methods.
2. Be able to apply analysis methods to determine circuit properties of passive/active microwave devices.
3. Analyze the characteristics of RKO and Gunn oscillator.
4. Measure the frequency and guided wavelength.
5. Estimate the VSWR for various loads and S-Matrix for various microwave devices.
6. Obtain the horn antenna radiation pattern.

LIST OF EXPERIMENTS:

1. Familiarization with waveguide components and usage of VSWR meter, slotted line, etc.

2. Measurement of guide wavelength and determination of frequency.

3. Measurement of detector constant _.

4. Measurement of directional coupler such as coupling, directivity, etc.

5. Measurement of radiation characteristics of horn antenna such as radiation patterns and gain.

6. Gunn oscillator measurements such as power versus frequency, I-V characteristics.

7. Klystron characteristics measurement.

8. Impedance measurement and attenuation measurement.

9. Measurement of S-parameters of waveguide T-junction.

10. Measurement of dielectric constant of a sample.

EC3703 Digital Signal Processing Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

1. Perform basic manipulation (Convolution, DFT, IDFT) of two signals using CCS.
2. Estimate power spectral densities using a variety of techniques using CCS.
3. Study the operation and performs of TMS320C64XX/TMS320C67XX fixed/floating point processor.
4. Usage of CODEC which is onboard of TMS320C64XX/TMS320C67XX fixed/floating point processor.
5. Configure TMS320C64XX/TMS320C67XX fixed/floating point processor as a function generator using its CODEC and its I/O

Course Outcomes:

1. Students will be familiarized with CCS kit with analog I/O and other peripherals.
2. Students have implemented basic manipulations (Convolution, DFT, IDFT) of two signals using CCS.
3. Students have used the DSK6713/6416 without CODEC as a Traffic light controller and with CODEC as a signal generator.
4. Students have designed and implementd
5. Students have implemented digital filters (FIR and IIR) using TMS320C6713 floating point processor

LIST OF EXPERIMENTS:

1. Familiarization with CCS kit with analog I/O and other peripherals.
2. FIR filter design
3. IIR filter design
4. Implementation for real time operation, testing with speech signal.
5. Use of MATLAB for filtering (FIR/IIR)
6. Use of SIMULINK
7. Design of a temperature control system including acquisition of signals.

EC3901 Seminar - III

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **1-0-1**

Scheme of Internal Exam : 25 Marks
Credits : 1

Course Objectives:

Objective of the project seminar is to actively involve the students in preparation of the final year project with regard to following components:

- Problem definition and specification
- Literature survey, familiarity with research journals
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of graphs, bar (activity) charts and analyzing the results.
- Presentation - oral and written.

The evaluation is purely internal and will be conducted as follows:

Preliminary Report on progress of the work and viva	05 marks
Final report	05 marks
Presentation and Defence before a departmental committee consisting of Head, a senior faculty and supervisor	15 marks

Rajiv Gandhi University of Knowledge Technologies

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B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

III YEAR II SEMISTER

Code	Subject	L-T	P	C
EC3201	Digital communications	4	-	4
EC3202	Digital System design	4	-	4
EC3203	Microprocessors and Interfacing	4	-	4
CS3001	Object Oriented Programming	4	-	4
CS3204	Computer Networks	4	-	4
HS3201	Soft Skills-II	2	-	1
EC3801	Digital communications Lab	-	3	2
EC3802	Digital System design Lab	-	3	2
CS3601	Object Oriented Programming Lab	-	3	2
EC3000	Comprehensive Viva-I	1	-	1
EC3902	Seminar-IV	1	-	1
	Total	**22**	**9**	**28**

EC3201 Digital Communications

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To introduce the components of Digital communication systems.
2. To learn various digital pulse modulation techniques like PCM, DPCM,DM.
3. To learn digital carrier modulation techniques like FSK, M-ary PSK, M- ary QAM. And probability of error calculations in the presence of noise.
4. To revise the concept of random variables and random processes needed for the analysis of digital communication systems.
5. To learn the different source coding and channel coding schemes.
6. To learn the need for spreading a code and various spread spectrum techniques.

Course Outcomes:

At the end of this course Students will learn:

1. The basic building blocks of digital communication systems.
2. Analysis of Digital pulse modulation techniques.
3. Probability of error analysis for digital carrier modulation techniques like FSK, M-ary PSK, M- ary QAM in the presence of AWGN.
4. Basic Information theory concepts.
5. Multiple access techniques like TDMA, FDMA, CDMA.

UNIT-I: **Introduction**

Introduction to digital signals and systems, spectra and bandwidth. A-Dconversion and quantization. PCM, Log-PCM, DPCM, DM, ADPCM, and LPC for speech signals, timedivision multiplexing, digital hierarchy and standards, basebandtransmission.

UNIT-II: **Modulation Techniques**

Digital modulation and demodulation: binary and M-aryASK, FSK, GMSK, PSK, DPSK and their spectra, circuits and systems,carrier recovery, performance of digital modulation systems, dataregenerators and clock recovery, inter-symbol interference, equalizers.

UNIT-I**II: Random Processes**

Detection of binary signals in presence of Gaussian noise, Maximumlikelihood receiver, Matched filter, Realization of matched filter, Errorprobability.

UNIT-IV: Information theory:

Elements of information theory, Source coding theorem, Discrete memory less channels, Channel capacity, Channel coding theorem,Information capacity theorem.

UNIT-V:Spread spectrum Techniques:

Pseudo noise sequences, A Notion of spread spectrum, DS-Spread Spectrum, Frequency hopping, synchronization, Jamming.

TEXT BOOKS:

1. A. Bruce Carlson, & Paul B. Crilly, ―Communication Systems – An Introduction to Signals & Noise in Electrical Communication‖, McGraw-Hill International Edition, 5th Edition, 2010.
2. Sam Shanmugam, ―Digital and Analog Communication Systems‖, John Wiley, 2005.

REFERENCES:

1. Bernard Sklar, ―Digital Communications‖, Prentice-Hall PTR, 2nd edition, 2001.
2. Simon Haykin, ―Communication Systems‖, Wiley-India edition, 3rd edition, 2010.
3. B.P. Lathi, & Zhi Ding, ―Modern Digital & Analog Communication Systems‖, Oxford University Press, International 4th edition, 2010.
4. Herbert Taub & Donald L Schilling, ―Principles of Communication Systems‖, Tata McGraw-Hill, 3rd Edition, 2009

EC3202 Digital System Design

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. Understands the design methodologies for combinational and sequential logic circuits.
2. Systems design using MSI and LSI Implementations.
3. Basic knowledge of Verilog HDL to design digital systems.
4. System design using ASM charts and Microprogrammed ASM charts.
5. Simulation and Synthesis for digital systems using the Verilog HDL language.

Course Outcomes:

1. Able to understand programmable logic designs and its implementation for the digital systems.
2. Able to analysis with all timing parameters for the digital systems
3. Able to write Verilog HDL code for advanced digital systems.
4. Able to design advanced digital system using ASM Chart.

Able to verify the design using simulation and synthesis tools

UNIT-I:INTRODUCTION

Introduction to VLSI design, Combinational circuit design, PLD, PAL, Review of Flip Flops, Timing Diagrams

UNIT-II:RTL CODING

Sequential circuit design, MSI implementation of sequential circuits, Design of sequential circuits using one hot controller, Verilog modeling of combinational circuits, Modeling of verilog sequential circuits, Modeling of verilog sequential circuits, RTL coding guidelines, Coding realization – complete realization, Coding realization – complete realization, Writing a test bench

UNIT-III:ASM CHARTS

System design using ASM Chart (BUS ARBITOR), Traffic Light Controller, Examples of System design using ASM Chart, DICE GAME, Micro programmer design

UNIT-IV:SIMULATION USING MODELSIM

Design flow of VLSI circuits, Simulation of combinational circuits, Simulation of combinational circuits, Analysis of waveforms using Modelsim, Analysis of waveforms using Modelsim, Modelsim simulation tool

UNIT-V:SYNTHESIS AND SYNPLIFY TOOLS

Synthesis tool, Synplify tool – schematic circuit diagram view, Technology view using Synplify tool, Synopsys tool and parallel cases, Xilinx place and route tool

REFERENCES

1. Jon F Wakerly, Digital Design: Principles and Practices, Prentice Hall.
2. Kevin Skahil, VHDL for programmable logic, Addison Wesley.
3. Zainalabedin Navabi, VHDL, analysis and modeling of digital systems, McGraw-Hill.
4. PLD, FPGA data sheets.

EC3203 Microprocessors & Interfacing

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

1. To examine the 8085 and 8086 microprocessors in terms of hardware/software and functions of signals generated/accepted.
2. To understand the 8086 architecture and its programming.
3. To understand the various input-output interfaces.
4. To understand memory interfacing, interrupts of 8086 and DMA controller.
5. To explore various communication interfaces.

Course Outcomes:

1. Able to differentiate architecture of 8085 and 8086 microprocessors.
2. Write an assembly language programming for different applications in 8086.
3. Able to interface peripherals like keyboard, display, ADC and DAC etc. to 8086.
4. Design an 8086 based microcomputer by interfacing memory and DMA.
5. Able to communicate through RS-232 and USART.
6.

UNIT I: 8085 and 8086 Architecture;

Introduction to 8085 Microprocessor, 8086 Architecture-Functional diagram. Register Organization, Memory Segmentation. Programming Mode!. Memory addresses. Physical memory organization. Architecture of 8086, signal descriptions of 8086- common function signals. Minimum and Maximum mode signals. Timing diagrams. Interrupts of 8086.

UNIT II: Instruction Set and Assembly Language Programming of 8086:

Instruction formats, addressing modes, instruction set, assembler directives, macros, simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

UNIT III: I/O Interface:

8255 PPI various modes of operation and interfacing to 8086. Interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter.

UNIT IV: Interfacing with advanced devices:

Memory interfacing to 8086, Interrupt structure of 8086, Vector interrupt table, Interrupt service

routine. Introduction to DOS and BIOS interrupts, Interfacing Interrupt Controller 8259 DMA Controller 8257 to 8086.

UNIT V: Communication Interface:
Serial communication standards, Serial data transfer schemes. 8251 USART architecture and interfacing. RS- 232. IEEE-4-88, Prototyping and trouble shooting.

TEXT BOOKS:

1. D. U. Hall. Micro processors and Interfacing, TMGH. 2'1 edition 2006.
2. Advanced Microprocessors and Peripherals - A. K. Ray and K.M. Bhurchandani, TMH, 2nd edition 2006.

REFERENCE BOOKS:

1. Micro Computer System 8086/8088 Family Architecture. Programming and Design - By Liu and GA Gibson, PHI, 2nd Ed.
2. The 8088 and 8086 Micro Processors – PHI, 4th Edition, 2003

CS3001 Object Oriented Programming though Java

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To be able to differentiate between structures oriented programming and object oriented programming.
- To be able to use object oriented programming language like Java and associated libraries to develop object oriented programs.
- To Able to understand and apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using Java language.
- To be able to apply concepts of operator overloading, constructors and destructors.
- To be able to apply exception handling and use built-in classes

Course Outcomes:

CO 1: Learning principals of object oriented programming paradigm in Java including classes, Objects, Methods, Abstraction, encapsulation, inheritance and polymorphism.

CO 2: Understand fundamentals of programming such as variables, conditional and iterative execution, methods, packages & interfaces etc.

CO 3: Learning the concept of inheritance to create new classes from existing one & Design the classes needed given a problem specification;

CO 4: Learning how to detect exceptions and to handle strings & Implement the designed classes using the object oriented programming language

CO 5: Learn how to test, verify, and debug object-oriented programs; and Learning about multithreading and multitasking.

CO 6: Creating and Demonstrating Applications using the concept of OOPS, event handling, JDBC Connectivity used in GUI with Java.

UNIT-1:

Introduction to OOPS: Paradigms of Programming Languages, Basic concepts of Object Oriented Programming, Differences between Procedure Oriented Programming and Object Oriented Programming, Objects and Classes, Data abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic binding, Message communication, Benefits of OOP , Application of

OOPs.

Java : History, Java features, Java Environment, JDK, API.

Introduction to Java : Types of java program, Creating and Executing a Java program, Java Tokens, Keywords, Character set, Identifiers, Literals, Separator, Java Virtual Machine (JVM), Command Line Arguments, Comments in Java program.

UNIT -2:

Elements: Constants, Variables, Data types, Scope of variables, Type casting, Operators: Arithmetic, Logical, Bit wise operator, Increment and Decrement, Relational, Assignment, Conditional, Special operator, Expressions – Evaluation of Expressions
Decision making and Branching: Simple if statement, if, else statement, Nesting if, else, else if Ladder, switch statement, Decision making and Looping: While loop, do, While loop, for loop, break, labelled loop, continue Statement.-, Simple programs

Arrays: One Dimensional Array, Creating an array, Array processing, Multidimensional Array, Vectors, Wrapper classes, Simple programs

UNIT-3:

Strings: String Array, String Methods, String Buffer Class, Simple programs

Class and objects: Defining a class, Methods, Creating objects, Accessing class members, Constructors, Method overloading, Static members, Nesting of Methods, this keyword, Command line input, Simple programs
Inheritance: Defining a subclass, Deriving a sub class, Single Inheritance, Multilevel Inheritance, Hierarchical Inheritance, Overriding methods, Final variables and methods, Final classes, Finalizer methods, Abstract methods and classes, Visibility Control: Public access, Private access, friend, protected. Interfaces: Multiple Inheritance, Defining interface, Extending interface, Implementing Interface, Accessing interface variables, Simple programs

UNIT- 4:

Packages: Java API Packages, System Packages, Naming Conventions, Creating & Accessing a Package, Adding Class to a Package, Hiding Classes, Programs
Applets: Introduction, Applet Life cycle, Creating & Executing an Applet, Applet tags in HTML, Parameter tag, Aligning the display, Graphics Class: Drawing and filling lines, Rectangles, Polygon, Circles, Arcs, Line Graphs, Drawing Bar charts, Programs
AWT Components and Even Handlers: Abstract window tool kit, Event Handlers, Event Listeners, AWT Controls and Event Handling: Labels, TextComponent, ActionEvent, Buttons, CheckBoxes, ItemEvent, Choice, Scrollbars, Layout Managers- Input Events, Menus, Programs

UNIT-5:

Exception Handling: Limitations of Error handling, Advantages of Exception Handling, Types of Errors, Basics of Exception Handling, try blocks, throwing an exception, catching an exception, finally statement

Multithreading: Creating Threads, Life of a Thread, Defining & Running Thread, Thread Methods, Thread Priority, Synchronization, Implementing runnable interface, Thread Scheduling.

I/O Streams: File, Streams, Advantages, The stream classes, Byte streams, Character streams.

JDBC, ODBC Drivers, JDBC ODBC Bridges, Seven Steps to JDBC, Importing java SQL Packages, Loading & Registering the drivers, Establishing connection. Creating &Executing the statement.

Suggested References:

1. Programming with Java - E. Balagurusamy
2. Java the complete reference, 7th editon, Herbert schildt, TMH.
3. Understanding OOP with Java, updated edition, T. Budd, pearsoneduction.
4. Object oriented Programming in Java - Dr. G.Thampi
5. Let us Java – Yashavant Kanetkar - BPB Publications, New Delhi - First Edition 2012

An Introduction to Oops with Java - C Thomas WU - TataMc-Graw Hill, 4th Edition

CS3204 Computer Networks

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To introduce UDP and TCP Models.

Course Outcomes:

- Understand computer network basics, network architecture, TCP/IP and OSI reference models.
- Identify and understand various techniques and modes of transmission.
- Describe data link protocols, multi-channel access protocols and IEEE 802 standards for LAN.
- Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme.
- Discuss the elements and protocols of transport layer.
- Analyze and understand the various protocols such as FTP, HTTP, Telnet, DNS, SSH, and SMTP.

UNIT - I:

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparioson of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

Data Link Layer: design issues, CRC codes, Elementary Data Link Layer Protocols, sliding window protocol.

UNIT - II:

Multi Access Protocols: ALOHA, CSMA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.

UNIT-III:

Network Layer: Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing alhorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Control to Infinity Problem, Hierarchical Routing, Congestion control algorithms, admission control.

UNIT-IV:

Internetworking: Tunneling, Internetwork Routing, Packet fragmentation, IPv4, IPv6 Protocol, IP addresses, CIDR, IMCP, ARP, RARP, DHCP.

Transport Layer: Services provided to the upper layers elements of transport protocol-addressing connection establishment, connection release, Connection Release, Crash Recovery.

UNIT-V:

The Internet Transport Protocols: UDP-RPC, Real Time Transport Protocols, The Internet Transport Protocols- Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Connection Management Modeling, The TCP Sliding Window, The TCP Congestion Control, The future of TCP.

Application Layer: Introduction, providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH

Suggested References:

1. Data Communications and Networking - Behrouz A. Forouzan, Fifth Edition TMH, 2013.
2. Computer Networks - Andrew S Tanenbaum, 4th Edition, Pearson Education.
3. An Engineering Approach to Computer Networks - S. Keshav, 2nd Edition, Pearson Edication.
4. Understanding communications and Networks, 3rd Edition, W. A. Shay, Cengage Learning.
5. Introduction to Computer Networks and Cyber Security, Chwan-Hwa (John) Wu, J. David Irwin, CRC Press.
6. Computer Networks, L. L. Peterson and B. S. Davie, 4th edition, ELSEVIER.
7. Computer Networking: A Top-Down Approach Featuring the Internet, James F. Kurose, K. W. Ross, 3rd Edition, Pearson Education.

HS3201 Soft Skills II

Externals: 60 Marks **L-T-P-C***

Internals: 40 Marks **2-0-0-1**

Course Objectives:

1. To enable students speak effectively in formal and informal situations
2. To equip the students with necessary writing skills in order to face the corporate world
3. To strengthen the writing skills of the students and help them in documentation
4. To enable students sharpen their communication skills towards writing a persuasive resume and effective job application letters
5. To equip students with pre-presentation steps, to understand the structure of a good presentation, and devise various techniques for delivering a successful presentation
6. To make students understand the importance of team work and group presentations and group discussions

Course Outcomes:

Students will be able:

1. communicate effectively in formal and informal situations
2. understand the structure and mechanics of writing resumes, reports, documents and e-mails
3. present effectively in academic and professional contexts
4. develop communication in writing for a variety of purposes
5. identify areas of evaluation in Group Discussions conducted by organizations as part of the selection procedure
6. overcome stage fear and tackle questions

UNIT-I

Activities on Fundamentals of Inter-personal Communication

Starting a conversation - responding appropriately and relevantly - using the right body language-Role Play in different situations & Discourse Skills using visuals.

UNIT-II

Activities on Reading Comprehension

General Vs Local comprehension- reading for facts- guessing meanings from context- scanning-skimming- inferring meaning- critical reading - effective googling.

UNIT-III

Activities on Writing Skills

Structure and presentation of different types of writing- Resume writing/ e-correspondence/ Technical report writing- planning for writing - improving one's writing.

UNIT-IV

Activities on Presentation Skills

Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations

UNIT-V

Activities on Group Discussion and Interview Skills - Dynamics of group discussion- intervention-summarizing-modulation of voice-body language-relevance-fluency and organization of ideas and rubrics for evaluation- Concept and process-pre-interview planning-opening strategies-answering strategies-interview through tele-conference & video-conferencing - Mock Interviews.

Suggested References:

1. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.

2. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.

3. Technical Communication by Paul V. Anderson , 2007. Cengage Learning pvt. Ltd. New Delhi.

4. Business and Professional Communication: Keys for Workplace Excellence, Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications, 2011.

5. The Basics of Communication: A Relational Prespective, Stev Duck & David T. Mc Mahan. Sage South Asia Edition. Sage Publications, 2012.

6. English Vocabulary in Use series, Cambridge University Press 2008.

7. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley, 2012. Cengage Learning.

9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.

10. Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.

EC3801 Digital Communications Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objectives:

1. To design and implement the analog to digital conversion circuit.
2. To design and implement the modulation and demodulation circuits used in digital communication systems.
3. To learn about multiplexing and de-multiplexing of data.

Course Outcomes:

After completing this lab, students will learn:

1. How to design basic digital communication system components like PCM, ASK, PSK, BPSK, QPSK modulators and demodulators, error correction circuits.
2. Multiplexing and de-multiplexing of digital signals.

LIST OF EXPERIMENTS:

2. Verification of sampling theorem.
3. Quantizer design.
4. PCM implementation.
5. PN sequence generation circuit.
6. ASK modulator and demodulator circuits.
7. FSK modulator and demodulator circuits.
8. BPSK modulator and demodulator circuits.
9. QPSK modulator and demodulator circuits.
10. Multiplexing and de-multiplexing of the digital signals.
11. Line coder setup.
12. Optical fiber communication setup.
13. Decoding of corrupted repetition code.

EC3802 Digital System Design Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-3-2**

Course Objective:

1. Familiarize with VLSI CAD tools like Xilinx14.4 and Mentor Graphics tool.
2. Gives Basic concepts of Verilog HDL code to write a code for digital circuits.
3. To have hands on experience to design digital circuits, simulate and synthesis the design with Xilinx 14.4 VLSI CAD tool with timing diagrams and RTL diagrams.
4. To have hands on experience for transistor level design and simulate it with transient and dc analysis using mentor Graphics tool.
5. FPGA implantation of the Verilog code written in the VLSI CAD tool.

Course Outcomes:

1. Able to write a Verilog HDL code for the digital systems.
2. Able to use the VLSI CAD tools to design digital systems and get synthesis the design to get RTL level diagram.
3. Able to simulate the digital system to check the functionality with the timing diagrams.
4. Able to do transient and dc analysis of the CMOS Inverter, Logic gates and analog circuits.
5. Able to do FPGA Implementation of the combinational and sequential circuits.

LIST OF EXPERIMENTS:

1. Familiarization with Xilinx14.4 tool.
2. Simulate and Synthesis of all basis gates.
3. Simulate and synthesis of multiplexers, decoders and code converters.
4. Simulate and synthesis of all flipflops.
5. Simulate and synthesis of Universal shift register.
6. Simulate and synthesis of the binary counter, MOD counters.
7. FPGA implementation of basic gates and binary counter.
8. Familiarization of the mentor Graphic tool for transistor level design.
9. Design and synthesis of a CMOS amplifier
10. Transient and DC analysis of CMOS inverter.
11. Transient, DC and power analysis of the NAND and NOR gates using CMOS implementation.
12. Transient, DC and power analysis of the XOR gates using NAND gates cells.
13. Transient, DC and power analysis of the 2x1 MUX using NAND gates cells.

CS3601 OBJECTED ORIENTED PROGRAMMING LAB

Externals: 60Marks **L-T-P-C**

Internals: 40Marks **0-0-3-2**

Course Objectives:

- To be able to apply an object oriented approach to programming and identify potential benefits of object-oriented programming over other approaches.
- To be able to reuse the code and write the classes which work like built-in types.
- To be able to design applications which are easier to debug, maintain and extend.
- To be able to apply object-oriented concepts in real world applications.

Course Outcomes:

- Be able to analyze and design a computer program to solve real world problems based on object-oriented principles.
- Be able to write simple GUI interfaces for a computer program to interact with users, and to understand the event-based GUI handling principles.
- A competence to design, write, compile, test and execute straightforward programs using a high level language.
- Demonstrate the ability to employ various types of selection constructs in a Java program. Be able to employ a hierarchy of Java classes to provide a solution to a given set of requirements.
- Become familiar with the fundamentals and to acquire programming skills in the Java language.

Experiments:

1. A program to illustrate the concept of class with constructors, methods and overloading.
2. A program to illustrate the concept of inheritance and dynamic polymorphism.
3. A program to illustrate the usage of abstract class.
4. A program to illustrate multithreading.
5. A program to illustrate thread synchronization.
6. A program to illustrate Exception handling.
7. A program to illustrate user-defined Exceptions
8. A program to demonstrate use of User-defined Packages.
9. A program using String Tokenize.
10. A program using Linked list class
11. A program using Tree Set class
12. A program using Hash Set and Iterator classes
13. A program using Map classes.
14. A program using Enumeration and Comparator interfaces.
15. A program using File and Filename Filter

16. A program to illustrate the usage of Byte and Character I/O streams.
17. A program to illustrate the usage of Serialization.
18. Program using Data class.\
19. An application involving GUI with different controls, menus and event handling.
20. A program to implement an applet.

For the detailed list of programs refer the lab manual.

Note: Any experiment according to the syllabus of CS3001 can be substituted

EC3000 Comprehensive Viva-I

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **1-0-1**

EC3902 Seminar - IV

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **1-0-1**

Scheme of Internal Exam : 25 Marks
Credits : 1

Course Objectives:
Objective of the project seminar is to actively involve the students in preparation of the final year project with regard to following components:

- Problem definition and specification
- Literature survey, familiarity with research journals
- Broad knowledge of available techniques to solve a particular problem.
- Planning of the work, preparation of graphs, bar (activity) charts and analyzing the results.
- Presentation - oral and written.

The evaluation is purely internal and will be conducted as follows:

Preliminary Report on progress of the work and viva	05 marks
Final report	05 marks
Presentation and Defence before a departmental committee consisting of Head, a senior faculty and supervisor	15 marks

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B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR I SEMISTER

Code	Subject	L-T	P	C
EC3900	Internship			6
EC44XX	Elective-I	4	-	3
EC44XX	Elective-II	4	-	3
EC44XX	Elective-III	4	-	3
EC44XX	Elective-IV	4	-	3
	Free Elective-I	4	-	3
EC4701	Microprocessor and microcontroller Lab	-	3	2
	Total	**20**	**6**	**23**

List of Free Electives:

Elective-I	EC4401	Wireless Communications
Elective-I	EC4402	Coding Theory
Elective-I	EC4403	Satellite Communications
Elective-I	EC4404	Optical Communications
Elective-I	EC4405	Radar Systems
Elective-II	EC4411	Real Time Operating Systems
Elective-II	EC4412	IoT and Applications
Elective-II	EC4413	Embedded Systems
Elective-II	EC4414	Detection and estimation theory
Elective-III	EC4421	Analog VLSI and Mixed Signal Design
Elective-III	EC4422	Analog IC Design
Elective-III	EC4423	CAD of VLSI circuits
Elective-III	EC4424	RF Integrated Circuits
Elective-III	EC4425	Adhoc Wireless Sensor Networks
Elective-IV	EC4431	Digital Image Processing
Elective-IV	EC4432	Multimedia Communication
Elective-IV	EC4433	DSP Processors Architecture
Elective-IV	EC4434	Antennas and Wave Propagation

EC4401 Wireless Communications

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course objectives:

- To provide the students with the fundamental theoretical and practical concepts of wireless communication
- To equip the students with various kinds of wireless networks and its operations.
- To prepare the students to understand the concept of frequency reuse and be able to apply it in the design of mobile cellular system
- To prepare the students to understand various multiple access techniques that are used in wireless communications
- To train the students to understand the basic concepts of OFDM and MIMO.

Course outcomes:

- On successful completion of this course, the students should be able to:

- Select appropriate value of C/I to design the Antenna system
- Analyze the characteristics of different setups for the wireless communication using new models for the coverage improvement.
- Select different technologies to solve numerical problems using multiple access technique.
- Demonstrate the technical aspects of diversity for wireless communication.
- Understand the basic PAPR problem in OFDM and understanding basic concepts in SIMO.

UNIT - I

Basic Cellular system and its operation: frequency reuse, channel assignment strategies, Handoffprocess, factors influencing handoffs, handoffs in different Generations, Interference and system capacity, Crosstalk, Enhancing capacity and cell coverage, Trunked radio system, grade of service as per Erlang's B system.

UNIT – II

Propagation models: Free space propagation model, three basic propagation mechanisms, practical linkbudget design using path loss models, outdoor propagation models: Ground reflection (2-ray) Model, log normal shadowing, Okumura model, Hata model and indoor propagation model. Rayleigh fading, BER in Rayleigh fading channel with BPSK transmission,doppler spread, rms delay spread, Coherence time and Coherence bandwidth of wireless channel.

UNIT – III

Basic equalizers: LS, MMSE estimators for channel, Multiple Access Techniques: FDMA, TDMA, CDMA, RAKE receiver, SDMA.

UNIT – IV

SIMO: Diversity, SIMO (multiple receive antennas) model, maximal ratio combining (MRC) receiver, BER with MRC (high SNR approximation), diversity order.

UNIT – V

OFDM: Multicarrier basics, OFDM transmitter and receiver blocks, cyclic prefix in OFDM, PAPR problem in OFDM, SC-FDMA transmitter and receiver blocks.

Text Books:

Theodore.S. Rappaport, "Wireless Communications: Principles and Practice", 2/e, Pearson Education, 2010

Aditya K Jagannatham, "Principles of Modern Wireless Communication Systems", Mc-Graw Hill

Suggested Reading:

David Tse and Pramod Viswanath, "Fundamentals of Wireless Communications",Cambridge University Press.

EC4402 Coding Theory

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To study the importance of channel coding techniques in digital communications.
- To learn the mathematical structure of various codes
- To learn the algorithms for various codes
- To study the various application of codes.
- To acquire the knowledge of measurement of information

Course Outcomes:

- At the end of this course Students will be able to
- Understand principles of channel Coding techniques.
- Analyze the performance of different codes.
- Design various codes like block codes, cyclic codes, convolution codes, turbo codes etc.
- Generate different codes.
- Estimate the information content and errors

UNIT-I

Coding for Reliable Digital Transmission and Storage: Introduction, Types of codes, Types of errors, Channels models, Modulation and coding, channel coding Theorem, Channel coding gain.

UNIT-II

Linear Block codes: Introduction, encoding, syndrome decoding, error-detecting and correcting

capabilities, Maximum likelihood decoding.Cyclic codes: Description, encoding and syndrome decoding.

UNIT- III

Galois Fields: Groups, Fields, Binary arithmetic, Construction of Galois Fields GF(2m), Basic properties of Galois Fields. RS codes: Introduction, encoding and decoding (Berlekamp-Massey algorithm).

UNIT- IV

Convolution codes: Introduction, Encoding, State diagram, Trellis diagram, Decoding - Maximum-Likelihood decoding, soft decision and hard decision decoding, Viterbi algorithm.

UNIT- V

Turbo codes: Concatenation, Types of Concatenation, interleaving, types of interleavers, Turbo codes: Introduction, encoding and decoding (BCJR Algorithm).

Text books:

Shulin and Daniel J. Costello, Jr. “Error Control Coding,” 2/e, Pearson, 2011.

L.H.Charles LEE “Error control block codes for Communication Engineers”, Artech, 2000.

Suggested readings:

Simon Haykin, “Communication Systems”, 4/e, Wiley, 2000.

K Sam Shanmugum, “Digital and Analog Communication Systems”, Wiley, 2005.

EC4403 Satellite Communications

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To prepare the student to excel in basic knowledge of satellite communication principles.
- To provide students with solid foundation in orbital mechanics and launches for the satellite communication
- To train the students with the basic knowledge of link design of satellite with a design examples.
- To provide the better understanding of multiple access systems and earth station technology.
- To prepare the students with knowledge in satellite navigation and GPS and satellite packet communication

Course Outcomes:

- At the end of this course Students will be able to
- Explain, basic concepts and frequency allocations for satellite communications.
- Describe the orbital mechanics, launch vehicles and launchers.
- Design satellite links for specified C/N.
- Visualize satellites sub systems like telemetry, tracking, command and monitoring power systems etc.,
- Explain the different multiple access systems and their need in satellite communications and GPS Receivers,.

UNIT-I: Communication Satellite Orbit and Description

A Brief history of satellite Communication, satellite Frequency Bands, Satellite Systems, Applications, Orbital Period and Velocity, effects of orbital Inclination, Azimuth and Elevation, Coverage angle and slant Range, Eclipse, Orbital Perturbations,Placement of a Satellite in a Geo-Stationary orbit.

UNIT-II: Satellite Sub-Systems

Attitude and Orbit Control system, TT&C subsystem, Attitude Control subsystem,Power systems, Communication subsystems, Satellite Antenna Equipment.Satellite Link: Basic Transmission Theory, System Noise Temperature and G/T ratio, Basic LinkAnalysis,

Interference Analysis, Design of satellite Links for a specified C/N, (With and without frequency Re-use), Link Budget

UNIT-III: Propagation Effects

Introduction, Atmospheric Absorption, Cloud Attenuation, Tropospheric and Ionospeheric Scintillation and Low angle fading, Rain induced attenuation, rain induced cross polarization interference. Multiple Access : Frequency Division Multiple Access (FDMA) - Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA) -Frame Structure, Burst Structure, Satellite switched TDMA, On-board Processing, Demand Assignment Multiple Access (DAMA) –Typesof Demand Assignment, Characteristics, CDMA Spread Spectrum Transmission and Reception.

UNIT-IV: Earth Station Technology

Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface,Power Test Methods, Lower Orbit Considerations. Satellite Navigation and Global Positioning Systems:Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers, GPS C/A Code Accuracy, Differential GPS.

UNIT-V: Satellite Packet Communications

Message Transmission by FDMA: M/G/1 Queue, Message Transmission by TDMA, PURE ALOHA-Satellite Packet Switching, Slotted Aloha, Packet Reservation, Tree Algorithm.

TEXT BOOKS:

1. Satellite Communications –Timothy Pratt, Charles Bostian, Jeremy Allnutt, 2ndEdition,

2003,john Wiley & Sons.

2. Satellite Communications Engineering –Wilbur, L. Pritchand, Robert A. Nelson and Heuri

G.Suyderhoud, 2ndEd., Pearson Publications.

3. Digital Satellite Communications-Tri.T.Ha, 2ndEdition, 1990, Mc.Graw Hill.

REFERENCES:

1. Satellite Communications-Dennis Roddy, 2ndEdition, 1996, McGraw Hill.

2. Satellite Communications: Design Principles –M. Richcharia, 2ndEd., BSP, 2003.

3.Digital Satellite Communications –Tri. T. Ha, 2ndEd., MGH, 1990.

4. Fundamentals of Satellite Communications –K. N. Raja Rao, PHI, 2004.

EC4404 OPTICAL COMMUNICATIONS

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To realize the significance of optical fiber communications.
- To understand the construction and characteristics of optical fiber cable.
- To develop the knowledge of optical signal sources and power launching.
- To identify and understand the operation of various optical detectors.
- To under the design of optical systems and WDM.

Course Outcomes:

- At the end of this course Students will learn:
- Describe and classify the different modulation formats and optical components
- Understand and analyze the constructional parameters of optical fibers.
- Estimate the losses due to attenuation, absorption, scattering and bending.
- Analyze the optical sources and detectors and derive the expression for their efficiency
- Compare various optical detectors and choose suitable one for different applications.
- Design an optical fiber link

UNIT-I: Overview of optical fiber communication

Historical development, The general system, advantages of optical fiber communications.Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection,Acceptance angle, Numerical Aperture, Skew rays. Cylindrical fibers- Modes, Vnumber, Modecoupling, Step Index fibers, Graded Index fibers.Single mode fibers - Cut off wavelength, Mode Field Diameter, Effective Refractive Index. [2]. Fiber materials — Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers.

UNIT-II: Signal distortion in optical fibers

Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Types of Dispersion – Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening. Optical fiber Connectors- Connector types, Single mode fiber connectors, Connector return loss.

UNIT-III: Fiber Splicing

Splicing techniques, Splicing single mode fibers. Fiber alignment and joint loss-Multimode fiber joints, single mode fiber joints,. Optical sources- LEDs, Structures, Materials, Quantumefficiency, Power, Modulation, Power bandwidth product. Injection Laser Diodes-Modes, Threshold conditions, External quantum efficiency,Laser diode rate equations,Resonant frequencies. Reliability of LED&ILD.Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling.

UNIT-IV: Optical detectors

Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparision of Photodetectors. Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital

Receiverperformance, Probability of error, Quantum limit, Analog receivers.

UNIT-V: Optical system design

Considerations, Component choice, Multiplexing. Point-to- point links, System considerations, Link power budget with examples. Overall fiber dispersion in Multi mode and Single mode fibers, Rise time budget with examples. Transmission distance, Line coding in Optical links, WDM, Necessity , Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye pattern.

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, Tata Mc Graw-Hill International edition,4th

Edition,2008.

2. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

REFERENCES:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson

Education, 2005.

2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.

3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.

4. Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.

EC4405 RADAR SYSTEMS

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To learn working principle of Radar Operating frequencies and derive Radar Range Equation,
- To understand the basic concepts of different types of Radars for surveillance & Tracking.
- To learn functioning of MTI radar and its performance limitations.
- To get acquainted with the working principles of CW radar, FM-CW radar.
- To understand concept of a Matched Filter in Radar Receivers gain knowledge of different receiver blocks and understand receiver functioning

Course Outcomes:

- At the end of this course Students will learn:
- Distinguish between thefunctioning of CW FM-CW and MTI radars,
- Apply Doppler principle to radars and hence detect moving targets.
- Distinguish between Sequential Lobing, Conical Scan, Monopulse type 0f Tracking Radars, specify their requirements and compare their characteristic features.
- Derive the matched filter response characteristics for radar applications and account for correlation receivers; to distinguish between different radar displays and duplexers.
- Account for the electronic scanning principle and implement the same through phased array antennas, knowing their requirements and utilities.

UNIT-I: Basics of Radar

Introduction, Maximum Unambiguous Range, Radar Waveforms, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Predictionof Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Related Problems. Radar Equation: SNR, Envelope Detector-False AlarmTime and Probability, Integration of Radar Pulses,Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Related Problems.

UNIT-II: CW and Frequency Modulated RadarDoppler Effect,

CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Related Problems.FM-CW Radar: FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

UNIT-III: MTI and Pulse Doppler Radar

Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar –Amplitude Comparison Monopulse (one- and two- coordinates), Angular Accuracy, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT-IV: Detection of Radar Signals in Noise

Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non- matched Filters, Matched Filter with Non-white Noise.

UNIT-V: Radar Receivers

Noise Figure and Noise Temperature, Displays – types, Introduction to Phased Array Antennas –Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.ElectronicWarfare : Introduction to ESM, ECM and ECCM systems.

TEXT BOOKS:

1.Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2 nd

Edition, Tata McGraw-Hill, 2007.

REFERENCES:

1. Introduction to Radar Systems – Merrill I. Skolnik, 3 rd Edition Tata McGraw-Hill, 2001.

2. Radar: Principles, Technology, Applications-Byron Edde, Pearson Education, 2004.

3. Principles of Modern Radar: Basic Principles-Mark A. Richards, James A. Scheer, William

A. Holm, Yesdee,2013.

4. ‘Radar Hand Book ‘ Ed. By M.I Skolnik, 2 nd Edition, Tata McGraw Hill.

5. ‘Understanding Radar Systems’ by Simon Kinsley and Shaun Quegan, Scitech Publishing, McGraw-Hill.

EC4411 REAL TIME OPERATING SYSTEMS

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To understand the need of real time operating system.
- To learn the basic concepts of inter process communication (IPC).
- To analyze various scheduling algorithms related to RTOS.
- To introduce the elementary concepts of Vx works.
- To study the basic concepts of UNIX operating system.

Course Outcomes:

- At the end of this course Students will learn:
- 1.Understand Real-time operating system requirements and applications.
- Categorize different scheduling approaches for real time scheduler.
- Compare different real time systems.
- Analyze a module and understand design issues.
- Develop a real time embedded system module.

UNIT-I:

Introduction to Real Time Systems Structures of Operating System (Monolithic, Microkernel, Layered, Exo-kernel and Hybrid kernel structures), Operating system objectives and functions, Virtual Computers, Interaction of OS and Hardware architecture, Evolution of operating systems, Batch, multi programming. Multitasking, Multiuser, parallel, distributed and real-time OS.

UNIT-II:

Process Management of OS/RTOS Hard versus Soft Real-Time System: Jobs and Processors, release time, deadlines, and timing constraints, hard and soft timing constraints, hard real-time systems. Uniprocessor Scheduling: Types of scheduling, scheduling algorithms: FCFS, SJF, Priority, Round Robin, UNIX Multi-level feedback queue scheduling, Thread scheduling, Multiprocessor scheduling concept, Real Time scheduling concept.

UNIT-III:

Real Time Operating System Concepts Foreground and Background Systems, Shared Resource, Critical section of a Code, Multi-Tasking, Task, Context switch, Kernel, Scheduler, Preemptive and non-preemptive kernel, Inter Task Communication: Message Mailboxes, Message queues or pipes and Event flags, Semaphores, Interrupts

UNIT-IV:

Introduction to Vx works/UNIX OS Elementary Concepts of Vx Works: Multitasking, Task State Transition, Task Control- Task Creation and Activation, Task Stack, Task Names and IDs, Task Options, Task Information, Task Deletion and Deletion Safety. Fundamental Concepts of UNIX Operating Systems UNIX Kernel – File system, Concepts of – Process, Concurrent Execution & Interrupts. Process Management – forks & execution. Basic level Programming with system calls, Shell programming and filters.

UNIT-V:

Linux development process Types of Host /Target Development and debug setup, Generic Architecture of an Embedded Linux System, System start up, Types of Boot configurations, System Memory Layout, Development Tools: Project Workspace, IDE, GNCC cross platform, selecting and configuring kernel, setting up boot loader.

TEXT BOOKS:

Tanenbaum,"Modern Operating Systems," 4/e, Pearson Edition, 2014.

Jane W.S.Liu, Real Time Systems, Pearson Education, Asia, 2001. REFERENCES: 1. Jean J Labrosse,"Embedded Systems Building Blocks Complete and Ready-to-use Modules in C" ,2/e, CRC Press ,1999. 2. Karim Yaghmour, Jon Masters, Gilad Ben-Yesset, Philippe Gerum, "Building Embedded Linux Systems", O'Reilly Media, 2008.

Wind River Systems, "VxWorks Programmers Guide 5.5", Wind River Systems Inc.2002.

EC4412 INTERNET OF THINGS & APPLICATIONS

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To provide an overview of Internet of Things, building blocks of IoT and the real-world applications
- To make understand of differences in M2M, WSN with reference to Iot.
- To make the students to learn Python language in IoT context.
- To introduce Rasberry Pi device, its interfaces and Django Framework.
- To make the students to build IoT systems.

Course Outcomes:

At the end of this course Students will learn:

- Understand the terminology, enabling technologies and applications of IoT
- Learn the concept of M2M (machine to machine) and describe the differences between
- M2M and IoT.
- Understand the basics of Python Language which is used in many IoT devices.
- Describe the steps involved in IoT system design methodology.
- Design simple IoTsystemsusing the understanding of the Rasberry Pi board and interfacing sensors and actuators with Rasberry Pi

UNIT-I: Introduction & Concepts

Introduction & Concepts: Introduction to Internet of Things- Definitions & Characteristics of IoT, Physical Design of IOT-Things in IoT, IoT Protocols, Logical Design of IOT-IoT FunctionalBlocks, IoT Communication Models, IoT Communication APIs, IOT Enabling Technologies-Wireless Sensor Networks, Cloud Computing, Big Data Analytics,CommunicationProtocols,Embedded Systems, IOT Levels & Deployment Templates.

UNIT-II: Domain Specific IoTs

IoT applications for Home Automation, Cities, Environment, Energy,Retail, Logistics,

Agriculture, Industry, health and LifestyleIoT and M2M – Introduction, M2M, Differences between IoT and M2M, Software DefinedNetworking, Network Function Virtualization.

UNIT-III: Introduction to Python

Motivation for using Python for designing IoT systems, Language features of Python, Data types- Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Data Structures: Control of flow-if, for, while, range, break/continue, pass, functions, modules, packaging, file handling,data/time operations, classes, Exception handling, Python packages of Interest for IoT - JSON, XML, HTTPLib, URLLib, SMTPLib

UNIT-IV: IoT Platforms Design Methodology

Introduction, IoT Design Methodology Steps-Purpose and Requirements Specification, ProcessSpecification, Domain Model Specification, Information Model Specification, Service

Specifications, IoT Level Specification, Functional View Specification, Operational View

Specification, Device and Component Integration, Application Development, Case Study on IoT System for Weather Monitoring.

UNIT-V: IoT Physical Devices and End Points

Basic building blocks of an IoT device, Rasberry Pi-About theRasberry Pi board, Rasberry Pi interfaces-Serial, SPI,I2C, Other IoT Devices- pcDuino, BeagleBone Black, CubieboardIoT Physical Servers and Cloud Offerings- Introduction to cloud storage models and CommunicationAPIs, WAMP-AutoBahn for IoT, Xivelycloud for IoT Python Web Application Framework: Django Framework-Roles of Model, Template and View.

TEXT BOOKS:

1. ArshdeepBahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach,

Universities Press, 2015.

REFERENCES:

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1 st Edition, Apress Publications, 2013

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014.

EC4413 EMBEDDED SYSTEMS

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- Understand the basics of an embedded system.
- Program an embedded system.
- To learn the design process of embedded system applications.
- To understands the RTOS and inter-process communication.
- To understand different communication interfaces.

Course Outcomes:

- At the end of this course Students will learn:
- Understand and design the embedded systems
- Learn the basics of OS and RTOS.
- Understand types of memory and interfacing to external world.
- Understand embedded firmware design approaches.
- Understand the interfacing of communication devices.

Syllabus:

UNIT-I: INTRODUCTION TO EMBEDDED SYSTEMS

Complex systems and microprocessors-embedding computers, characteristics of embedded computing applications, challenges in embedded computing system design, performance in embedded computing; The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, design example.

UNIT-II: TYPICAL EMBEDDED SYSTEM

Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems; Sensors, actuators and other components-sensors, actuators, seven segment LED, relay, piezo buzzer, push button switch, reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

UNIT-III: EMBEDDED FIRMWARE DESIGN AND DEVELOPMENT

Embedded firmware design approaches-super loop based approach, operating system based approach; Embedded firmware development languages-assembly language based development, high level language based development; Programming in embedded C.

UNIT-IV: RTOS BASED EMBEDDED SYSTEM DESIGN

Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-preemptive and pre-emptive scheduling; task communication-shared memory, message passing.

UNIT-V: COMMUNICATION INTERFACE

Onboard communication interfaces-I2C, SPI, UART, 1 wire interface, parallel interface; External communication interfaces-RS232 and RS485,USB, infrared, Bluetooth, wi-Fi, zigbee, GPRS; Automotive networks and sensor networks.

TEXT BOOKS:

Computers as Components –Wayne Wolf, Morgan Kaufmann (second edition).

Introduction to Embedded Systems - shibu k v, Mc Graw Hill Education.

REFERENCES:

Embedded System Design -frank vahid, tony grivargis, john Wiley.

Embedded Systems- An integrated approach - Lyla b das, Pearson education 2012.

Embedded Systems – Raj kamal, TMH. 4. An embedded Software Primer, David e Simon, Pearson education

EC4414 Detection and Estimation Theory

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- 1.To enable the students to acquire the fundamental concepts of Signal detection and estimation
- To expose the conceptual basics of Hypotheses.
- To introduce the methods of Detection and estimation of signals in white and non-white Gaussian noise.
- To familiarize with the detection of random signals.

- To enable the students to understand the time varying waveform detection and its estimation.

Course Outcomes:

- After completion of the course the student will be able to
- Understand the basic concepts of Signal detection and estimation.
- Understand conceptual basics of Hypotheses.
- Understand the conceptual basics of Detection and estimation of signals in white and non-white Gaussian noise.
- Understand the detection of random signals.
- Understand the time varying waveform detection and its estimation.

UNIT –I: Random Processes

Discrete Linear Models, Markov Sequences and Processes, Point Processes,and Gaussian Processes.

UNIT –II: Detection Theory

Basic Detection Problem, Maximum A posteriori Decision Rule,Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)-minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III: Linear Minimum Mean-Square Error Filtering

Linear Minimum Mean Squared Error stimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with tored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV: Statistics

Measurements, Nonparametric Estimators of Probability Distribution and DensityFunctions,Point Estimators of Parameters, Measures of the Quality of Estimators, Introductionto Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression,Multiple Linear Regression.

UNIT –V: Estimating the Parameters of Random Processes from Data

Tests for Stationarity andErgodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

TEXT BOOKS:

Random Signals: Detection, Estimation and Data Analysis - K. Sam Shanmugan&A.M.Breipohl, Wiley India Pvt. Ltd, 2011.

Random Processes: Filtering, Estimation and Detection - Lonnie C. Ludeman, Wiley India Pvt. Ltd., 2010.

REFERENCES:

Fundamentals of Statistical Signal Processing: Volume I Estimation Theory– Steven.M.Kay,Prentice Hall, USA, 1998.

Fundamentals of Statistical Signal Processing: Volume I Detection Theory– Steven.M.Kay,Prentice Hall, USA, 1998.

Introduction to Statistical Signal Processing with Applications - Srinath, Rajasekaran,Viswanathan, 2003, PHI.

EC4421 ANALOG VLSI AND MIXED SIGNAL DESIGN

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objective:

- To understand the types of active filters and its operation.
- To understand the types of continuous time filters and digital filters and its operation.
- To understand various ADC and DAC converters and its importance in the Electronic systems.
- Gives Knowledge on VHDL Programming language for Mixed Signal Circuit Design.
- Extension the Verilog concepts for analog VLSI circuits.

Course Outcomes:

- Able to design filters with active devices only.
- Able to design the first and second order digital filters.
- The ability to use and design DAC and ADC techniques for data conversions.
- The ability to program, Mixed Signal VLSI Circuits.
- Verilog program for analog VLSI circuits.

UNIT I: Introduction to Active Filters (PLL) & Switched capacitor filters

Active RC Filters for monolithic filer design: First & Second order filter realizations - universal active filter (KHN)- self tuned filter - programmable filters - Switched capacitor filters: Switchedcapacitor resistors - amplifiers –comparators - sample & hold circuits – Integrator-Biquad.

UNIT II: Continuous Time filters & Digital Filters

Introduction to Gm - C filters - bipolar transconductors - CMOS Transconductors using Triode transistors, active transistors - BiCMOStransconductors – MOSFET C Filters - Tuning Circuitry - Dynamic range performance -Digital Filters: Sampling – decimation – interpolation - implementation of FIR and IIR filters.

UNIT III: Digital to Analog & Analog to Digital Converters

Non-idealities in the DAC - Types of DAC's: Current switched, Resistive, Charge redistribution (capacitive), Hybrid, segmented DAC's - Techniques for improving linearity -

Analog to Digital Converters: quantization errors -non-idealities - types of ADC's: Flash, two step, pipelined, successive approximation, folding ADC's.Sigma Delta Converters: Over sampled converters - over sampling without noise & with noise – implementation imperfections - first order modulator - decimation filters- second order modulator - sigma delta DAC & ADC's

UNIT IV: Analog and Mixed Signal Extensions to VHDL

Introduction - Language design objectives - Theory of differential algebraic equations - the 1076 .1 Language - Tolerance groups - Conservative systems - Time and the simulation cycle -A/D and D/A Interaction - Quiescent Point - Frequency domain modeling and examples.

UNIT V: Analog Extensions to Verilog

Introduction –data types –Expressions-Signals-Analog Behavior-Hierarchical structures-Mixed Signal Interaction. Introduction - Equation construction - solution - waveform Filter functions - simulator - Control Analysis - Multi -disciplinary model.

TEXT BOOKS:

David A. Johns, Ken Martin, "Analog Integrated Circuit Design" John Wiley & Sons, 2002.

Rudy van de Plassche "Integrated Analog-to-Digital and Digital-to-Analog Converters ",Kluwer 1999.

Antoniou, "Digital Filters Analysis and Design" Tata McGraw Hill, 1998.

REFERENCES:

Phillip Allen and Douglas Holmberg "CMOS Analog Circuit Design" Oxford University. Press, 2000.

BenhardRazavi, "Data Converters", Kluwer Publishers, 1999.

Jacob Baker, Harry W LI, and David E Boyce "CMOS, Circuit Design Layout and Simulation", Wiley- IEEE Press, 1 st Edition, 1997.

Tsividis Y P, "Mixed Analog and Digital VLSI Devices and Technology", Mc-Graw Hill,1996.

EC4422 ANALOG INTEGRATED CIRCUIT DESIGN

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- Understand the working principle of MOSFET transistor and its equivalent circuit, and also to design the single-stage and multi-stage amplifiers.
- Understand the high frequency and noise analysis in the single-stage and multi-stage amplifiers.
- Gives basic knowledge to design feedback amplifiers and working principle of operational amplifier and its complete circuit.
- Basic understanding to compensate the design with some parameters by taking phase margin and gain margin into account.
- Basic Knowledge to get a supply and temperature independent analog designs.

Course Outcomes:

- Able to understand the working principle of MOSFET transistor, using the MOSFET able to design the various styles of voltage and current amplifiers.
- Able to design the analog circuits by considering noise in the circuit and also for the high frequency analysis.
- Able to design the stable analog circuits with a feedback.
- Able to compensate the analog circuits for desired outputs by modifying the circuit.
- Able to design the temperature and supply independent analog cirucits.

UNIT I : SINGLE STAGE AMPLIFIERS

Basic MOS physics and equivalent circuits and models, CS,, CG and Source Follower ascode and folded cascade configurations, differential amplifiers and current mirror configurations.

UNIT II :HIGH FREQUENCY AND NOISE OF CHARACTERISTICS AMPLIFIERS

Current mirrors, cascode stages for current mirrors, current mirror loads for differential pairs. Miller effect, association of poles with nodes, frequency response of CS, CG and source follower, cascade and differential pair stages Statistical characteristics of noise, noise in single stage amplifiers, noise in differential amplifiers.

UNIT III :FEEDBACK AND OPERATIONAL AMPLIFIERS

Properties and types of negative feedback circuits, effect of loading in feedback networks, operational amplifier performance parameters, One-stage Op Amps, Two-stage Op Amps, Input range limitations, Gain boosting, slew rate, power supply rejection, noise in Op Amps.

UNIT IV : STABILITY AND FREQUENCY COMPENSATION
General considerations, Multipole systems, Phase Margin, Frequency Compensation, Compensation of two stage Op Amps, Slewing in two stage Op Amps, Other compensation techniques.

UNIT V:ANDGAP REFERENCES

supply independent biasing, temperature independent references, PTAT current generation, Constant-Gm Biasing.

TEXT BOOKS:

BehzadRazavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill, 2001.

Phillip E.Allen, DouglasR.Holberg, "CMOS Analog Circuit Design", Second edition, Oxford University Press, 2002.

REFERENCE BOOKS:

Willey M.C. Sansen, "Analog Design Essentials", Springer, 2006.

Grebene, "Bipolar and MOS Analog Integrated circuit design", John Wiley &sons,Inc., 2003.

Recorded lecture available at http://www.ee.iitm.ac.in/~ani/ee5390/index.html.

Jacob Baker "CMOS: Circuit Design, Layout, and Simulation, Third Edition", Wiley IEEE Press 2010 3rd Edition.

EC4423 CAD OF VLSI CIRCUITS

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To make understand the VLSI CAD tools flow with Algorithmic Graphs.
- Gives knowledge on layout design rules and various algorithms for placement and partitioning of circuits.
- Understands the Floor planning and routing process in the VLSI CAD tools.
- Knows the various concepts of simulation and synthesis process in VLSI CAD tools.
- Gives Knowledge on modelling concepts of synthesis process.

Course Outcomes:

- Understands the complete VLSI CAD tool flow.
- Able to follow the design rules and debug it while creating layouts for circuits in VLSI CAD tool and also understands the placement and partitioning of the digital systems.
- Able to debug the floor planning and routing problems in the VLSI CAD tools for the digital systems.
- Understands the simulation and synthesis process and make advantage to debug the errors when developing and using the VLSI CAD tools.
- Able to develop a synthesis process in the VLSI CAD tools

UNIT I: VLSI DESIGN METHODOLOGIES

Introduction to VLSI Design methodologies - Review of Data structures and algorithms - Review of VLSI Design automation tools - Algorithmic Graph Theory and Computational Complexity - Tractable and Intractable problems - general purpose methods for combinatorial optimization.

UNIT II:DESIGN RULES

Layout Compaction - Design rules - problem formulation - algorithms for constraint graph compaction - placement and partitioning - Circuit representation - Placement algorithms - partitioning

UNIT III:FLOOR PLANNING

Floor planning concepts - shape functions and floorplan sizing - Types of local routing problems - Area routing - channel routing - global routing - algorithms for global routing.

UNIT IV:SIMULATION

Simulation - Gate-level modeling and simulation - Switch-level modeling and simulation - Combinational Logic Synthesis - Binary Decision Diagrams - Two Level Logic Synthesis.

UNIT V:MODELLING AND SYNTHESIS

High level Synthesis - Hardware models - Internal representation - Allocation assignment and scheduling - Simple scheduling algorithm - Assignment problem - High level transformations.

TEXTBOOKS:

S.H. Gerez, "Algorithms for VLSI Design Automation", John Wiley & Sons,2002.

N.A. Sherwani, "Algorithms for VLSI Physical Design Automation", Kluwer Academic Publishers, 2002.

EC4424 RF Integrated Circuits

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To educate students fundamental RF circuit and system design skills.
- To introduce students, the basic transmission line theory, single and multiport networks, RF component modelling.
- To offer students experience on designing matching and biasing networks & RF transistor amplifier design.

Course Outcomes:

- At the end of this course Students will learn:
- Understand the design bottlenecks specific to RF IC design, linearity related issues, ISI.
- Identify noise sources, develop noise models for the devices and systems.
- Specify noise and interference performance metrics like noise figure, IIP3 and different matching criteria.
- Comprehend different multiple access techniques, wireless standards and various transceiver architectures
- Design various constituents' blocks of RF receiver front end.

Unit I: INTRODUCTION TO RF AND WIRELESS TECHNOLOGY:

Complexity comparison, Design bottle necks, Applications, Analog and digital systems, Choice of Technology. BASIC CONCEPTS IN RF DESIGN: Nonlinearity and time variance, ISI, Random process and noise, sensitivity and dynamic range, passive impedance transformation.

Unit II: MULTIPLE ACCESS:

Techniques and wireless standards, mobile RF communication, FDMA, TDMA, CDMA, Wireless standards.

Unit III: TRANSCEIVER ARCHITECTURES:

General considerations, receiver architecture, Transmitter Architecture, transceiver performance tests, case studies.

Unit IV: AMPLIFIERS, MIXERS AND OSCILLATORS:

LNAs, down conversion mixers, Cascaded Stages, oscillators, Frequency synthesizers.

Unit V: POWER AMPLIFIERS:

General considerations, linear and nonlinear Pas, classification, High Frequency power amplifier, large signal impedance matching, linearization techniques.

Text Books:

BehzadRazavi, RF Microelectronics Prentice Hall of India, 2001

Thomas H. Lee, the Design of CMOS Radio Integrated Circuits, Cambridge University Press.

EC4425 Adhoc Wireless Sensor Networks

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To introduction of fundamentals of Wireless LANS and PANS and its design issues.
- To understand the MAC protocols for Ad Hoc Wireless Networks and its designingissues.
- To introduction of different kinds of Routing algorithms for effective design of Ad HocWireless Networks.
- To introduction and designing issues in Transport Layer Protocol for Ad Hoc WirelessNetworks.
- Introduction of Wireless Sensor Networks and its Architecture.

Course Outcomes:

- At the end of this course Students will learn
- Students will be good at fundamentals of Wireless LANS and PANS and its designissues.
- Students will know the MAC protocols for Ad Hoc Wireless Networks and its
- designing issues.
- Student knows the different kinds of Routing algorithms for effective design of Ad
- Hoc Wireless Networks.
- Student will be ability to overcome the issues in Transport Layer Protocol for Ad Hoc
- Wireless Networks.
- Finally, student will be good at design and architecture of Wireless Sensor Networks.

UNIT -I:

Wireless LANS and PANS: Introduction, Fundamentals of WLANS, IEEE 802.11 Standards,HIPERLAN Standard, Bluetooth, Home RF.AD HOC Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks.

UNIT -II:

MAC Protocols: Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks,

Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation

Mechanisms,Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocolsthat use Directional Antennas, Other MAC Protocols.

UNIT -III:

Routing Protocols: Introduction, Issues in Designing a Routing Protocol for Ad Hoc WirelessNetworks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – DemandRouting Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

UNIT –IV:

Transport Layer Protocols: Introduction, Issues in Designing a Transport Layer Protocol for AdHoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT –V:

Wireless Sensor Networks: Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

TEXT BOOKS:

Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.

Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control – JagannathanSarangapani, CRC Press.

REFERENCES:

Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh , 1st Ed. Pearson Education.

Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.

EC4426 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

This course provides

- An introduction to measurement techniques and instrumentation design and operation
- The basic concepts of units measurement error and accuracy, the construction and design of measuring devices and circuits measuring instruments and their proper applications
- To use different measuring techniques and measurement of different physical parameters using different transducers

Course Outcomes:

- Upon a successful completion of this course, the student will be able to:
- Describe the fundamental concepts and principles of instrumentation.
- Explain the operations of the various instruments required in measurements.
- Apply the measurement techniques for different types of tests.
- To select specific instrument for specific measurement function.
- Understand principle of operation, working of different electronic instruments like digital multi meter, vector voltmeter.
- Learners will apply knowledge of different oscilloscopes like CRO, DSO.
- Students will understand functioning, specification, and applications of signal analyzing instruments.

UNIT - I:

Block Schemantics of Measuring Systems: Performance characteristics, Static characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag; Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT - II:

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary waveform Generator, Video Signal Generators, and Specifications.

UNIT - III:

Oscilloscopes: CRT, Block Schemantic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Strorage Oscilloscopes, Digital Storage CROs.

UNIT - IV:

Transuducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperatue sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

UNIT - V:

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure - High Pressure, Vacuum level, Temperature - Measurements, Data Acqisition Systems.

TEXTBOOKS:

Electronic instrumentation: H.S.Kalsi - TMH, 2nd Edition 2004.

Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI, 5th Edition, 2003.

REFERENCES:

Electronic Instrumentation and Measurements - David A. Bell, Oxford Uiv. Press, 1997.

Electronic Measurements and Instrumentation: B. M. Oliver, J. M. Cage TMH Reprint.

Measurement Systems - Emest O. Doebelin and Dhanesh N Manik, 6th Ed., TMH.

Electronic Measurements and Instrumentations by K. Lal Kishore, Pearson Education - 2010.

Industrial Instrumentation: T. R. Padmanabham Spiriger 2009.

EC4431 Digital Image Processing

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- Learn and understand the representation of Two Dimensional Linear shift invariant Systems using Matrices
- To understand the acquisition of digital images.
- Learn and implement the algorithms for basic image processing applications such as image enhancement
- Formulate and solve the optimization problems to achieve image restoration from degraded images
- To implement, analyze, and asses the performance of the image processing algorithms.

Course Outcomes:

- To Introduce the applications of the Digital image processing in different research fields, and learn the Mathematical preliminaries required for analyzing two dimensional systems.
- Learn the acquisition process of a Digital images
- Demonstrated understanding of Image transforms such as Discrete Fourier Transform, Cosine Transform, Hadamard Transform, and KLT.
- Demonstrated understanding of image enhancement techniques
- Understanding of formulation and solution of image restoration techniques

UNIT-I: INTRODUCTION, Mathematical Preliminaries and Two dimensional Systems

Introduction to image Processing and applications of image processing in different fields, Fundamentals of Linear algebra, and Probability, one dimensional and two dimensional Linear shift invariant systems and their representation using matrices, one dimensional and Two Dimensional Convolution, Separable operations using matrices, Two dimensional Discrete time Fourier transform, Two dimensional Z transform and Properties.

UNIT-II: Image sampling and Quantization

Sampling of One dimensional signals, Sampling of Two dimensional signals, Anti-aliasing filter, Quantization: Liyod Max quantizer, Uniform quantizer, Signal to quantization noise ratio.

UNIT-III: Image Transforms

Unitary transforms and properties, One dimensional Discrete Fourier transform, Two dimensional Discrete Fourier transform, One dimensional Discrete cosine transform, Two dimensional Discrete cosine transform, One dimensional Discrete sine transform, Two

dimensional Discrete sine transform, One dimensional Discrete Walsh transform, Two dimensional Discrete Walsh transform, One dimensional Discrete Hadamard transform, Two dimensional Discrete Hadamard transform, One dimensional Discrete Haar transform, Two dimensional Discrete Haar transform, One dimensional Discrete KLT transform, Two dimensional Discrete KLT transform, Application of KLT for Face recognition.

UNIT-IV: Image Enhancement

Point operations: contrast stretching, digital negative, Power law correction, dynamic range compression, intensity level slicing, Thresholding, Bit plane extraction; Histogram equalization and histogram specification; spatial operations:Linear and non linear filtering in spatial domain using spatial masks, Unsharp masking; Transform Operations: Filtering in transform domain; Psuedo coloring

Unit – V: Image Restoration

Classification of restoration methods, Characteristic metrics for Image restoration, Linear and non linear degradation models, Inverse filtering, Pseudo inverse filtering, Wiener filtering: Least squares approach.

REFERENCES:

A.K Jain , Fundamentals of Digital Image Proceessing, Prentice Hall.

R. C. Gonzalez, R.E. Woods, Digital Image Processing, Pearson.

EC4432 MULTIMEDIA COMMUNICATION

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives

- The course is designed
- To provide an introduction to the fundamental principles and techniques in Multimedia Signal coding and compression.
- To give an overview of current multimedia standards and technologies.
- To provide techniques related to computer and multimedia networks.
- To provide knowledge related to Multimedia Network Communications and Applications.

Course Outcomes

- Upon completing the course, the student will be able to:
- Understand the fundamentals behind multimedia signal processing.
- Understand the fundamentals behind multimedia compression.
- Understand the basic principles behind existing multimedia compression and communication standards.
- Understand future multimedia technologies.
- Apply the acquired knowledge to specific multimedia related problems and projects at work.
- Take advanced courses in this area.

UNIT -I

Introduction to Multimedia: Multimedia, World Wide Web, Overview of Multimedia Tools, Multimedia Authoring, Graphics/Image Data Types, and File Formats.

Color in Image and Video: Color Science — Image Formation, Camera Systems, Gamma Correction, Color Matching Functions, CIE Chromaticity Diagram, Color Monitor Specifications, Out-of-Gamut Colors, White Point Correction, XYZ to RGB Transform, Transform with Gamma Correction, L*A*B* Color Model. Color Models in Images — RGB Color Model for CRT Displays, Subtractive Color: CMV Color Model, Transformation from RGB to CMV, Under Color Removal: CMYK System, Printer Gamuts, Color Models in Video — Video Color Transforms, YUV Color Model, YIQ Color Model, Ycbcr Color Model.

UNIT -II

Video Concepts: Types of Video Signals, Analog Video, Digital Video.

Audio Concepts: Digitization of Sound, Quantizatiofl and Transmission of Audio.

UNIT -III

Compression Algorithms

Lossless Compression Algorithms: Run Length Coding, Variable Length Coding, Arithmetic Coding, Lossless JPEG, Image Compression.

Lossy Image Compression Algorithms: Transform Coding: KLT And DCT Coding, Wavelet Based Coding.

Image Compression Standards: JPEG and JPEG2000.

UNIT – IV

Video Compression Techniques: Introduction to Video Compression, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261- Intra-Frame and Inter-Frame Coding, Quantization, Encoder and Decoder, Overview of MPEG 1 and MPEG2.

UNIT -V

Audio Compression Techniques: ADPCM in Speech Coding, G.726 ADPCM, Vocoders Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP, Hybrid Excitation Vocoders, MPEG Audio — MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithms, MPEG-2 AAC, MPEG-4 Audio.

TEXT BOOKS

Fundamentals of Multimedia — Ze- Nian Li, Mark S. Drew, PHI, 2010.

Multimedia Signals & Systems — Mrinal Kr. Mandal Springer International Edition 1St Edition, 2009

REFERENCE BOOKS

Multimedia Communication Systems — Techniques, Stds&Netwroks KR. Rao, Zorans. Bojkoric, DragoradA.MjIovanj 1st Edition, 2002.

Fundamentals of Multimedia Ze- Man Li, Mark S.Drew, Pearson Education (LPE), 1st Edition, 2009.

Multimedia Systems John F. KoegelBufond Pearson Education (LPE), 1st Edition, 2003.

Digital Video Processing — A. Murat Tekaip, PHI, 1996.

Video Processing and Communications — Yaowang, JornOstermann, Ya-QinZhang, Pearson,2002

EC4433 DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- To introduce architectural features of programmable DSP Processors of TI and AnalogDevices.
- To recall digital transform techniques.
- To give practical examples of DSP Processor architectures for better understanding.
- To develop the programming knowledge using Instruction set of DSP Processors.
- To understand interfacing techniques to memory and I/O devices.

Course Outcomes:

- Student will be able to:
- To distinguish between the architectural features of general purpose processors and DSP processors
- Understand the architectures of TMS 320C54XX and ADSP2100 DSP devices
- Able to write assembly language programs using instruction set of TMS320C54XX
- Can interface various devices to DSP Processors

UNIT-I: Introduction to Digital Signal Processing:

Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolationComputational 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: 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.

UNIT-III: Programmable Digital Signal Processors:

Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline operation of TMS320C54XX Processors.

UNIT-IV: Analog Devices Family of DSP Devices:

Analog Devices Family of DSP Devices – ALU and MAC block diagram, ShifterInstruction,Base Architecture of ADSP 2100, ADSP-2181 high performance Processor. introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT-V: Interfacing Memory and I/O Peripherals to Programmable DSP Devices:

Memory space organization, External bus interfacing signals, Memory interface, ParallelI/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS:

Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.

A Practical Approach to Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009

Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007

REFERENCES:

Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.

Digital Signal Processing – Jonatham Stein, 2005, John Wiley.

DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.

Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI

The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, Ph.D.,California Technical Publishing, ISBN 0-9660176-3-3, 1997 6.Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes, ISBN 0750679123, 2005.

EC4434 ANTENNAS AND WAVE PROPAGATION

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **4-0-4**

Course Objectives:

- Understand basic terminology and concepts of Antennas.
- To attain knowledge on the basic parameters those are considered in the antenna design process and the analysis while designing that.
- Analyze the electric and magnetic field emission from various basic antennas and
- mathematical Formulation of the analysis.
- To have knowledge on antenna operation and types as well as their usage in real time filed.
- Aware of the wave spectrum and respective band based antenna usage and also to know thepropagation of the waves at different frequencies through different layers in the existing layered free space environment structure.

Course Outcomes:

- Student will be able to:
- Aware of antenna parameter considerations
- Capable to analyze the designed antenna and field evaluation under various conditions andformulate the electric as well as magnetic fields equation set for far field and near field conditions
- Understand the array system of different antennas and field analysis under application of different currents to the individual antenna elements
- Understand the design issues, operation of fundamental antennas and their operation
- methodology in practice.
- Design a lens structure and also the bench set up for antenna parameter measurement of testingfor their effectiveness
- Knowledge about the means of propagation of electromagnetic waves

UNIT-I: Antenna Basics:

Introduction, Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Illustrative Problems. Fields fromOscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem.Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area, Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances.

UNIT-II: Antenna Arrays:

Point Sources – Definition, Patterns, arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions –General Considerations and Binomial Arrays, Illustrative Problems.

Antenna Measurements:Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3- Antenna Methods)

UNIT-III: VHF, UHF and Microwave Antennas-I:

Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics,Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

VHF, UHF and Microwave Antennas - II:

Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas– Geometry and Parameters, Characteristics of Microstrip Antennas. Impact of Different Parameters on Characteristics, 103 Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems. Lens Antennas – Introduction, Geometry of Non-metallic Dielectric Lenses, Fermat‘s Principle, Zoning, Applications.

UNIT-IV: Wave Propagation – I:

Introduction, Definitions, Categorizations and General Classifications, Different Modes of WavePropagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation – Introduction, Field Strength Variation with Distance andHeight, Effect of Earth‘s Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.

UNIT-V: Wave Propagation – II:

Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflectionof Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multihop Propagation.

TEXT BOOKS:

Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4thed., (Special Indian Edition), 2010.

Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed.2000.

A.Harish, M.Sachidanada," Antennas and Wave Propagation", Oxford University Press,2007

REFERENCES:

Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.

Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications,New Delhi,2001.

Transmission and Propagation – E.V.D. Glazier and H.R.L. Lamont, The Services Text Book of Radio,vol. 5, Standard Publishers Distributors, Delhi.

Antennas – John D. Kraus, McGraw-Hill (International Edition), 2nd Ed. 1988.

Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th edition, 1955.

EC4701 Microprocessor and Microcontroller Lab

Externals: 60Marks **(L-T)-P-C**

Internals: 40Marks **0-2-2**

LIST OF EXPERIMENTS:

1. Familiarization with TITAN II Kit's hardware and usage of Triton IDE along with Flash Magic for dumping the code to the controller by blinking on board LEDs.
2. Interface simple seven segment LED display with controller.
3. To Display "DEPT OF ECE" on LCD in 8-bit as well as 4-bit mode
4. Interface Keyboard and LCD with controller.
5. Interface Stepper Motor by controlling its direction and make it spin faster or slower.
6. Interface DC motor and control its speed using PWM technique.
7. Interface Elevator to the controller.
8. Interface Traffic Light with controller.
9. Interfacing ADC to Microcontroller.
10. Interface DAC with Microcontroller and generate multiple waveforms.
11. Interface Temperature Sensor to ADC and measure it on LCD with microcontroller.

List of Free-electives :

SUBJECT CODE	SUBJECT NAME	L-T	P	C
BM4402	Production and Project Management	4	0	3
BSBE4401	BIOINFORMATICS	4	0	3
BSBE4402	INDUSTRIAL BIOTECHNOLOGY	4	0	3
BSBE4403	BIOMEDICAL ENGINEERING	4	0	3

BSBE 4401 BIOINFORMATICS

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **3-0-0-3**

Course Objectives: To give an overview of the existing methodologies adopted in computational analysis of biological data. The main objective of the course is to stress the need for algorithm and data processing technologies for analysis and decoding the information processing of biological systems.

Course Outcome: This course improves the critical intellectual faculty required for handling and analyzing large data sets. It also stresses the need for integrating information to solve problems. The gap in resolving biological problems with the aid of core domain knowledge of different disciplines can be curtailed with the help of this course since it embarks the student with the skills to gather and integrate the required biological information. Students interested in developing algorithms and data processing technologies for analyzing biological information have huge demands since the applications of this branch play a vital role in alleviating bottlenecks in drug development.

UNIT-1: Biological Data Bases

1. Introduction to Bioinformatics -History of Bioinformatics- Internet and Bioinformatics

2. Introduction – Data base definition, data, Biological databases- Types of databases- conventions for databases indexing and specification of search terms

3. Contents and formats of database entries – retrieval of data using text based search tools – sources of data (Ex. Sequencing projects, Patent office's etc.), Method for deposition of data to databases.

4. Nucleic acid sequence databases – Genbank, EMBL, DDBJ

5. Protein sequence database – Primary sequence database. Introduction to protein information Resource (PIR)- Martinsried institute of Protein Sequence (MIPS), SWISS- PROT , Structure of SWISS- PROT Entries, Translated EMBL (TrEMBL)

6. Secondary sequence Database- Introduction to PROSITE, PROFILE, PRINTS, BLOCK, pfam and IDENTITY databases.

7. Genome Databases at NCBI, EBI, TIGR, SANGER.

8. Structural and Related Databases – PDB, NDB, CCSD, Prosite, PRODOM, Pfam, CATH, SCOP, DSSP, FSSP, DALI

UNIT-2: Sequence Analysis

9. Various file formats for Bio – molecular sequences – Genbank, FASTA, GCG, MSF, NBRF-PIR. Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, Paralogues

10. Scoring matrices- Basic concept of a scoring matrix- matrices for nucleic acid and protein sequences – PAM and BLOSUM matrices – Principles based on which these matrices are derived

11. Sequence – based Database searches- What are Sequence based database searches, BLAST and FASTA algorithms. Various versions of Basic BLAST and FASTA. Use of these methods for sequence analysis

12. Pairwise sequence Alignments- Basic concepts of sequence alignment, Needleman & Wuncsh, Smith & Waterman algorithms for Pair wise alignments – use of pair wise alignments for analysis of nucleic acid and protein sequences

13. Sequence Patterns and profiles – Basic concept and definition of sequence patterns, motifs and profiles, various types of pattern representations- namely consensus, regular expression and profiles.

14. Profile based database searches using PSI- BLAST, analysis and interpretation of profile – based searches

UNIT-3: Phylogenetic Analysis

15. Introduction – Evolution, definition of phylogenetic tree – nodes, internodes , root , tree , styles, cladogram, Phenogram, curvogram

16. Steps involved in construction of Phylogenetic tree

17. Methods of Phylogenetic analysis – Distance method, character based method

18. Tree Evaluation – Jumbling sequence addition order, Boot strap method.

19. Problems in Phylogenetic analysis- Phylogenetic analysis tool (Phylip, Clustalw,Tree view)

Unit 4: Applications of Bio Informatics

20. Chemiinformatics in Biology- conventions for representing molecules – Chemiinformatics, resources

21. Bioinformatics in Pharmaceutical industries and Medical Sciences, Immunology, Agriculture, Forestry, Geo Informatics, Bio sensing.

22. Legal, Ethical and commercial ramifications of bioinformatics

REFERENCES

1. *David E. Mount. Textbook of Bioinformatics. Cold Spring Harbor (CSH) publication.*
2. *D. Baxavenis, and B. F. F. Ouellette, Bio informatics- A Practical guide to the analysis of Genes and Proteins, 2nd ed., John Wiley and Sons Inc., 2001.*
3. *A.R Leach, Molecular Modeling: Principles and Applications, Addisons-Wesley Pub Co.1997.*
4. *P.E.Bourne and H.Weissig, Structural Bioinformatics, WILEY, 2003.*
5. *T.Lenguer, Bioinformatics-From Genome to Drug, Vols 1 and 2,Wiley-VCH,2002.*
6. *B.Brayn, Bioinformatics computing: the comlete practical guide to bioinformatics for life scientists,Prentice Hall, 2000.*
7. *Misner and S.A. Krawetz, Bioinformatics: methods and protocols,Hanuma Press,2000.*
8. *S.A. krawetz and D.D. Womble, Introduction to Bioinformatics: a theoretical and practical approach, Hanuma Press,2003.*
9. *D.Higgins and W.Taylor (ed), Bioinformatics: sequence ,structure and databanks-a practical approach, Oxford, 2000.*
10. *Prof. P.B. Kavi Kishor and L.N. Chavali, Principlesof Biological Databases, Himalaya Publishers, 2013.*

BSBE 4402 INDUSTRIAL BIOTECHNOLOGY

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **3-0-0-3**

Course Objectives:

-Discuss the significance of industrial biotechnology.

-Explain the large-scale production of biomolecules using bioreactors.

-Discuss the types of fermenters and their applications.

-Discuss upstream an downstream process for biotechnology products.

-Explain biosafety issues and automation of industrial plants.

-Discuss product validation and regulation of biotechnology products.

-Discuss industrial applications of microbes, plants, mammalians cells in biotechnology development.

UNIT-1: INTRODUCTION TO INDUSTRIAL BIOPROCESS

Fermentation - Bacterial, Fungal and Yeast, Biochemistry of fermentation. Traditional and modern Biotechnology, A brief survey of organisms, processes, products. Basic concepts of Upstream and downstream processing in Bioprocess, Bioreactors - design and types.

UNIT 2 : PRODUCTION OF PRIMARY AND SECONDAR METABOLITES

Primary Metabolites – Production of commercially important primary metabolites Like organic acids, amino acids and alcohols. Secondary Metabolites – Production processes for various classes of secondary metabolites, antibiotics, vitamins and steroids.

UNIT 3 : ENZYME BIOTECHNOLOGY AND OTHER BIOPRODUCTS

Industrial use and production of Enzymes (Cellulases, proteases Lipases etc.), immobilization of Enzymes and applications. Biosensors, Biopesticides, Biofertilizers, Biopreservatives, Biopolymers, biofuels – biogass, biodiesel, bio hydrogen, bio ethanol, microbial fuel cell technology. Biodegradable plastics, biorefineries to generate electricity.

UNIT 4: FOOD BIOTECHNOLOGY

Food preservation through canning, sterilization, pasteurization, chemicals, radiations drying and packing. Food spoilage-Biotechnology process for prevention of food spoilage. Fermented foods and pro-biotics. Microbial foods- SCP.

UNIT 5 : PRODUCTION OF MODERN BIOTECHNOLOGY PRODUCTS

Production of recombinant proteins having therapeutic and diagnostic applications, vaccines, monoclonal antibodies. Gene therapy, Bioprocess strategies in Plant Cell,Animal and microbial cell cultures.

REFERENCES:

1. *Satyanarayana, U. "Biotechnology" Books & Allied (P) Ltd., 2005.*
2. *Kuma, H.D."A Textbook on Biotechnology" Edition. Affiliated East West Press Pvt. Ltd., 1998.*
3. *Balasubramanian, D. etal. , "Concepts in Biotechnology" Universities Press Pvt.Ltd., 2004.*
4. *Ratledge, Colin and Bjorn Kristiansen "Basic Biotechnology" 2 nd Edition Cambridge University Press, 2001.*
5. *Dubey , R.C. "A Textbook of Biotechnology" S.Chand & Co. Ltd. , 2006.*
6. *Casida, L.E. "Industrial Microbiology", New Age International (P) Ltd, 1968.*
7. *Presscott, S.C. and Cecil G. Dunn, "Industrial Microbiology", Agrobios India), 2005.*
8. *Microbiology", 2 nd Edition, Panima Publishing, 2000.*
9. *Moo – Y oung, Murrey, "Comprehensive Biotechnology", 4 Vols. Ergamon Press, (An Imprint of Elsevier) 2004.*
10. *Stanbur y, P . F ., A. Whitaker and S.J. Hall "Principles of Fermentation T echnology", 2 nd Edition, Butterworth-Heinemann (an imprint of Elsevier), 1995.*
11. *C. F. A Brycean d EL.Mansi, Fermentation microbiology & Biotechnology, 1999.*
12. *K.G.Ramawat & Shaily Goyal, Comprehensive Biotechnology, 2009, S.Chand publications.*

BSBE 4403 BIOMEDICAL ENGINEERING

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **3-0-0-3**

Course Objectives:

The students will be able to

1. Interpret technical aspects of medicine.
2. Solve Engineering Problems related to medical field.
3. Understand medical diagnosis and therapy.

Course Outcomes:

On completion of this module students will be able to analyze a problem from both an engineering and biological perspective; they can anticipate the special difficulties of technological intervention in working with living systems and to evaluate a wide range of possible approaches.

Students will be able to apply their engineering domain knowledge with a biological perspective to solve the problems at the interface of engineering and biology.

Addressing the problems associated with the technological interface with living systems, students would be enabled to design a variety of electronic and/or computer-based devices and software for applications including biomedical instrumentation, medical imaging, physiological measurement, biomedical signal processing, rehabilitation engineering and medical informatics.

They will be able to make physical measurements and gather data to reflect biological activity from living systems; and aid in the analysis of biological systems, design of biomedical instruments, and the technological advancement for health care.

UNIT I: HUMAN ANATOMY & PHYSIOLOGY.

Structure and function of Cell & cellular components – Membrane Potential – Action Potential – Generation and Conduction; Overview of Cardiovascular system, Nervous System, Muscular-Skeletal System, Respiratory system, Excretory system**.**

UNIT 2: PRINCIPLES OF DIAGNOSTIC AND THERAPEUTIC EQUIPMENTS

Normal and abnormal ECG waveform, diagnosis interpretation, cardiac pacemaker, heart lung machines - need for the unit, spirometer, respiratory volume measurement, pnemograph, artificial respirator –ipr type, functioning, pulse oximetry, basic principles of echo technique, display techniques a, b, m, d modes, echo cardiograms, echo encephalogram, ultrasonic applied as diagnostic tool in ophthalmology, obstetrics and gynaecology. Principles of dialysis – Hemodialys.

UNIT 3: MEDICAL IMAGING

Introduction to medical imaging and different medical imaging modalities. Review of Signals and system, Fourier transform, Transfer functions, Hankel transform, Sampling theorem, Projection Radiography (Mammography, Fluoroscopy, Angiography etc), Nuclear Medical Imaging, Ultrasound Imaging, Magnetic Resonance Imaging.

UNIT 4: MEMS & BIOMEMS

Introduction, MEMS, micro system, sensor, actuator Material for MEMS Sensing and actuation Fabrication of MEMS, Material for MEMS, Sensing and actuation, Fabrication of MEMS and MEMS packaging.

UNIT 5: BIOSENSORS

Sensor architecture and Classification; Medically significant measurands, functional specifications of medical sensors; Sensor characteristics: linearity, repeatability, hysteresis, drift; Sensor models in the time & frequency domains. Sensors for physical measurands: strain, force, pressure, acceleration, flow, volume, temperature and biopotentials. Sensors for measurement of chemicals: Electronic eye,electronic nose and electronic tongue and their use in fermentations and breweries. Potentiometric sensors, ion selective electrodes, ISFETS; Amperometric sensors, Clark Electrode; Biosensors, Catalytic biosensors, Immunosensors.

References:

1. William R. Hendee, E. Russell Ritenour Medical Imaging Physics.
2. Jerry L. Prince, Jonathan M., Medical Imaging Signals and Systems. Pearson
3. Khandpur R.S., Hand book of Biomedical instrumentation, TMH.
4. Carr & Brown, Introduction to Biomedical Equipment,PHI.
5. J. G. Webster (Ed.): Medical Instrumentation - Application and Design; Houghton Mifflin Co., Boston, 1992.
6. R. Aston: Principles of Biomedical Instrumentation and Measurement, Merril Publishing Co., Columbus, 1990.
7. Manz and H. Becker, Eds. Microsystem Technology in Chemistry and LifeSciences Spronger-Verlag, New York, 1999.
8. Guyton and Hall, “Textbook of Medical Physiology”, Elsever

BM4006 PROJECT AND PRODUCTION MANAGEMENT

Externals: 60Marks **L-T-P-C***

Internals: 40Marks **4-0-0-3**

Course Objective:

- To make students learn about holistic approach of Project Management
- To make students learn about optimizing Production to increase the return while reducing the risk
- This course aims at helping the students to learn operations management systems and analyze issues pertaining to management of productivity, technology and facilities.
- The objective of the course is to impart the concepts, tools & techniques in formulation and analysis of projects as well as in planning, scheduling & controlling of projects.

Course Outcomes:

1. After learning this, the students will be in the position to understand and practice the process of project management and its application in delivering successful IT projects.
2. Evaluate a project to develop the scope of work, provide accurate cost estimates and to plan the various activities.
3. After learning this, students understand and use risk management analysis techniques that identify the factors that put a project at risk and to quantify the likely effect of risk on project timescales.
4. Identify the resources required for a project and to produce a work plan and resources schedule.
5. The learner will have a deep knowledge of the fundamental theory and mathematical principles involved in the Learning Curve, Line Balancing, Forecasting, Material Requirement Planning, Capacity Management, Line Balancing, Inventory, Scheduling, Staffing and Control in order to optimize operating systems.
6. The learner will have a range of skills which can be applied to any production or service system. This module will also enhance the professional and technical skills of the student Competence.

Unit I:

Introduction: Project management: an overview, Project Selection: Project Identification and Screening, Project Appraisal: Part I, Project Appraisal: Part II, Project Selection. (6 modules)

Unit II:

Project Planning and Implementation: Development of Project Network, Project Representation, Consistency and Redundancy in Project Networks, **Project Scheduling:** Basic Scheduling with A-O-A Networks, Basic Scheduling with A-O-N Networks, Project Scheduling with Probabilistic Activity Times. Project Implementation: Project Monitoring and Control with PERT /Cost, Project Completion, Review and Future Directions. (8 Modules)

Unit III:

Production Management: Introduction to Production Systems and a Generalized Model of Production, Life cycle of a Production System and Major managerial Decisions, **financial evaluation of production related decisions,** Performance Measures of a Production System, Financial Evaluation of Capital Decisions, Decision Trees and evaluation of risk. (6 Modules)

Unit IV:

Product Design, Facility Location and Layout: Introducing New Products and Services, Product Mix Decisions, **Facility location and layout:** Plant Location, Process Layouts, Product Layouts and Assembly Line Balancing, Cellular Layouts, Layouts for Advanced Manufacturing Systems. (8 Modules)

Unit V:

Production Planning: Production Planning over medium term: Demand Forecasting, Aggregate Production Planning. Operational Decisions over Short term: .Inventory related Decisions, Material Requirements Planning and Scheduling of Job Shops. (8 Modules)

REFERENCE BOOKS:

1. Elements of Production Planning and Control / Samuel Eilon.

2. Modern Production/ operation managements / Baffa & Rakesh Sarin

3. Operations Management – S.N. Chary.

4. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.

5. Reliability Engineering & Quality Engineering by Dr. C. Nadha Muni Reddy and Dr. K. Vijaya Kumar Reddy, Galgotia Publications, Pvt., Limited.

6. Operations Management / Joseph Monks.

7. Project Management, Prasanna Chandra.

Rajiv Gandhi University of Knowledge Technologies

Basar, Nirmal – 504107

B. TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

IV YEAR II SEMISTER

Subject Type	Subject Code	Subject Name	L-T	P	C
Free Elective-II			4	-	3
Compulsory	EC4000	Comprehensive Viva			1
Compulsory	EC4800	Project			16
TOTAL					

List of Free-electives:

BM4501	FOUNDATIONS OF MANAGEMENT
BM4502	ENTREPRENEURSHIP AND NEW VENTURES
BM4503	INTELLECTUAL PROPERTY RIGHTS
BSBE4501	SUSTAINABLE TECHNOLOGY
BSBE4502	PHARMACEUTICAL TECHNOLOGY
BSBE4503	BIO MATERIALS
CH4504	Computational Fluid Dynamics

BM4501 **FOUNDATIONS OF MANAGEMENT**

Externals: 60Marks **L-T-P-C***

Internals: 40Marks **4-0-0-3**

Course Objective:

- This course enables the students to learn wide range of managerial concepts and equip them to handle the management assignment in the future.

Course Contents:

1. **Development of Management Thought:** Learning objectives, Concept of management, Scientific Management-Taylor, Henry Fayol contributions, Human Relations approach-Hawthorne experiments, Approaches to Management, Ethics in management.

2.

2. **Functions of Management:** Management Processes and function: Nature and description of management process, Managerial functions: Planning, Organizing, Directing, Coordinating and Controlling. Communication process, Theories of motivation and leadership, (14 Modules)

3. Human Resource Management: Nature and Scope of Human Resource Management, Functions of HRM, Industrial Relations. (7 Modules)

4. **Marketing Management:** Marketing Environment, Consumer Markets and Buyer Behaviour, Segmentation, NPD, PLC, Marketing Mix (4Ps), Channels of Distribution. Advertising and Sales Promotion, Personal selling, Public relations. (8 Modules)

5. **Production/Operation Management:** Planning and Design of Production and Operation Systems, Facilities Planning, Location, Layout and Movement of Materials, Materials Management and Inventory Control, Maintenance management, Statistical Quality Control, TQM and ISO Certification. (7 Modules)

Suggested Reference Books:

1. Weirich, Koontz & Aryasri, *Principles of Management,* TMH, New Delhi, (2004).
2. Paul Heresy & Ken Blanchard, *Management and Organizational behavior*, PHI, New Delhi, (1995)
3. Kotler Philip, *Marketing Management*, Prentice Hall of India (1997).
4. Luthans Fred, *Human Resource Management*, McGraw Hill, (1997).
5. Stephen Robbins, O*rganizational Behaviour Concepts, Controversies and Applications*.

BM4502 ENTREPRENEURSHIP AND NEW VENTURES

Externals: 60Marks **L-T-P-C***

Internals: 40Marks **4-0-0-3**

Course Objective:

- This course enables the students to learn wide range of managerial concepts and equip them to handle the management assignment in the future.

Course Objective:

This course has two basic objectives. The first is to teach effective entrepreneurial and general management practice from the perspective of the founder and stakeholders. The second is to apply the entrepreneurial perspective in order to approach business problems from a value creation framework.

Course Contents:

1. **Introduction to Entrepreneurship:** Learning objectives, Entrepreneurship in Indian Scenario and Future prospects, Emerging economies, Entrepreneurial traits, motivation and leadership (7Modules)

2. **Entrepreneurial Process:** Opportunity Identification, Idea Generation and Evaluation. (6 Modules)

3. **Business Model:** Business Plan, Business Models (Creating a business model with technology differentiators) (5 Modules)

4. **Financing Venture**: Funding, Valuation of a new company, Marketing, Company Growth, Acquisitions and Exit Strategies. (6 Modules)

5. **Building the Team and IPR:** Launching and managing venture, Human resource aspects. Intellectual Property and Corporate Law. (12 Modules)

Suggested Reference Books:

1. Kuratko & Hodgetts, *Entrepreneurship-Theory, Process Practice*, Thompson South-Western Publication, (2008).
2. Holt, *Entrepreneurship – New Venture Creation*, PHI Publication, (1992).
3. Kawasaki, *The Art of the Start*, Portfolio Publication, (2004).
4. Lusk & Harrison, *The Mouse Driver Chronicles: The True-Life Adventures of Two First-Time Entrepreneurs*, Perseus Books Group, (2002).
5. Dorf & Byers, *Technology Ventures: From Idea to Enterprise*, McGraw Hill Publication, (2010).
6. Kaplan, Startup: *A Silicon Valley Adventure*, Penguin Books, (2001).

BM4503 **INTELLECTUAL PROPERTY RIGHTS**

Externals: 60Marks **L-T-P-C***

Internals: 40Marks **4-0-0-3**

Course Objective:

- This course enables the students to learn wide range of managerial concepts and equip them to handle the management assignment in the future.

Course Objective: This course aims at helping the students to learn legalities of intellectual property to avoid plagiarism and other IPR relates crimes like copyright infringements.

Course Contents:

1. **Introduction to IPR:** Meaning of Intellectual Property, Nature of I.P, Protection of IP Rights, Kinds of I.P rights, International Conventions on Intellectual Property Rights-patent treaty 1970, GATT1994, TRIPS &TRIMS, International Organisation for Protection of IPR-WTO, WIPRO, UNESCO.

2. **Patent Rights:** Meaning of patent, commercial significance, Obtaining patent, patentable subject, rights and obligations of patentee, Registration of patents, compulsory licensing and licenses of rights, revocation.

3. **Industrial designs**: Definitions of Designs, Registration of Designs, rights and duties of proprietor of designs, piracy of registered designs.

4. **Introduction and significance of Trademarks**: Meaning of Trademark, purpose of protecting Trademarks, Registered Trademarks, procedure, passing off, assignment and licensing of Trademarks, Infringement of Trademarks.

5. **Nature of scope of Copy Right**: Subject matter of Copy Right, Right conferred by copyright publication, Board- Casting and telecasting, Computer programme, database right, Assignment and Transmission of Copyright, Infringement of copy right.

Suggested Readings:

1. Cornish.W.R, “Intellectual Property Patents”, Copy Right and Trademarks and Allied rights, Sweet&Maxwell 1993.
2. P. Narayanan: Intellectual Property Law, Eastern Law House, 2nd edn 1997.
3. Roy Chowdhary, S.K. & Other:Law of Trademark, Copyrights, Patents and Designs, Kamal Law House, 1999.
4. Dr. G.B. Reddy,Intellectual Property Rights and the Law 5th Ed. 2005 GogiaLaw Agency.
5. B.L. Wadhera: Intellectual Property Law, Universal Publishers, 2nd Ed. 2000.

BSBE 4501 SUSTAINABLE TECHNOLOGIES

Externals: 60 Marks L-T-P-C
Internals: 40 Marks 3-0-0-3

Course Objectives:
To give an overview of existing technologies and their associated problems. The main objective of the course is to stress on the need of innovation in development of sustainable technologies.

Course Outcome:
This paper sets out to discuss the commonalities that can be found for sustainable development. The commonalities include systemic or holistic thinking, the integration of different perspectives, skills such as critical thinking, diverse attitudes and values. Student will get the knowledge to resolve the environmental problems of the planet, work towards community-oriented problems with coherent and inferential problem solving skills.

UNIT 1: DRAW BACKS OF CURRENT TECHNOLOGIES

Environmental degradation, financial constraints, social issues with automation in technology, extinction of fossil fuels, risks involved in operations. Global environmental issues- Resource degradation, Climate change (Carbon credits and carbon trading, carbon foot print), Global warming, Ozone layer depletion, Regional and Local Environmental Issues.

UNIT 2: ENVIRONMENT REMEDIATION

Environment Impact Assessment (EIA) - Procedures of EIA in India, Physical and Chemical technologies for reclamation, Need for ecosystem restoration, Bioremediation.

Alternative Hirarchy Process (AHP), Selection of best technology using AHP, Alternative resources and technologies, resource recovery from waste, energy recovery from waste, Sustainable Development vs Environmental Engineering - Energy Issues.

UNIT 3: SUSTAINABLE TECHNOLOGIES

Sustainability - Introduction, Need and concept of sustainability; People, planet and profit; Social, environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols - Clean Development Mechanism (CDM), Green technologies.

UNIT 4: BIOMIMICRY

Defining biomimicry, why biomimicry matters? Biomimicry examples - Bioplastics, biomaterials, bioluminescence for LED's, neural networks, swarm intelligence, aerodynamics for automobile engineering, DNA computing.

UNIT 5: BIOLOGICAL RESOURCES FOR SUSTAINABILITY

Organic Farming for sustainable agriculture, Microbial leaching of low grade mineral ores, Bioelectricity (Microbial fuel cells), Biomagnetism (for therapy), Biofuels (for energy), Microbial engineering for cleaning environmental pollution, biosynthesis of industrial products.

Reference:

1. *Perspectives on Sustainable Technology- M. Rafiqul Islam*

2. Sustainable Energy Consumption and Society- David L. Goldblatt

3. Sustainable development (energy, engineering and technologies, manufacturing and environment) - Chaouki Ghenai

4. Sustainability and Environmental Impact of Renewable Energy Sources - R. E. Hester, R. M. Harrison

5. Sustainable Natural Resources Management - Prof. Abiud Kaswamila.

6. Sustainable Communities Design Handbook - Woodrow W. Clark

7. Handbook of Bioplastics and Biocomposites Engineering Applications - Srikanth Pilla

8. Modeling & Imaging of Bioelectrical Activity: Principles and Applications (Bioelectric Engineering) - Bin He

9. Handbook of Swarm Intelligence: Concepts, Principles and Applications – YuhuiShi, Meng- Hiot Lim, Bijaya ketan Panigrahi.

10. DNA Computing and Molecular Programming - DNA 16 – Yasubumi sakkibara, yongli Mi

11. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.

12. Bradley. A.S; Adebayo,A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning .

13. Environment Impact Assessment Guidelines, Notification of Government of India, 2006

14. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998 .

15. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System

16. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill Professional.

17. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).

18. Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios publication.

19. Biomimicry: Innovation Inspired by Nature by Janine Benyus.

BSBE 4502 PHARMACEUTICAL TECHNOLOGY

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **3-0-0-3**

Course Objectives:

Pharmaceutical Technology course is designed to educate chemical engineer students and provide them with the skills required to work in the pharmaceutical field, with particular emphasis on the engineering aspects of drug manufacturing, pharmaceutical production, pharmaceutical development, and pharmaceutical operations.

Course Outcomes:

Upon completion of the program, students will be able to:

-Apply in-depth knowledge and practical skills for formulation and process manufacturing of

chemical and biological drugs into a range of pharmaceutical dosage forms, ranging from tablets to injectables.

-Demonstrate that they have gained practical skills in instrumental analysis, clinical testing and quality control of drugs.

-Evaluate therapeutic management of diseases based on knowledge of drug design, pharmacokinetics and pharmacotherapy.

-Demonstrate their ability to solve problems and suggest pharmological interventions in health issues related to the local community.

-Demonstrate their ability to conduct healthcare related research.

-Demonstrate the acquired skills and knowledge expertise in communication and coordinate activites with other health providers and beneficiaries.

-Integrate the necessary knowledge and skills quickly into the industrial environment and to operate effectively in production processes.

-Understand the regulatory and quality compliance of pharmaceuticals in the process of drug development and manufacturing.

UNIT 1: PREFORMULATION STUDIES

Introduction, Consideration of physicochemical properties of new drug molecules for different dosage forms. Aqueous solubility, organic solubility, intrinsic solubility, methods of enhancement of solubility-surfactants, pH, co-solvency, solid dispersion, complexation. Techniques for the study of crystal properties and polymorphism - DSC, TGA, PXRD, Optical microscopy, hot stage microscopy.

UNIT 2: PHARMACEUTICAL EXCIPIENTS & POLYMERS

Factors affecting the selection of excipients, drug-excipient interactions, Study of cyclodextrins, ion exchange resins, film coating materials, super-disintegrants, directly compressible vehicles, surfactants and thickeners. Co-processed excipients. Excipient compatibility studies

Polymer classification-biodegradable, synthetic, semi-synthetic and natural polymers. Hydrogels and their applications.

UNIT 3: FORMULATION TECHNOLOGY

Tablet technology: Compression, consolidation, decompression, compaction at high loads, forces distribution during compression, compaction profiles, measurement of forces during compression, energy involved in compaction, properties of granules of compression, influence of compression force on the properties of tablets.

Capsule technology: Manufacturing equipment and machinery used in capsule technology. Formulation and evaluation of hard gelatin capsules and soft gelatin capsules.

Parenterals technology: Manufacturing of LVP, SVP, Sterilization and sterility testing of parenterals, GMP & c GMP regulations of parenteral technology.

UNIT 4: STABILITY TESTING - DRUGS AND DOSAGE FORMS

Solid state drug stability, dosage form stability, accelerated stability testing, shelf life calculations, strategies for prolonging shelf life. Effect of packaging materials on dosage form stability. Basic principles of ICH, stability testing of new drug substance and formulations, photostability testing and oxidative stability, role of containers in stability testing. WHO stability guidelines.

UNIT 5: CONCEPTS OF CONTROLLED RELEASE DRUG DELIVERY SYSTEMS

Introduction, concept, advantages & disadvantages. Factors to be considered for designing controlled release dosage forms. Dissolution, Diffusion, Combination of dissolution and diffusion controlled drug delivery systems. Classification of rate-controlled drug delivery systems. Rate-programmed release, activation-modulated and feedback regulated drug delivery systems. Effect of system parameters on controlled drug delivery. Hydrodynamically balanced systems, Osmotic pressure controlled, pH controlled, ion exchange controlled systems

REFERENCE BOOKS

1) Lieberman HA and Lachman L. Pharmaceutical Dosage Forms: Tablets. Vol. I, II and III, Marcel Dekker, New York. Latest Edition.

2). Avis KE, Lachman L and Lieberman HA, Pharmaceutical Dosage Forms: Parenterals. Volume I and II, Marcel Dekker, New York. Latest Edition.

3) Robinson and Lee, Controlled drug delivery: Fundamentals and applications, Marcel Dekker.

4) Carstensen, Pharmaceutical principles of solid dosage forms, CRC.

5) Ray and Weller, Handbook of Pharmaceutical Excipients, Pharmaceutical Press.

BSBE 4503 **BIOMATERIALS**

Externals: 60 Marks **L-T-P-C**
Internals: 40 Marks **3-0-0-3**

Course Objectives:

After successfully completing this course, students will be able to:

1. Understand the fundamental principals in biomedical engineering, material science and chemistry, and how they contribute to biomaterial development and performance.

2. Understand the material selection and structure-function relationships

3. Lists the different strategies to modify and/or design materials that are biocompatible.

Course Outcomes

On completion of this course students should be able to:

- Demonstrate in-depth knowledge of the mechanical and biological properties of both natural and synthetic biomaterials and thereby implicate its behavior with biological system.

- Describe the role of adsorbed proteins and cells in the tissue response to biomaterials.

- Demonstrate an understanding of the host response to orthopedic biomaterials and be able to compare the responses to different materials.

- Describe the methods of testing for biomaterials biocompatibility.

- Distinguish the events that lead to the degradation of materials in the biological environment.

- Demonstrate an understanding of implant failure from a biological perspective.

-Appreciate the complex mechanical and biological interactions between biomaterials and biological systems

-Demonstrate an in-depth knowledge of the application of biomaterials (both natural and synthetic) in orthopedics, dental, cardiovascular, drug delivery and various system repairing activities of a human body.

UNIT 1. INTRODUCTION TO THE BACKGROUND CONCEPTS OF BIOLOGY, BIOCHEMISTRY AND MEDICINE.

Concepts of cells, proteins and their interaction with the biomaterial, Structure and properties of different classes of biomaterials; Interactions of materials with the human body; Criteria for selection of biomaterials for specific medical applications, Concepts of Biocompatibility, mechanical properties of biomaterials, corrosion and biodegradation, evaluation of biomaterials.

UNIT 2. METALS AND ITS COMPOSITES.

Surface interaction with the cells; Classes of metals & metal composites; Applications of metals & metal composites; Biocompatibility testing's and evaluation of metals and its composites.

UNIT 3. CERAMICS AND ITS COMPOSITES.

Surface interaction with the host cells; Classes of Ceramics and its composites; Applications of Ceramics and its composites; Biocompatibility testing's and evaluation of Ceramics and its composites.

UNIT 4. POLYMERS AND ITS COMPOSITES.

Surface interaction with the cells, classes of polymers and its composites; Applications of polymers and its composites; Biocompatibility testing's and evaluation of polymers and its composites.

UNIT 5. BIOMEDIACAL APPLICATIONS OF BIO MATERIALS.

Nanostructure biomaterials, Orthopedic implants, dental implants, vascular grafts, ocular materials, drug delivery carriers, introduction to tissue regeneration scaffolds.

.**Texts & References**

- Ratner B, Hoffman A. et al. Biomaterials science: An introduction to materials in medicine, Academic Press, 2004
- Fredrick H. Silver: Biomaterials, Medical Devices & Tissue Engineering: An integrated approach. Chapman & Hall, 1994

CH4504 COMPUTATIONAL FLUID DYNAMICS

Externals: 60 Marks **L-T-P-C**

Internals: 40 Marks **4-0-0-3**

Course Objective:

- To be able to apply to apply the conservation laws to fluids in motion under different conditions
- To learn modeling of fluid flow under different conditions
- To learn how to convert differential equations to difference equations and to learn grid generation methods
- To simulate the model

Unit-1 Conservation Laws And Turbulence Models

Governing equations of fluid flow and heat transfer –mass conservation, momentum and energy equation, differential and integral forms, conservation and non-conservation form. Characteristics of turbulent flows, time averaged Navier Strokes equations, turbulence models-one and two equation, Reynolds stress, LES and DNS

Unit-2 Finite Differnce Approximation

Mathematical behaviour of PDE, finite difference operators, basic aspects of discretization by FDM, explicit and implicit methods, error and stability analysis

Unit-3 Finite Volume Method

Diffusion problems – explicit and implicit time integration; Convection-diffusion problems – properties of discretisation schemes, central, upwind, hybrid, QUICK schemes; Solution of discretised equations.

Unit-4 Flow Field Computation

Pressure velocity coupling, staggered grid, SIMPLE algorithm, PISO algorithm for steady and unsteady flows

Unit-5 Grid Generation

Physical aspects, simple and multiple connected regions, grid generation by PDE solution,

grid generation by algebraic mapping.

Text Books:

1. Computational Fluid Dynamics: The Basics with Applications, Anderson, J. D., McGraw-Hill, 1995.
2. Computational Techniques for Fluid Dynamics, Fletcher, C. A. J., Springer Verlag, 1997.

References:

1. An Introduction to Computational Fluid Dynamics:The Finite Volume Method, Versteeg, H.K. and Malalasekera, W.,Pearson Education Ltd., 2007.
2. Computational Fluid Dynamics, Chung T.J , Cambridge University Press 2003.
3. Computational Fluid Flow and Heat Transfer, Muralidhar, K., and Sundararajan, T., Narosa Publishing House, New Delhi, 2001.
4. Numerical heat transfer fluid flow, Subas, V. Patankar Hemisphere Publishing Corporation, 1980.

EC4800 **PROJECT**

Externals: 60 Marks **L-T-P-C**

Internals: 40 Marks **0-0-0-12**

Student has to do literature review on the chosen/allotted area of project work and must submit a report.

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