DEPARTMENT OF
ELECTRONICS AND COMMUNICATION ENGINEERING

CBCS
CURRICULUM
&
SYLLABUS

(Applicable for Students admitted from Academic Year 2015-16)

B. Tech.
ELECTRONICS AND COMMUNICATION ENGINEERING
VISION

The Vision of the ECE Department is to offer holistic quality education in the field of Electronics and Communication with focus on research.

MISSION

The Mission of the ECE Department is to transform the students into professional engineers, develop their interdisciplinary skills as per the need of the society and inculcate Entrepreneurship skills among the students.

PROGRAM EDUCATIONAL OBJECTIVES

PEO-1 To provide students with a strong foundation in the Mathematical, Scientific and Engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies, R&D, consultancy and higher learning.

PEO-2 To provide exposure to emerging cutting edge technologies, adequate training & opportunities to work as teams on multidisciplinary projects with effective communication skills and leadership qualities.

PEO-3 To prepare the students for a successful career and work with values & social concern, bridging the digital divide and meeting the requirements of Indian and multinational companies.

PEO-4 To promote student awareness on life-long learning and to introduce them to professional ethics and codes of professional practice.

PROGRAM OUTCOMES

PO1. An ability to apply knowledge of fundamentals of mathematics, science, and engineering.

PO2. An ability to identify, formulate and solve Electronics and Communication Engineering problems.

PO3. An ability to understand and correctly interpret the impact of engineering solutions in a social/global context.

PO4. An ability to use research approaches for problem analysis and design.

PO5. An ability to skillfully use modern engineering tools and techniques necessary for engineering design, analysis and applications.

PO6. Ability to apply contextual knowledge relevant to professional engineering practices.

PO7. Understand the need for sustainable development and impact of professional engineering solutions in societal and environmental context.

PO8. Understanding of professional and ethical responsibility.

PO9. An ability to function and/or develop leadership in multi-disciplinary teams.

PO10. Ability to communicate effectively.

PO11. Ability to apply engineering and management principles to manage projects.

PO12. An ability to engage in life-long learning to follow developments in electronics and communication engineering.
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#### Professional Elective Courses - PE for B.Tech (ECE) Regular

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### Open Electives

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#Project
GOAL

The goal of the programme is to provide a theoretical input towards nurturing accomplished learners who can function effectively in the English language skills; to cultivate in them the ability to indulge in rational thinking, independent decision-making and lifelong learning; to help them become responsible members or leaders of the society in and around their workplace or living space; to communicate successfully at the individual or group level on engineering activities with the engineering community in particular, and on multi-disciplinary activities in general, with the world at large.

OBJECTIVES

The course should enable the students to:

1. Widen the capacity of the learners to listen to English language at the basic level and understand its meaning.
2. Enable learners to communicate in an intelligible English accent and pronunciation.
3. Assist the learners in reading and grasping a passage in English.
4. Learn the art of writing simple English with correct spelling, grammar and punctuation.
5. Cultivate the ability of the learners to think and indulge in divergent and lateral thoughts.

OUTCOME

The students should be able to:

1. Have the self-confidence to improve upon their informative listening skills by an enhanced acquisition of the English language.
2. Speak English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.
3. Read, comprehend and answer questions based on literary, scientific and technological texts.
5. Have the confidence to develop thinking skills and participate in brainstorming, mind-mapping, audiovisual activities, creative thinking and also answer tests in the job-selection processes.

UNIT I LISTENING SKILL

Listening to the sounds, silent letters & stress in English words & sentences - Listening to conversation & telephonic conversation -- Listening for general meaning & specific information -- Listening for positive & negative comments - Listening to technical topics - Listening to prose & poetry reading - Listening exercises.
Embedded language learning: Sentence definition -- Spelling & punctuation -- Imperative form Sequencing of sentences -- Gerunds -- Infinitives -- ‘Wh’-questions.

UNIT II SPEAKING SKILL

Self-introduction - Expressing personal opinion - Dialogue - Conversation - Simple oral interaction - Speaking on a topic -- Expressing views for & against -- Speaking on personal topics like hobbies, topics of interest, present & past experiences, future plans - Participating in group discussions, role plays, debates, presentations, power-point presentations & job-interviews.

UNIT III READING SKILL

Reading anecdotes, short stories, poems, parts of a novel, notices, message, time tables, advertisements, leaflets, itinerary, content page - Reading pie chart & bar chart -- Skimming and scanning -- Reading for contextual meaning - Scanning for specific information -- Reading newspaper & magazine articles - Critical reading -- Reading-comprehension exercises.

Embedded language learning: Tenses - Active and passive voice -- Impersonal passive -- Words and their function -- Different grammatical forms of the same word.

UNIT IV WRITING SKILL

Writing emails, notes, messages, memos, notices, agendas, advertisements, leaflets, brochures, instructions, recommendations & checklists -- Writing paragraphs -- Comparisons & contrasts Process description of Flow charts - Interpretation of Bar charts & Pie charts - Writing the minutes of a meeting -- Report writing -- Industrial accident reports -- Letter-writing -- Letter to the editors - Letter inviting & accepting or declining the invitation - Placing orders - Complaints -- Letter requesting permission for industrial visits or implant training, enclosing an introduction to the educational institution -- Letters of application for a job, enclosing a CV or Resume - Covering letter.

Embedded language learning: Correction of errors - Subject-verb Concord -- Articles - Prepositions - Direct and indirect speech.

UNIT V THINKING SKILL

Eliciting & imparting the knowledge of English using thinking blocks - Developing thinking skills along with critical interpretation side by side with the acquisition of English -- Decoding diagrams & pictorial representations into English words, expressions, idioms and proverbs.

Embedded language learning: General vocabulary -- Using expressions of cause and effect - Comparison & contrast -- If-conditionals -- Expressions of purpose and means.

REFERENCES

The course is aimed at developing the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subject and make use of MATLAB software to visualize the application of the concepts learnt.

OBJECTIVES

- To find out algebraic Eigen value problems from practical areas and obtain the Eigen solutions in certain cases using MATLAB.
- To diagonalize a matrix which would render the Eigen solution procedure very simple.
- To understand effectively the basic concepts of differentiation and partial differentiation and their applications.
- To understand effectively the methods of integration and their applications.
- To solve differential equations of certain type, that they might encounter in the same or higher semesters.
- To find the values and the expansions of trigonometric and hyperbolic functions using MATLAB

OUTCOME

- Visualized the Cayley-Hamilton theorem, Diagonalization of Matrix, Taylor’s series, Maxima and Minima of functions of two variables, integration- Area, volume, surface and Hyperbolic function using MATLAB.
- Functions and their interesting properties in science and engineering using MATLAB is the outcome of this paper

UNIT I MATRICES

12(8+4)

Characteristic equation – Eigen values and Eigen vectors – Properties - Cayley Hamilton theorem (Statement only) – Verification and inverse using Cayley Hamilton theorem- Diagonalization of matrices using similarity transformation.
Lab: Eigen values and Eigen vectors, Verification and inverse using Cayley Hamilton theorem- Diagonalisation

UNIT II    DIFFERENTIAL CALCULUS
12(8+4)


Lab: Taylor’s series – Maxima and minima of functions of two variables

UNIT III    INTEGRAL CALCULUS
12(8+4)

Integration – Methods of integration – Substitution method - Integration by parts – Integration using partial fraction - Bernoulli’s formula. Applications of Integral Calculus: Area, Surface area and Volume.

Lab: Applications of Integral Calculus: Area, Surface area and Volume.

UNIT IV    ORDINARY DIFFERENTIAL EQUATIONS
12(8+4)

Second order differential equations with constant coefficients – Particular integrals – $e^{ax}$, $\sin ax, \cos ax, ax^m$, $e^{ax}$ Cos bx, $e^{ax}$ Sin bx. Solutions of homogeneous differential equations with variable coefficients - Variation of parameters.

Lab: Solution of Second order differential equations.

UNIT V    TRIGONOMETRY
12(8+4)

Expansions of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ where $n$ is appositive integer. Expansions of $\sin^m \theta$, $\cos^m \theta$, $\sin^m \theta \cos^n \theta$ in terms of sines and cosines of multiples of $\theta$ where $m$ and $n$ are positive integers. Expansions of $\sin \theta \cdot \cos \theta$, $\tan \theta$. Hyperbolic functions - Relation between trigonometric and hyperbolic functions - Inverse hyperbolic function.

Lab: Expansions of $\sin \theta$, $\cos \theta$, $\tan \theta$ and $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ and hyperbolic functions.

TOTAL: 60

TEXT BOOK:


REFERENCES
PHA101 ENGINEERING PHYSICS

L T P C
3 0 0 3

To impart fundamental knowledge in various fields of Physics and its applications.

OBJECTIVES

The course should enable the students to:

1. Develop strong fundamentals of properties and behaviour of the materials
2. Enhance theoretical and modern technological aspects in acoustics and ultrasonics.
3. Enable the students to correlate the theoretical principles with application oriented study of optics.
4. Provide a strong foundation in the understanding of solids and materials testing.
5. Enrich the knowledge of students in modern engineering materials.

OUTCOME

The students should be able to:

1. Understand the properties and behaviour of materials.
2. Have a fundamental knowledge of acoustics which would facilitate in acoustical design of buildings and on ultrasonics and be able to employ it as an engineering tool.
3. Understand the concept, working and application of lasers and fiber optics.
4. Know the fundamentals of crystal physics and non destructive testing methods.
5. Have an understanding of the production, characteristics and application of the new engineering materials. This would aid them in the material selection stage.

UNIT I PROPERTIES OF MATTER

UNIT II ACOUSTICS AND ULTRASONICS

Classification of sound - characteristics of musical sound - intensity - loudness - Weber Fechner law - Decibel - Reverberation - Reverberation time, derivation of Sabine's formula for reverberation time(Jaeger's method) - absorption coefficient and its determination - factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics - production - Magnetostriiction and Piezoelectric methods - properties - applications of ultrasonics with particular reference to detection of flaws in metal (Non - Destructive testing NDT) - SONAR.

UNIT III LASER AND FIBRE OPTICS


UNIT IV CRYSTAL PHYSICS AND NON-DESTRUCTIVE TESTING

Crystal Physics: Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - 'd' spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - coordination number - Packing factor for SC, BCC, FCC and HCP structures.

Non Destructive Testing: Liquid penetrate method - Ultrasonic flaw detection - ultrasonic flaw detector (block diagram) - X-ray Radiography - Merits and Demerits of each method.

UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS


Superconducting Materials: Superconducting phenomena - Properties of superconductors - Meissner effect - Type I and Type II superconductors - High Tc superconductors (qualitative) - uses of superconductors.

TOTAL : 45

TEXT BOOKS


REFERENCES

5. P. Charles, Poople and Frank J. Owens, Introduction to Nanotechnology, Wiley India,

**CYA101 ENGINEERING CHEMISTRY**

To impart basic principles of chemistry for engineers.

**OBJECTIVES**

The course should enable the students to

1. Make the students conversant with the basics of
   (a) Water technology  And  (b) Polymer science
2. Provide knowledge on the requirements and properties of a few important engineering materials.
3. Educate the students on the fundamentals of corrosion and its control.
4. Give a sound knowledge on the basics of a few significant terminologies and concepts in thermodynamics.
5. Create an awareness among the present generation about the various conventional energy sources.

**OUTCOME**

The students should be able to

1. Gain basic knowledge in water analysis and suitable water treatment method.
2. Get an idea on the type of polymers to be used in engineering applications.
3. Get awareness about new materials
4. Get knowledge on the effects of corrosion and protection methods will help the young minds to choose proper metal / alloys and also to create a design that has good corrosion control.
5. Get exposure on the important aspects of basic thermodynamics will be able to understand the advanced level thermodynamics in engineering applications.
6. Get a good background on the various aspects of energy sources will create awareness on the need to utilize the fuel sources effectively and also for exploring new alternate energy resources.

**UNIT I WATER TECHNOLOGY AND POLYMER CHEMISTRY**

Hardness (Definition, Types, Units) - problems - Estimation of Hardness (EDTA Method) - Water softening - Carbonate conditioning and Calgon conditioning - Demineralization (Ion-Exchange Method) - Water Quality Parameters - Municipal Water Treatment- Desalination - Reverse Osmosis.

Classification of Polymers - PVC, Bakelite - preparation, properties and applications - Effect of Polymer Structure on Properties - Compounding of Plastics- Polymer Blends and Polymer Alloys Definition, Examples

**UNIT II ENGINEERING MATERIALS**
Properties of Alloys - Heat Treatment of Steel - Polymer Composites - types and applications Lubricants - Classification, properties and applications - Mechanism of Lubrication - MoS2 And Graphite - Adhesives - classification and properties - Epoxy resin (Preparation, properties and applications) - Refractories - Classification, Properties and General Manufacture - Abrasives Classification , Properties and Uses - Carbon nano tubes - preparation, properties and applications.

UNIT III ELECTROCHEMISTRY AND CORROSION

Conductometric Titration - HCl vs NaOH and mixture of acids vs NaOH - Electrochemical Series and its applications - Nernst Equation - problems - Polarization, Decomposition Potential, Over-voltage (definitions only) - Galvanic series - Corrosion (Definition, Examples, effects) - Mechanism of Dry Corrosion and Wet Corrosion - Differential aeration Corrosion, examples - Factors Influencing Corrosion - Metal and Environment - Corrosion Control - Design -Cathodic Protection methods - Protective Coatings - Galvanising - Anodising - Electroplating (Cu and Ni) and Electroless plating (Cu and Ni) Constituents of Paints and varnish.

UNIT IV CHEMICAL THERMODYNAMICS


UNIT V FUELS AND ENERGY SOURCES


TOTAL : 45

TEXT BOOKS


REFERENCES

1. B. K. Sharma, Engineering chemistry, Krishna Prakasham Media (P) Ltd., 2003
3. A. Gowarikar, Text Book of Polymer Science, 2002
4. Kuriacose & Rajaram, Vols. 1 & 2, Chemistry in Engineering and Technology, 2004
# CSA101 COMPUTER PROGRAMMING

<table>
<thead>
<tr>
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<th>L</th>
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</table>

## GOAL

To introduce computers and programming and to produce an awareness of the power of computational techniques that are currently used by engineers and scientists and to develop programming skills to a level such that problems of reasonable complexity can be tackled successfully.

## OBJECTIVES

The course should enable the students to:

1. Learn the major components of a Computer system.
2. Learn the problem solving techniques.
3. Develop skills in programming using C language.

## OUTCOMES

The student should be able to:

1. Understand the interaction between different components of Computer system and number system.
2. Devise computational strategies for developing applications.
3. Develop applications (Simple to Complex) using C programming language.

## UNIT I  COMPUTER FUNDAMENTALS  9


## UNIT II  COMPUTER PROGRAMMING AND LANGUAGES  9


## UNIT III  PROGRAMMING WITH C  9

Introduction to C - The C Declaration - Operators and Expressions - Input and Output in C - Decision Statements - Loop Control Statements.

## UNIT IV  FUNCTIONS, ARRAYS AND STRINGS  9

Functions - Storage Class - Arrays - Working with strings and standard functions.

## UNIT V  POINTERS, STRUCTURES AND UNION  9

Pointers - Dynamic Memory allocation - Structure and Union - Files.

**TOTAL : 45**

## TEXT BOOK

REFERENCES

CSA131 COMPUTER PROGRAMMING LABORATORY
(Common to all branches)

<table>
<thead>
<tr>
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<td>0</td>
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GOAL
To provide an awareness to develop the programming skills using computer languages.

OBJECTIVES
The course should enable the students to:
1. To gain knowledge about Microsoft office, Spread Sheet.
2. To learn a programming concept in C.

OUTCOME
The students should be able to
1. Use MS Word to create document, table, text formatting and Mail merge options.
2. Use Excel for small calculations using formula editor, creating different types of charts and including pictures etc.
3. Write and execute the C programs for small applications.

LIST OF EXPERIMENTS

a) Word Processing
1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
4. Drawing- flow Chart

b) Spread Sheet
5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document

c) Programming in C
8. To write a C program to prepare the electricity bill.
9. Functions
   (a) Call by value   (b) Call by reference.
10. To write a C program to print the Fibonacci series for the given number.
11. To write a C program to find the factorial of number using recursion.
12. To write a C program to implement the basic arithmetic operations using Switch Case statement.
13. To write a C program to check whether the given number is an Armstrong number.
14. To write a C program to check whether the given string is a Palindrome.
15. To write a C program to create students details using Structures.
16. To write a C program to demonstrate the Command Line Arguments.
17. To write a C program to implement the Random Access in Files.
18. To write C programs to solve some of the Engineering applications

TOTAL : 45

HARDWARE/SOFTWARE REQUIRED FOR BATCH OF 30 STUDENTS

HARDWARE
LAN system with 33 nodes (OR) Standalone PCs - 33 Nos
Printers - 3 Nos

SOFTWARE
OS - Windows / UNIX
Application package - MS office
Software - C language

GEA131 ENGINEERING PRACTICE LABORATORY - I
( Common to all branches )

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<td>1</td>
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</table>

GOAL
To provide the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

OBJECTIVES
The course should enable the students to
1. Relate theory and practice of basic Civil and Mechanical Engineering
2. Learn concepts of welding and machining practice
3. Learn concepts of plumbing and carpentry practice

OUTCOMES
The students should be able to
1. Identify and use of tools, Types of joints used in welding, carpentry and plumbing operations.
2. Have hands on experience on basic fabrication techniques such as carpentry and plumbing practices.
3. Have hands on experience on basic fabrication techniques of different types of welding and basic machining practices.
LIST OF EXPERIMENTS

I. MECHANICAL ENGINEERING PRACTICE

1. Welding
   Arc welding: Butt joints, Tee and lap joints.

2. Basic Machining
   Facing, turning, threading and drilling practices using lathe and drilling operation with vertical drilling machine.

3. Machine assembly practice
   Study of centrifugal pump

4. Study on
   a. Smithy operations - Productions of hexagonal headed bolt.

II. CIVIL ENGINEERING

1. Basic pipe connection using valves, couplings, unions, reducers, elbows in household fitting.
2. Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.
3. Wood work: Sawing, Planning and making common joints.
4. Study of joints in door panels, wooden furniture.

TOTAL : 45

Reference:

List of equipment and components
( For a Batch of 30 Students )

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:
   (a) Rotary Hammer 2 Nos
   (b) Demolition Hammer 2 Nos
   (c) Circular Saw 2 Nos
   (d) Planer 2 Nos
   (e) Hand Drilling Machine 2 Nos
   (f) Jigsaw 2 Nos
MECHANICAL
1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner One each.

ELA131 COMMUNICATION SKILLS LABORATORY 1

<table>
<thead>
<tr>
<th>L</th>
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<th>P</th>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
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</tbody>
</table>

GOAL
The goal of the programme is to provide a practical input towards nurturing accomplished learners who can function effectively in the English language skills.

OBJECTIVES
The course should enable the students to
1. Extend the ability of the learners to be able to listen to English and comprehend its message.
2. Enable the learners to have a functional knowledge of spoken English.
3. Assist the learners to read and grasp the meaning of technical and non-technical passages in English.
4. Help the learners develop the art of writing without mistakes.
5. Expand the thinking capability of the learners so that they would learn how to view things from a different angle.

OUTCOME
The students should be able to
1. Listen to and evaluate English without difficulty and comprehend its message.
2. Develop a functional knowledge of spoken English so as to use it in the institution and at job interviews.
3. Read and comprehend the meaning of technical and non-technical passages in English.
4. Develop the art of writing so as to put down their thoughts and feelings in words.
5. Think independently and contribute creative ideas.

UNIT I LISTENING SKILL
Listening to conversations and interviews of famous personalities in various fields -- Listening practice related to the TV -- Talk shows -- News -- Educatively programmes -- Watching films for critical comments -- Listening for specific information -- Listening for summarizing information -- Listening to monologues for taking notes -- Listening to answer multiple-choice questions.

UNIT II SPEAKING SKILL
Self-introduction -- Group discussion -- Persuading and negotiating strategies -- Practice in dialogues -- Presentations based on short stories / poems -- Speaking on personal thoughts and feelings --
academic topics - News reading - Acting as a compere -- Speaking about case studies on problems and solutions - Extempore speeches.

UNIT III READING SKILL
Reading anecdotes to predict the content - Reading for interpretation -- Suggested reading -- Short stories and poems -- Critical reading - Reading for information transfer - Reading newspaper and magazine articles for critical commentary - Reading brochures, advertisements, pamphlets for improved presentation.

UNIT IV WRITING SKILL
At the beginning of the semester, the students will be informed of a mini dissertation of 1000 words they need to submit individually on any non-technical topic of their choice. The parts of the dissertation will be the assignments carried out during the semester and submitted towards the end of the semester on a date specified by the department. This can be judged as part of the internal assessment.

UNIT V THINKING SKILL
Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms and proverbs - Inculcating interest in English using thinking blocks. Making pictures and improvising diagrams to form English words, phrases and proverbs -- Picture reading

REFERENCES

Websites for learning English
3. Intercultural: English Listening Lesson Library Online http://www.elllo.org/
## List of Experiments

<table>
<thead>
<tr>
<th>S.No.</th>
<th>List of Experiments</th>
<th>Batch 2 (30)</th>
<th>Batch 1 (30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Week</td>
<td>Periods allotted</td>
</tr>
<tr>
<td>1</td>
<td>Torsional Pendulum - Determination of rigidity modulus of the material of a wire.</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Non Uniform Bending - Determination of Young's Modulus.</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Viscosity - Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow.</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Lee's Disc - Determination of thermal conductivity of a bad conductor.</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Air Wedge - Determination of thickness of a thin wire.</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Spectrometer - Refractive index of a prism.</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Semiconductor laser - Determination of wavelength of Laser using Grating.</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>7</td>
<td>21</td>
</tr>
</tbody>
</table>

## List of Equipments Required for a Batch of 30 Students

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Torsional Pendulum (500 gm, wt, 60 cm wire Al-Ni Alloy)</td>
<td>5 nos.</td>
</tr>
<tr>
<td>2</td>
<td>Travelling Microscope (X10)</td>
<td>15 nos.</td>
</tr>
<tr>
<td>3</td>
<td>Capillary tube (length 10cm, dia 0.05mm)</td>
<td>5 nos.</td>
</tr>
<tr>
<td>4</td>
<td>Magnifying lens (X 10)</td>
<td>15 nos.</td>
</tr>
<tr>
<td>5</td>
<td>Lee's disc apparatus (std form)</td>
<td>5 nos.</td>
</tr>
<tr>
<td>6</td>
<td>Stop watch ( +/- 1 s)</td>
<td>5 nos.</td>
</tr>
<tr>
<td>7</td>
<td>Meter scale (1m length)</td>
<td>5 nos.</td>
</tr>
<tr>
<td>No.</td>
<td>Item</td>
<td>Description</td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>8</td>
<td>Spectrometer</td>
<td>(main scale 360 deg, ver 30°)</td>
</tr>
<tr>
<td>9</td>
<td>Grating</td>
<td>(2500 LPI)</td>
</tr>
<tr>
<td>10</td>
<td>Laser</td>
<td>(632.8 nm)</td>
</tr>
<tr>
<td>11</td>
<td>Semi transparent glass plate</td>
<td>Al coating, 65 nm thickness, 50% visibility</td>
</tr>
<tr>
<td>12</td>
<td>Equilateral prism</td>
<td>(n = 1.54)</td>
</tr>
<tr>
<td>13</td>
<td>Thermometer</td>
<td>+/- 1 deg</td>
</tr>
<tr>
<td>14</td>
<td>Screw gauge</td>
<td>(+/- 0.001cm)</td>
</tr>
<tr>
<td>15</td>
<td>Vernier caliper</td>
<td>(+/- 0.01 cm)</td>
</tr>
<tr>
<td>16</td>
<td>Steam Boiler</td>
<td>1 L</td>
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<tr>
<td>17</td>
<td>Scale</td>
<td>50 cms</td>
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<tr>
<td>18</td>
<td>Cylindrical mass</td>
<td>100 gms</td>
</tr>
<tr>
<td>19</td>
<td>Slotted wt</td>
<td>300 gms</td>
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<tr>
<td>20</td>
<td>Heater</td>
<td>1.5 KW</td>
</tr>
<tr>
<td>21</td>
<td>Transformer sodium vapour lamp</td>
<td>1 KW</td>
</tr>
<tr>
<td>22</td>
<td>Sodium vapour lamp</td>
<td>700 W</td>
</tr>
<tr>
<td>23</td>
<td>Burette</td>
<td>50 mL</td>
</tr>
<tr>
<td>24</td>
<td>Beaker</td>
<td>250 mL</td>
</tr>
<tr>
<td>25</td>
<td>Spirit level</td>
<td></td>
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</tbody>
</table>

**REFERENCE**

## CYA131 CHEMISTRY LABORATORY

### S.No. | List of Experiments | Batch 1 (30) | Batch 2 (30) |
<table>
<thead>
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<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>Estimation of Commercial soda by acid-base titration</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Determination of Percentage of nickel in an alloy</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Determination of Temporary, permanent and total hardness of water by EDTA method</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Determination of Chloride content in a water sample</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Potentiometric Estimation of iron</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Conductometric Titration of a strong acid with a strong base</td>
<td>11</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Conductometric Titration of mixture of acids.</td>
<td>13</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Determination of Degree of polymerization of a polymer by Viscometry</td>
<td>15</td>
<td>1</td>
</tr>
</tbody>
</table>

Total

|       | 6 | 6 | 24 |

### List of Glassware and Equipments required for a batch of 30 students

1. Burett (50 mL) 30 nos
2. Pipette (20 mL) 30 nos.
3. Conical Flask (250 mL) 30 nos
4. Distilled water bottle (1 L) 30 nos
5. Standard flask (100 mL) 30 nos
6. Funnel (small) 30 nos
7. Glass rod 20 cm length 30 nos
8. Reagent Bottle (250 mL) 30 nos.
9. Reagent Bottle (60 mL) 30 nos
10. Beaker (100 mL) 30 nos
11. Oswald Viscometer Glass 30 nos
12. Measuring Cylinder (25 mL) 30 nos
13. Digital Conductivity Meter PICO make 8 nos
14. Conductivity cell (K=1) 12 nos
15. Digital Potentiometer PICO make 8 os
16. Calomel Electrode Glass 12 nos
17. Platinum Electrode Polypropylene 12 nos
18. Burette Stands Wooden 30 nos
19. Pipette stands Wooden 30 nos
20. Retard stands Metal 30 nos
21. Porcelain Tiles White 30 os
22. Clamps with Boss heads Metal 30 nos

REFERENCES
GOAL
To develop graphical skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings using Computer Aided Design and Drafting practice.

OBJECTIVES
The course should enable the students to
1. Introduce drawing standards and use of drawing instruments.
2. Introduce first angle projection.
3. Practice of engineering hand sketching and introduce to computer aided drafting
4. Familiarize the students with different type of pictorial projections.
5. Introduction to Solid modeling
6. Introduce the process of design from sketching to parametric 3D CAD and 2D orthographic drawings to BIS

OUTCOME
The students should be able to
1. Develop Parametric design and the conventions of formal engineering drawing
2. Produce and interpret 2D & 3D drawings
3. Communicate a design idea/concept graphically
4. Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
5. Get a Detailed study of an engineering artifact

Note: Only first angle projection is to be followed

Unit I – BASICS OF ENGINEERING GRAPHICS AND PLANE CURVES 12
Importance of graphics Use of drawing instruments - BIS conventions and specifications - drawing sheet sizes, layout and folding - lettering - Dimensioning-Geometrical constructions - Scales. Introduction to plane curves like ellipse, parabola, cycloids and involutes


Unit II – VISUALIZATION, ORTHOGRAPHIC PROJECTIONS AND FREE HAND SKETCHING 15
Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three Dimensional objects — Pictorial Projection methods - Layout of views- Free hand sketching of multiple views from pictorial views of objects. Drafting of simple Geometric Objects/Editing

General principles of presentation of technical drawings as per BIS - Introduction to Orthographic projections - Naming views as per BIS - First angle projection method. Conversion to orthographic views from given pictorial views of objects, including dimensioning – Drafting of Orthographic views from Pictorial views.

Unit III – PROJECTIONS OF POINTS, LINES, SURFACES AND SOLIDS

Introduction to Projections of points – Projections of straight lines located in first quadrant using rotating line method only – Projections of plane surfaces when the surface of the lamina is inclined to one reference plane only – Projections of simple solids when the axis of the solid is inclined to one reference plane only – Sectioning of above solids in simple positions — Section Views. Practice includes drafting the projection of lines and solids using appropriate software. 2D drawing commands: Zoom, Picture editing commands, Dimensioning and 2D drafting.

Unit IV GEOMETRICAL MODELING AND ISOMETRIC VIEWS


Unit V COMPUTER AIDED DESIGN AND DRAFTING

Preparation of solids of machine components like slide block, solid bearing block, bushed bearing, gland, wall bracket, guide bracket, shaft bracket, jig plate, shaft support (open type), vertical shaft support etc using appropriate modeling software.

Introduction to computer aided drafting and dimensioning using appropriate software. Generate 2D drawing from the 3D models – generate and develop the lateral surfaces of the objects. Presentation Techniques of Engineering Drawings – Title Blocks – Printing/Plotting of drawing.

TOTAL PERIODS: 75

TEXT BOOKS


REFERENCE BOOKS:

1. Introduction to AutoCAD – 2D and 3D Design, A.Yarmwood, Newnes Elsevier, 2011


Bureau of Indian Standards (BIS) for Engineering Drawing:

**SEMESTER-II**

**MAA 102– ENGINEERING MATHEMATICS – II**

(Common to All Branches)

<table>
<thead>
<tr>
<th>MAA 102</th>
<th>ENGINEERING MATHEMATICS-II</th>
<th>4 CREDITS</th>
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<td>3 1 0 4</td>
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**AIM**

- The course is aimed at developing the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subject using MATLAB.

**OBJECTIVES**

- To understand effectively the evaluation of double and triple integrals and their applications
- To know the basics of vector calculus comprising of gradient, divergence, curl, line surface and volume integrals along with the classical theorems involving them
- To have a sound knowledge of Laplace transform and its properties. Solutions of Laplace transform using MATLAB.
- To understand and expand periodic functions as Fourier series using MATLAB

**OUTCOME**

- To understand effectively the evaluation of double and triple integrals and their applications
- To know the basics of vector calculus comprising of gradient, divergence, curl, line surface and volume integrals along with the classical theorems involving them
- To have a sound knowledge of Laplace transform and its properties. Solutions of Laplace transform using MATLAB.
- To understand and expand periodic functions as Fourier series using MATLAB

**UNIT I     MULTIPLE INTEGRALS**

12(8+4)

Double integration – Cartesian and polar co-ordinates – Change of order of integration. Area as a double integral – Triple integration in Cartesian co ordinates – Volume as a triple integral - Change of variables between Cartesian and polar coordinates.

**Lab: Area and Volume of double integration and triple integration.**

**UNIT II     VECTOR CALCULUS**

12(8+4)

Gradient, Divergence and Curl – Unit normal vector, Directional derivative – angle between surfaces-Irrotational and solenoidal vector fields.
Green’s theorem - Gauss divergence theorem and Stoke’s theorem (without proof) – Verification and evaluation of the above the theorems - Simple applications to regions such as square, rectangle, triangle, cuboids and rectangular parallelopipeds.

Lab: Green’s theorem - Gauss divergence theorem and Stoke’s theorem

UNIT III LAPLACE TRANSFORM 12(8+4)

Lab: Solutions of differential equations using Laplace transform

UNIT IV FOURIER SERIES 12(8+4)
Dirichlet’s Conditions – General Fourier Series – Odd and even functions – Half range sine and cosine series –Harmonic Analysis.

Lab: Solutions of Fourier series and Harmonic Analysis.

UNIT V COMPLEX VARIABLES 12(8+4)
Functions of a complex variable – Analytic function - Cauchy - Riemann equations (Statement only) – Properties of analytic function (Statement only) – Construction of Analytic functions by Milne – Thomson method.

Lab: Cauchy - Riemann equations, Milne – Thomson method

TOTAL: 60

TEXT BOOK:

REFERENCE:

PHA101 ENGINEERING PHYSICS
To impart fundamental knowledge in various fields of Physics and its applications.

OBJECTIVES

The course should enable the students to:

1. Develop strong fundamentals of properties and behaviour of the materials.
2. Enhance theoretical and modern technological aspects in acoustics and ultrasonics.
3. Enable the students to correlate the theoretical principles with application oriented study of optics.
4. Provide a strong foundation in the understanding of solids and materials testing.
5. Enrich the knowledge of students in modern engineering materials.

OUTCOME

The students should be able to:

1. Understand the properties and behaviour of materials.
2. Have a fundamental knowledge of acoustics which would facilitate in acoustical design of buildings and on ultrasonics and be able to employ it as an engineering tool.
3. Understand the concept, working and application of lasers and fiber optics.
4. Know the fundamentals of crystal physics and non destructive testing methods.
5. Have an understanding of the production, characteristics and application of the new engineering materials. This would aid them in the material selection stage.

UNIT I PROPERTIES OF MATTER


UNIT II ACOUSTICS AND ULTRASONICS

Classification of sound - characteristics of musical sound - intensity - loudness - Weber Fechner law - Decibel - Reverberation - Reverberation time, derivation of Sabine's formula for reverberation time(Jaeger's method) - absorption coefficient and its determination - factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics - production - Magnetostriction and Piezoelectric methods - properties - applications of ultrasonics with particular reference to detection of flaws in metal (Non-Destructive testing NDT) - SONAR.

UNIT III LASER AND FIBRE OPTICS


UNIT IV CRYSTAL PHYSICS AND NON-DESTRUCTIVE TESTING
Crystal Physics: Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - 'd' spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - coordination number Packing factor for SC, BCC, FCC and HCP structures.

Non Destructive Testing: Liquid penetrate method - Ultrasonic flaw detection - ultrasonic flaw detector (block diagram) - X-ray Radiography - Merits and Demerits of each method.

UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS 9


Superconducting Materials: Superconducting phenomena - Properties of superconductors - Meissner effect - Type I and Type II superconductors - High Tc superconductors (qualitative) - uses of superconductors.

TOTAL : 45

TEXT BOOKS


REFERENCES


10. P.Charles, Poople and Frank J. Owens, Introduction to Nanotechnology, Wiley India,

CYA101 ENGINEERING CHEMISTRY

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

To impart basic principles of chemistry for engineers.

OBJECTIVES

The course should enable the students to

1. Make the students conversant with the basics of
   (a) Water technology And (b) Polymer science

2. Provide knowledge on the requirements and properties of a few important engineering materials.

3. Educate the students on the fundamentals of corrosion and its control.

4. Give a sound knowledge on the basics of a few significant terminologies and concepts in thermodynamics.
5. Create an awareness among the present generation about the various conventional energy sources.

OUTCOME

The students should be able to

1. Gain basic knowledge in water analysis and suitable water treatment method.
2. Get an idea on the type of polymers to be used in engineering applications.
4. Get knowledge on the effects of corrosion and protection methods will help the young minds to choose proper metal / alloys and also to create a design that has good corrosion control.
5. Get exposure on the important aspects of basic thermodynamics will be able to understand the advanced level thermodynamics in engineering applications.
6. Get a good background on the various aspects of energy sources will create awareness on the need to utilize the fuel sources effectively and also for exploring new alternate energy resources.

UNIT I WATER TECHNOLOGY AND POLYMER CHEMISTRY

Hardness (Definition, Types, Units) - problems - Estimation of Hardness (EDTA Method) - Water softening - Carbonate conditioning and Calgon conditioning - Demineralization (Ion-Exchange Method) - Water Quality Parameters - Municipal Water Treatment- Desalination - Reverse Osmosis.

Classification of Polymers - PVC, Bakelite - preparation, properties and applications - Effect of Polymer Structure on Properties - Compounding of Plastics- Polymer Blends and Polymer Alloys Definition, Examples

UNIT II ENGINEERING MATERIALS

Properties of Alloys - Heat Treatment of Steel - Polymer Composites - types and applications.Lubricants - Classification, properties and applications - Mechanism of Lubrication - MoS2 And Graphite - Adhesives - classification and properties - Epoxy resin (Preparation, properties and applications) - Refractories - Classification, Properties and General Manufacture - Abrasives Classification , Properties and Uses - Carbon nano tubes - preparation, properties and applications.

UNIT III ELECTROCHEMISTRY AND CORROSION

Conductometric Titration - HCl vs NaOH and mixture of acids vs NaOH - Electrochemical Series and its applications - Nernst Equation - problems - Polarization, Decomposition Potential, Over-voltage (definitions only) - Galvanic series - Corrosion (Definition, Examples, effects) - Mechanism of Dry Corrosion and Wet Corrosion - Differential aeration Corrosion , examples - Factors Influencing Corrosion - Metal and Environment - Corrosion Control - Design -Cathodic Protection methods - Protective Coatings - Galvanising - Anodising - Electroplating (Cu and Ni) and Electroless plating (Cu and Ni) Constituents of Paints and varnish.

UNIT IV CHEMICAL THERMODYNAMICS


UNIT V FUELS AND ENERGY SOURCES

Fuels - classification - Calorific Value - Dulong's Formula - Problems - Determination of Calorific Value by Bomb Calorimeter - Coal - Proximate Analysis - problems - Octane Number - Cetane Number - Diesel Index (Definitions only) - Bio Gas - Producer Gas - Water Gas - Preparation, Properties and

TOTAL : 45

TEXT BOOKS

REFERENCES
1. B. K. Sharma, Engineering chemistry, Krishna Prakasam Media (P) Ltd., 2003
3. A. Gowarikar, Text Book of Polymer Science, 2002
4. Kuriacose & Rajaram, Vols. 1 & 2, Chemistry in Engineering and Technology, 2004
## CYA102 ENVIRONMENTAL SCIENCE AND ENGINEERING
(Common to all Branches)

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CYA102</td>
<td>ENVIRONMENTAL SCIENCE AND ENGINEERING</td>
<td>3 CREDITS</td>
</tr>
<tr>
<td>Goal</td>
<td>To impart basic knowledge on the significance of environmental science for engineers.</td>
<td></td>
</tr>
<tr>
<td><strong>OBJECTIVES</strong></td>
<td><strong>OUTCOME</strong></td>
<td></td>
</tr>
<tr>
<td>The objective of the course is</td>
<td>Upon successful completion of the course, the outcomes are as follows:</td>
<td></td>
</tr>
<tr>
<td>- To make the students aware of the existing natural resources such as forest water resources etc. and to educate them to understand the need for preserving the resources.</td>
<td>- The students would have understood the effects of over exploitation of water resources, forest resources etc. and their impact on day to day life on earth.</td>
<td></td>
</tr>
<tr>
<td>- To educate the students about the functions of various ecosystems and biodiversity.</td>
<td>- Knowledge on the functions of several of ecosystems will help the students to design the processes that are eco-friendly.</td>
<td></td>
</tr>
<tr>
<td>- To provide knowledge on the various aspects of different types of pollution such as air pollution, water pollution, soil pollution etc.</td>
<td>- Knowledge on the different types of pollution will help the young minds to device effective control measures to reduce rate of pollution.</td>
<td></td>
</tr>
<tr>
<td>- To give a basic knowledge on the social issues such as global warming, acid rain, ozone layer depletion, nuclear hazards etc. and to educate them about the various Environmental Protection Acts. and ill effects of fireworks.</td>
<td>- Exposure on the issues such as global warming, acid rain, ozone layer depletion, nuclear hazards and ill effects of fire-works will make the students understand the significances of sustainable development and the need to enforce Environmental Acts.</td>
<td></td>
</tr>
<tr>
<td>- To create an awareness among the present generation about the various aspects of human population and their effect on environment.</td>
<td>- Educating on the various aspects of population explosion will create an awareness on population control for effective utilization of the resources and the need to explore new alternate energy resources for a healthy environment.</td>
<td></td>
</tr>
</tbody>
</table>
Introduction to Environmental Studies and Natural Resources

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

Ecosystems and Biodiversity


Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

Environmental Pollution

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Soil waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Ill effects of fireworks and upkeep of clean environment: Chemical contents of fireworks- and health hazards-Soil pollution, water pollution, air pollution and noise pollution.

Field Study of local polluted site – Urban / Rural / Industrial / Agricultural

Social Issues and Environment

Human Population and Environment 9 Periods

TOTAL: 45 periods

TEXT BOOKS

REFERENCES
ECB101 ELECTRON DEVICES & CIRCUITS

<table>
<thead>
<tr>
<th>ECB101</th>
<th>ELECTRON DEVICES &amp; CIRCUITS</th>
<th>4 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>The aim of this course is to understand the concepts and analysis of basic electrical circuits using laws and theorems, to know about the basic analysis and synthesis techniques in electrical networks and to familiarize the student with the principle of operation, capabilities and limitations of various electron devices so that he will be able to use these devices effectively.</td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Understand the use of circuit analysis theorems and methods,</td>
<td>1. Use network techniques, like node analysis and loop analysis, to write equations for large linear circuits; Apply Thevenin and Norton theorems to analyze and design for maximum power transfer. Apply the concept of linearity and the associated technique of superposition to circuits and networks,</td>
<td></td>
</tr>
<tr>
<td>2. Understand basic concepts of DC and AC circuit behavior and develop and solve mathematical representations for simple RLC circuits,</td>
<td>2. Explain the concept of steady state, apply phasor analysis to AC circuits in sinusoidal steady state and analyze the frequency response of circuits containing inductors and capacitors,</td>
<td></td>
</tr>
<tr>
<td>3. Understand the Diode operation and switching characteristics,</td>
<td>3. Develop through basic knowledge on the behavior and the characteristics of semiconductor junction,</td>
<td></td>
</tr>
<tr>
<td>4. Understand the Operation of BJT, FET, MOSFET metal semiconductor rectifying and ohmic contacts,</td>
<td>4. Acquire knowledge on the applications of BJT, FET, MOSFET,</td>
<td></td>
</tr>
<tr>
<td>5. Study the characteristics of special type semiconductor diodes.</td>
<td>5. Learn the usage of different types of devices for various applications.</td>
<td></td>
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</tbody>
</table>

UNIT I CIRCUIT ANALYSIS TECHNIQUES

UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS

UNIT III SEMICONDUCTOR DIODES

UNIT IV TRANSISTORS
Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.
UNIT V SPECIAL SEMICONDUCTOR DEVICES  
(Qualitative Treatment only)  


TEXT BOOKS  

REFERENCES  

ELECTRICAL MACHINES  

<table>
<thead>
<tr>
<th>EEB121</th>
<th>ELECTRICAL MACHINES</th>
<th>4 CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To expose the students to the concepts of various types of electrical machines and transmission and distribution of electrical power</td>
<td></td>
</tr>
</tbody>
</table>

Objectives | Outcome  
--- | --- |
The course should enable the students to: | At the end of the course the student should be able to: |
1. Give a through theoretical knowledge on the principle, e.m.f equation constructions losses, and characteristics of D.C generators and more about the torque & speed relations of D.C. motors, | 1. The theory behind D.C generators, and to do experiments which will help the student to become expert in D.C. generators, to select different motors for practical applications, |
2. Learn the e.m.f equation construction, Testing and losses, | 2. The Knowledge implement to for practical experiments and apply them in day today life, |
3. Learn the Performance of induction machines with a sound knowledge of the principle, construction losses etc, | 3. To think practically to conduct experiments, |
4. Learn the principle construction and e.m.f of alternators and synchronous motors special machines, | 4. Conduct experiments to obtain the regulations and to select special machines for project, |
5. Gain knowledge of generation Transmissions & Distribution systems. | 5. Give more contributions in turn practical field of power system which will in help the society. |

UNIT I D.C. MACHINES  
Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Principle of operation of

UNIT II TRANSFORMERS
9

UNIT III INDUCTION MOTORS
9

UNIT IV SYNCHRONOUS AND SPECIAL MACHINES
9

UNIT V TRANSMISSION AND DISTRIBUTION
9

TOTAL : 45

TEXT BOOKS

REFERENCES
ELA102-Personality Development and Soft Skills

L T P C
3 0 0 3

GOAL
- To enhance holistic development of students and improve their employability skills.
- To nurture the language skills and cultivate in them the ability to indulge in rational thinking, independent decision-making and lifelong learning.
- To help them become responsible members or leaders of the society in and around their workplace or living space.
- To communicate successfully at the individual or group level on engineering activities with the engineering community in particular, and on multi-disciplinary activities in general, with the world at large.

OBJECTIVES
The course should enable the students to:
1. Develop interpersonal skills and be an effective goal oriented team player.
2. Develop professionals with idealistic, practical and moral values.
3. Develop communication and problem solving skills.
4. To face the challenges in the world and enable the students excel in the world of work and life.

OUTCOME
The students should be able to:
1. Have the self-confidence to improve upon their informative listening skills by an enhanced acquisition of the English language.
2. Speak English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.
3. Read, comprehend and answer questions based on literary, scientific and technological texts.
4. Have the confidence to develop thinking skills and participate in brainstorming, mind-mapping, audiovisual activities, creative thinking and also answer tests in the job-selection processes.
5. Make right decisions, communicate effectively, and develop self-management talents, to lead a healthy and productive life.
6. Imbibe the requisite employability skills, learned skills, intuitive skills and people skills.

UNIT I SPEAKING SKILLS
9 hours
Art of Speaking- Body Language and speaking- Non Verbal communication- Vocal Communication Techniques- Intercultural communication- The difference in Approach in five countries- Vocabulary Enrichment- Pronunciation of words-Mark the stress on appropriate syllable-split the word into syllables- Speaking as an Art-Simple Oral Interaction-Body Language and Speaking- Five characteristics of an ideal GD- group discussions- role-plays- short speeches-Extempore – JAM – Debate-Talk shows-Power point presentation and speaking

UNIT II LANGUAGE SKILLS
13 hours
Functional Grammar: Synonyms and Antonyms – Active and Passive Voice- Direct and Indirect Speech- Conditional Clauses- collocations- rearrange the jumbled sentences and make meaningful sentences- Language functions: apologising, greeting, clarifying, inviting, advising, agreeing, disagreeing, refusing, thanking, interrupting, expressing obligation, expressing preferences, CV / application letters- Job interviews-FAQ’s – e-mail etiquette

UNIT III PEOPLE SKILLS/SOFT SKILLS
8 hours
SWOT analysis- JOHARI window- Goal setting -speaking on Goals - goals to be achieved- modes of behaviour to achieve the goals- decision making- time management -stress management- power of positive attitude- leadership skills
UNIT IV COMPREHENSION SKILLS  
7 hours
Art of Listening- listening to English news- listening to debates on current issues - Listening to dialogues for general meaning and specific information- listening to toast master speeches- -cloze exercises-open comprehension questions-Art of Listening-Reading passages –interpreting in own words- reading articles in magazines/journals/newspapers- writing articles for newspaper-reporting events-completing the middle/end of a story

UNIT V PERSONALITY DEVELOPMENT  
9 hours
Define Personality- Types of Personality-Personality test- Leadership Skills - Interpersonal Skills- Team Work - Mind Mapping- concept maps- Study skills and techniques - Edward De Bono’s lateral thinking-exercises-questionnaires-project

TEXT BOOK:
English for Life and the workplace through LSRW&T skills by Dr. Dolly John, Pearson Publications

REFERENCES
2. Effective technical Communication, M. Ashraf Rizvi, Tata McGraw Hill Companies
3. Professional Speaking Skills, Aruna Koneru, Oxford University Press

Web links for reference for Flipped classroom sessions
1. https://owl.english.purdue.edu/exercises/28/12/33
### List of Experiments

<table>
<thead>
<tr>
<th>S.No.</th>
<th>List of Experiments</th>
<th>Batch 2 (30)</th>
<th>Batch 1 (30)</th>
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<td></td>
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<td>Periods</td>
<td>Periods allotted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>P</td>
</tr>
<tr>
<td>1</td>
<td>Torsional Pendulum - Determination of rigidity modulus of the material of a wire.</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Non Uniform Bending - Determination of Young's Modulus.</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Viscosity - Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow.</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Lee's Disc - Determination of thermal conductivity of a bad conductor.</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Air Wedge - Determination of thickness of a thin wire.</td>
<td>9</td>
<td>1</td>
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<tr>
<td>6</td>
<td>Spectrometer - Refractive index of a prism.</td>
<td>11</td>
<td>1</td>
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<tr>
<td>7</td>
<td>Semiconductor laser - Determination of wavelength of Laser using Grating.</td>
<td>13</td>
<td>1</td>
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<td><strong>Total</strong></td>
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</table>

56 Periods

### List of Equipments Required for a Batch of 30 Students

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Torsional Pendulum</td>
<td>(500 gm, wt, 60 cm wire Al-Ni Alloy) 5 nos.</td>
</tr>
<tr>
<td>2</td>
<td>Travelling Microscope</td>
<td>(X10) 15 nos.</td>
</tr>
<tr>
<td>3</td>
<td>Capillary tube</td>
<td>(length 10cm, dia 0.05mm) 5 nos.</td>
</tr>
<tr>
<td>4</td>
<td>Magnifying lens</td>
<td>(X 10) 15 nos.</td>
</tr>
<tr>
<td>5</td>
<td>Lee's disc apparatus</td>
<td>(std form) 5 nos.</td>
</tr>
<tr>
<td>6</td>
<td>Stop watch</td>
<td>(+/- 1 s) 5 nos.</td>
</tr>
<tr>
<td>7</td>
<td>Meter scale</td>
<td>1m length 5 nos.</td>
</tr>
<tr>
<td>8</td>
<td>Spectrometer</td>
<td>(main scale 360 deg, ver 30&quot;) 5 nos.</td>
</tr>
<tr>
<td>9</td>
<td>Grating</td>
<td>(2500 LPI) 5 nos.</td>
</tr>
<tr>
<td>10</td>
<td>Laser</td>
<td>(632.8 nm) 5 nos.</td>
</tr>
<tr>
<td>No.</td>
<td>Item Description</td>
<td>Quantity</td>
</tr>
<tr>
<td>-----</td>
<td>------------------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>11</td>
<td>Semi transparent glass plate Al coating, 65 nm thickness, 50% visibility</td>
<td>5 nos.</td>
</tr>
<tr>
<td>12</td>
<td>Equilateral prism (n = 1.54)</td>
<td>5 nos.</td>
</tr>
<tr>
<td>13</td>
<td>Thermometer +/- 1 deg</td>
<td>8 nos.</td>
</tr>
<tr>
<td>14</td>
<td>Screw gauge (+/- 0.001cm)</td>
<td>12 nos.</td>
</tr>
<tr>
<td>15</td>
<td>Vernier caliper (+/- 0.01 cm)</td>
<td>8 nos.</td>
</tr>
<tr>
<td>16</td>
<td>Steam Boiler 1 L</td>
<td>5 nos.</td>
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<tr>
<td>17</td>
<td>Scale 50 cms</td>
<td>5 nos.</td>
</tr>
<tr>
<td>18</td>
<td>Cylindrical mass 100 gms</td>
<td>10 sets</td>
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<tr>
<td>19</td>
<td>Slotted wt 300 gms</td>
<td>5 sets</td>
</tr>
<tr>
<td>20</td>
<td>Heater 1.5 KW</td>
<td>5 nos.</td>
</tr>
<tr>
<td>21</td>
<td>Transformer sodium vapour lamp 1 KW</td>
<td>10 nos.</td>
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<tr>
<td>22</td>
<td>Sodium vapour lamp 700 W</td>
<td>5 nos</td>
</tr>
<tr>
<td>23</td>
<td>Burette 50 mL</td>
<td>5 nos</td>
</tr>
<tr>
<td>24</td>
<td>Beaker 250 mL</td>
<td>5 nos</td>
</tr>
<tr>
<td>25</td>
<td>Spirit level</td>
<td>10 nos.</td>
</tr>
</tbody>
</table>

REFERENCE

## List of Experiments

Any five

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Batch 1 (30)</th>
<th>Batch 2 (30)</th>
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<tbody>
<tr>
<td></td>
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<td>Periods allotted</td>
</tr>
<tr>
<td></td>
<td>Week</td>
<td>L</td>
</tr>
<tr>
<td>1</td>
<td>Estimation of Commercial soda by acid-base titration</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Determination of Percentage of nickel in an alloy</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>Determination of Temporary, permanent and total hardness of water by EDTA method</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>Determination of Chloride content in a water sample</td>
<td>7</td>
</tr>
<tr>
<td>5</td>
<td>Potentiometric Estimation of iron</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>Conductometric Titration of a strong acid with a strong base</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>Conductometric Titration of mixture of acids.</td>
<td>13</td>
</tr>
<tr>
<td>8</td>
<td>Determination of Degree of polymerization of a polymer by Viscometry</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>6</td>
</tr>
</tbody>
</table>

### List of Glassware and Equipments required for a batch of 30 students

1. Burett (50 mL) 30 nos
2. Pipette (20 mL) 30 nos.
3. Conical Flask (250 mL) 30 nos
4. Distilled water bottle (1 L) 30 nos
5. Standard flask (100 mL) 30 nos
6. Funnel (small) 30 nos
7. Glass rod 20 cm length 30 nos
8. Reagent Bottle (250 mL) 30 nos.
9. Reagent Bottle (60 mL) 30 nos
10. Beaker (100 mL) 30 nos
11. Oswald Viscometer Glass 30 nos
12. Measuring Cylinder (25 mL) 30 nos
13. Digital Conductivity Meter   PICO make   8 nos
14. Conductivity cell   (K=1)   12 nos
15. Digital Potentiometer   PICO make   8 os
16. Calomel Electrode   Glass   12 nos
17. Platinum Electrode   Polypropylene   12 nos
18. Burette Stands   Wooden   30 nos
19. Pipette stands   Wooden   30 nos
20. Retard stands   Metal   30 nos
21. Porcelain Tiles   White   30 os
22. Clamps with Boss heads   Metal   30 nos

REFERENCES


GEA132 ENGINEERING PRACTICES LABORATORY II

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
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<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>3</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

LIST OF EXPERIMENTS

Electrical Engineering:

1. Wiring for a tube light. 6
2. Wiring for a lamp and fan. 6
3. Staircase wiring 3
4. Study of (i) Iron box and (ii) Fan with Regulator Electronics Engineering 6

Electronics Engineering

5. Study of Electronic components and Equipments 3
6. Characteristics of PN junction diode & measurement of Ripple factor of half wave and full wave rectifier. 9
7. Applications of OP-AMP - Inverter, Adder and Subtractor. 9
8. Study and verification of Logic Gates 3

Components Required:

Electrical Engineering

Choke 2 nos
Starter 2 nos
Tubelight stand 2 nos

PRACTICAL 45
36W tubelight 2 nos
Fan 2 nos
40W lamp 5 nos
Single way switch 10 nos
Two way switch 5 nos
Iron box 2 nos
Fan with regulator opened 1 no (demo purpose)

Electronics Engineering
IC Trainer Kit, Resistors, Capacitors, CRO, Function Generator, BreadBoard, Regulated Power Supply, Zener Diode, PN Junction Diode, Potentiometer, Digital Multimeter, Ammeter, Voltmeter, Wattmeter, IC 7408, IC 7432, IC 7486, IC 7400, IC 7404, IC 7402

TEXT BOOK

ECB131 CIRCUITS AND DEVICES LABORATORY

<table>
<thead>
<tr>
<th>ECB131</th>
<th>CIRCUITS AND DEVICES LABORATORY</th>
<th>1CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To Provide practical knowledge about various electric circuits and electron devices</td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>This lab experiments should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Verify KVL and KCL,</td>
<td>1. Understand KVL and KCL,</td>
<td></td>
</tr>
<tr>
<td>2. Verify Thevenin Theorems,</td>
<td>2. Understand Thevenin Theorems,</td>
<td></td>
</tr>
<tr>
<td>3. Verify superposition Theorem,</td>
<td>3. Understand superposition Theorem,</td>
<td></td>
</tr>
<tr>
<td>4. Verify Maximum power transfer and reciprocity theorems,</td>
<td>4. Understand Maximum power transfer and reciprocity theorem,</td>
<td></td>
</tr>
<tr>
<td>5. Analyze the frequency response of series and parallel resonance circuits,</td>
<td>5. Understand frequency response of series and parallel resonance circuits,</td>
<td></td>
</tr>
<tr>
<td>6. Analyze the characteristics of BJT under CE configuration,</td>
<td>6. Understand, design and verify the characteristics of BJT under CE configuration,</td>
<td></td>
</tr>
<tr>
<td>7. Analyze the characteristics of UJT,</td>
<td>7. Understand, design and verify the characteristics of UJT,</td>
<td></td>
</tr>
<tr>
<td>8. Analyze the characteristics of SCR,</td>
<td>8. Understand, design and verify the characteristics of SCR,</td>
<td></td>
</tr>
<tr>
<td>9. Analyze the characteristics of JFET,</td>
<td>9. Understand, design and verify the characteristics of JFET,</td>
<td></td>
</tr>
<tr>
<td>10. Study of Thevenin and Superposition theorem using multisim software tool</td>
<td>10. Study of Thevenin and Superposition theorem using multisim software tool</td>
<td></td>
</tr>
</tbody>
</table>

LIST OF EXPERIMENTS:
1. Verification of KVL and KCL
2. Verification of Thevenin Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of BJT under CE configuration.
7. Characteristics of UJT.
8. Characteristics of SCR.
9. Characteristics of JFET.
10. Study of Thevenin and Super position theorem using multisim software tool

TOTAL = 45

SEMESTER III
MAA202-ENGINEERING MATHEMATICS – III

UNIT – I: Partial Differential Equations
Formation of partial differential equation differential equations by elimination arbitrary constant
arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange’s
linear equation – Linear partial differential equations of second and higher order with constant
coefficients.

UNIT – II: Boundary Value Problems
Classification of second order linear partial differential equations – Solutions of one dimensional wave
equation – One dimensional heat equation – Steady state solution of two dimensional heat equations
(Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT – III: Fourier Transform
Fourier Integral Theorem (without proof) – Fourier transform pair – Sine and Cosine transforms –

UNIT – IV: \( Z \) – Transform and Difference Equations
\( Z \) – Transform – Elementary Properties – Inverse \( Z \) – transform – Convolution theorem – Formation of
Difference equations – Solution of difference equations using \( z \) – transform

UNIT V: BESSLE FUNCTIONS
Bessel's equation, Bessel functions, recurrence relations, orthogonality property, generating function,
equations reducible to Bessel's equation.

Total: 60

TEXT BOOKS:

REFERENCES:
UNIT I  TRANSISTOR BIASING
BJT – Need for biasing - Load line and quiescent point. Different types of biasing circuits in BJT and FET. Midband analysis of single stage BJT amplifiers .Methods of increasing input impedance using Darlington connection and bootstrapping.

UNIT II  FREQUENCY RESPONSE OF AMPLIFIERS
Low frequency and High frequency analysis of BJT amplifiers High frequency equivalent circuit and analysis of FET amplifiers.Genera expression for frequency response of multistage amplifiers. Calculation of overall upper and lower cut off frequencies of multistage amplifiers. Basic emitter coupled differential amplifier circuit. CMRR, transfer characteristics.

UNIT III  POWER AMPLIFIERS

UNIT IV  FEEDBACK AMPLIFIERS AND TIMEBASE GENERATORS

UNIT V  RECTIFIERS AND POWER SUPPLIES

At the end of the course the student should be able to:
1. Understand the methods of biasing transistors and design of simple amplifier circuits,
2. Understand the frequency response of amplifiers and calculate its cutoff frequencies and bandwidth
3. Understand power amplifiers and calculate power efficiency.
4. Understand the different topologies of feedback amplifiers and time base generators.
5. Understand the analysis and design of power supplies and power control using SCR.

**TEXT BOOK**

**REFERENCES**
2. S Salivahanan and N Suresh Kumar, Electronic devices and Circuits Tata Mcgraw Hill publishers 2nd edition 2011

**DIGITAL SYSTEMS**

<table>
<thead>
<tr>
<th>ECB202</th>
<th>DIGITAL SYSTEMS</th>
<th>4 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prerequisite</strong></td>
<td>To learn the basic methods and provide the fundamental concepts used in the design of digital systems.</td>
<td></td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Learn number systems, codes, basic postulates of Boolean algebra and shows the correlation between Boolean expressions,</td>
<td>1. Reduce complex logical expressions using various postulates of Boolean algebra,</td>
<td></td>
</tr>
<tr>
<td>2. Gain knowledge of the methods for simplifying Boolean expressions,</td>
<td>2. Use different graphical methods for the simplification of complex logical expressions,</td>
<td></td>
</tr>
<tr>
<td>3. Outline the formal procedures for the analysis and design of combinational circuits,</td>
<td>3. Use the design methodology for combinational logic circuits,</td>
<td></td>
</tr>
<tr>
<td>4. Learn about several structural and behavioral models for synchronous sequential circuits,</td>
<td>4. Make use of design concepts of sequential circuits,</td>
<td></td>
</tr>
<tr>
<td>5. Provide knowledge of the concept of memories and programmable logic devices.</td>
<td>5. Understand the structure of various semiconductor storage devices.</td>
<td></td>
</tr>
</tbody>
</table>

**UNIT I NUMBER SYSTEMS AND BOOLEAN SWITCHING ALGEBRA**

Introduction to Number Systems – Positional Number Systems, Number System conversion, Binary codes – Binary arithmetic, Binary logic functions – Switching algebra – Functionally complete

UNIT II COMBINATIONAL LOGIC CIRCUIT DESIGN 12


UNIT III ARITHMETIC AND STANDARD COMBINATIONAL MODULE 12


UNIT IV SEQUENTIAL CIRCUIT 12


UNIT V MEMORIES AND PROGRAMMABLE LOGIC DEVICES 12


L = 45, T = 15, TOTAL=60

TEXT BOOKS:


REFERENCE BOOKS:

<table>
<thead>
<tr>
<th><strong>ECB203</strong></th>
<th><strong>SIGNALS AND SYSTEMS</strong></th>
<th><strong>4 CREDITS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prerequisite</strong></td>
<td>Maths basics</td>
<td></td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>To study and analyze characteristics of continuous, discrete signals and systems</td>
<td></td>
</tr>
</tbody>
</table>

**Objectives**

**Outcome**

<table>
<thead>
<tr>
<th>The course should enable the students to:</th>
<th>At the end of the course the student should be able to:</th>
</tr>
</thead>
</table>

**UNIT I REPRESENTATION OF SIGNALS**

Continuous and discrete time signals: definition and mathematical representation of basic signals - step, impulse, ramp and exponential signals, sinc signal, Classification of Signals – Periodic, aperiodic, even, odd, energy and power signals, Deterministic and random signals, complex exponential and sinusoidal signals, periodicity. Transformations: time scaling, time shifting, Determination of Fourier series representation of continuous time and discrete time periodic signals, Explanation of properties of continuous time and discrete time Fourier series.

**UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS AND SYSTEMS**

Continuous time Fourier Transform and Laplace Transform: analysis with examples, basic properties- Linearity, Time Sift, frequency shift, time scaling, Parseval’s relation and convolution in time and frequency domains. Basic properties of continuous time systems with examples- linearity, causality, time invariance, stability, static and dynamic, magnitude and Phase representations of frequency response of LTI systems, Analysis and characterization of LTI systems using Laplace transform; Computation of impulse response and transfer function using Laplace transform.

**UNIT III SAMPLING THEOREM AND Z-TRANSFORMS**

Representation of continuous time signals by its samples, Sampling theorem, Reconstruction of a Signal from its samples, aliasing, Z-transform: definition of Z-transform, region of convergence, examples, Poles and Zeros, properties of ROC, Properties of Z-transform with examples

**UNIT IV: INVERSE Z-TRANSFORM**

UNIT V: DTFT AND DISCRETE TIME SYSTEMS


L = 45, T = 15, TOTAL = 60

TEXT BOOK

REFERENCES
ELECTROMAGNETIC FIELDS AND WAVES

UNIT I STATIC ELECTRIC FIELDS


ECB204

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Electromagnetic Fields and Waves</th>
<th>4 Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAA102</td>
<td></td>
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</tbody>
</table>

Goal

To familiarize the student to the concepts, calculations pertaining to electric, magnetic and electromagnetic fields so that an in depth understanding of antennas, electronic devices, Waveguides is possible

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the student to</td>
<td>At the end of the course the student should be able to</td>
</tr>
<tr>
<td>1. Review the basics of Coordinate systems and Vector Calculus static Electric fields and Electric Potential, flux density,</td>
<td>1. Solve problems of 3D coordinate systems and vector calculus, Coulomb's law to solve problems related to electrical force, Solve problems related to charge, electric field, and forces,</td>
</tr>
<tr>
<td>2. Be familiarized with the fundamental theory of static magnetic fields, Obtain field distribution of various sources, to introduce the fundamentals of Magnetic forces and torque,</td>
<td>2. Develop field equations starting from a basic knowledge of Biot-Savart Law, Ampere's law, Develop field equations for various sources of magnetic field and plot the field distribution using any of the software,</td>
</tr>
<tr>
<td>3. Understand the Laplace's and Poisson's equations, Capacitance of various geometries, boundary conditions for electric fields, Study the Inductance, Study Magnetic boundary conditions,</td>
<td>3. Solve problems using Laplace's and Poisson's, Calculate capacitance of various geometries, Apply boundary conditions to solve electromagnetic problems, Understand the inductance of different types of conductors, Apply boundary conditions to solve electromagnetic problems,</td>
</tr>
<tr>
<td>4. Study understand Maxwell's equations, the meaning and physical significance, Express Maxwell's four equations in integral and differential forms Study the power flow,</td>
<td>4. Solve problems using Maxwell's equations, Apply Maxwell's theory to understand the concept of wave propagation, Solve problems of Power flow using Poynting vector,</td>
</tr>
<tr>
<td>5. Know the concept of plane waves, mathematically represent it in various forms, study wave propagation through various media. And wave passage between dissimilar media.</td>
<td>5. Know how the electromagnetic waves are propagating, Solve problems using various conditions of field propagation, differentiate between different media based on wave propagation and related phenomena and solve problems of reflection and refraction of complex wave propagation.</td>
</tr>
</tbody>
</table>
UNIT II STATIC MAGNETIC FIELD

UNIT III ELECTRIC AND MAGNETIC FIELDS IN MATERIALS

UNIT IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS

UNIT V ELECTROMAGNETIC WAVES

TEXT BOOKS

REFERENCE BOOKS

ECB231 ELECTRONIC CIRCUITS LAB L T P C
LIST OF EXPERIMENTS

1. Fixed Bias amplifier circuits using BJT.
2. BJT Amplifier using voltage divider bias (self-bias).
3. Source follower with Bootstrapped gate resistance.
4. Darlington amplifier
5. Class B Complementary symmetry power amplifier
6. Full wave rectifier with simple capacitor filter.
7. Voltage Series feedback amplifiers Frequency response, Input and output impedance calculation

SIMULATION USING MULTISIM / PSPICE

1. Differential amplifier.
2. Astable, Monostable
3. Bistable multivibrator

TOTAL = 45

DIGITAL SYSTEMS LAB

<table>
<thead>
<tr>
<th>EC232</th>
<th>DIGITAL SYSTEMS LAB</th>
<th>1 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>L T P C</td>
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<td></td>
<td></td>
<td>0 0 3 1</td>
</tr>
</tbody>
</table>

Prerequisite

Goal

To understand the design and analysis of combinational sequential circuits using logic gates and MSI devices and to implement the same using HDL

Objectives

The course should enable the students to:

1. Understand Boolean theorems and logic gates and to design and implement combinational circuits using basic logic gates,
2. Design Combinational circuits using MSI devices,
3. Design and implement synchronous and asynchronous sequential circuits,
4. Understand Hardware description language and simulate the design of combinational and sequential circuits using Verilog.

Outcome

At the end of the course the student should be able to:

1. Implement combinational circuits using basic logic gates,
2. Understand the design of Combinational circuits such as adders, comparators..etc. using MSI devices,
3. Understand the design and implementation of Multiplexers, synchronous and asynchronous counters etc,
4. Understand the Hardware Description Language and design and simulate combinational circuits like arithmetic circuits and multiplexers, and sequential circuits like counters using Verilog.

LIST OF EXPERIMENTS
1. Design and implementation of Adders and Subtractors using logic gates.
2. Design and implementation of code converters using logic gates
   (i) BCD to excess-3 code and vice versa
   (ii) Binary to gray and vice-versa
3. Design and implementation of 4 bit binary Adder/ subtractor and BCD adder using IC 7483
4. Design and implementation of 2Bit Magnitude Comparator using logic gates and 8 Bit Magnitude
   Comparator using IC 7485
5. Design and implementation of Multiplexer and De-multiplexer using logic gates
6. Design and implementation of encoder and decoder using logic gates
7. Construction and verification of 4 bit ripple counter and Mod-10 counters
8. Design and implementation of 3-bit synchronous up/down counter
10. Design of Asynchronous up Counter.(MOD-6)
11. Design of Adder and Subtractor using VHDL.
12. Design of MUX and DeMux using VHDL.
13. Design of 4 bit Ripple Counter and MOD 10 Counter using VHDL.

TOTAL: 45

ELECTRICAL MACHINES LAB

<table>
<thead>
<tr>
<th>EEB241</th>
<th>ELECTRICAL MACHINES LAB</th>
<th>1 CREDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To expose the students to the basic operations of electrical machines and help them to develop experimental skills.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
</table>
The course will enable the students to:

1. By conduct open circuit load test, obtain the open circuit & load characteristics,
2. Conduct actual load test for D.C Shunt Motor,
3. Conduct actual load test D.C Series Motor,
4. Predetermine the efficiency of a D.C. machines,
5. Obtain the performance characteristics of single phase transformer,
6. Obtain the regulation by e.m.f, m.m.f Method,
7. Obtain the torque slip characteristics,
8. Obtain performance of induction Characteristics,

At the end of this course the students should be able to:

1. Know the magnetic characteristics and critical resistances from open circuit. And study analysis of variation of load voltage can be studied.
2. The performance of D.C Shunt motor can be studied,
3. Obtain the Performance characteristics of D.C Series motor,
4. Predetermine the efficiency at different loads,
5. Select motor for practical applications,
6. Predict the variations in terminal voltage of alternator,
7. Select the motor for particular applications,
8. select motor for particular application,
9. To select among several motors.

**LIST OF EXPERIMENTS**

1. Open circuit and load characteristics of separately excited and self excited D.C. generator.
2. Load test on D.C. shunt motor.
3. Load test on D.C. series motor.
4. Swinburne’s test and speed control of D.C. shunt motor.
5. Load test on single phase transformer and open circuit and short circuit test on single phase transformer
6. Regulation of three phase alternator by EMF and MMF methods.
7. Load test on three phase induction motor.
8. No load and blocked rotor tests on three phase induction motor (Determination of equivalent circuit parameters)

**TOTAL : 45**
PURPOSE:
The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential.

INSTRUCTIONAL OBJECTIVES
1. To guide thought process
2. Appear for placement aptitude tests confidently
3. To develop Communication skill
4. To build confidence
5. Acquire aptitude skills for employment

METHODOLOGY:
The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.
1. Group Activities + Individual activities
2. Collaborative learning
3. Interactive sessions
4. Ensure participation
5. Empirical learning

LOGICAL REASONING:
Number, Letter series, Analogies- Coding, Decoding – Blood relations, direct sense, Operator based questions – Clock & Calendars
Distribution, Binary Logic and Puzzles – Arrangements, Selections.
Routes & Networks, Comparison – Cubes & Venn Diagrams.

VERBAL ABILITY:
Critical Reasoning – Antonym, Synonym
Odd man – fill in the blank
Sentence Construction / Completion – Idiomatic expression
Detection of errors.
Jumbled sentences, Vocabulary, Alphabetical sequence, cloze passage.

EVALUATION:
1. University Theory Question paper
2. Activities assessed by both group and individual participation
3. Continuous assessment based on daily participation
SCHEME OF INSTRUCTION:
Marks allocated for regular participation in all oral activities in class.

SCHEME OF EXAMINATION:

Complete internal evaluation on regular basis.
SEMESTER IV

MAA 204 RANDOM PROCESSES L T P C 3 1 0 4
(FOR ECE BRANCH)

UNIT I PROBABILITY AND RANDOM VARIABLE 12
Axioms of probability - Conditional probability - Total probability – Baye’s theorem - Random variable - Probability mass function - Probability density functions - Properties – Moments - Moment generating functions and their properties.

UNIT II STANDARD DISTRIBUTIONS 12
Binomial, Poisson, Geometric, Uniform, Exponential, and Normal distributions and their properties - Functions of a random variable.

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 12
Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression

UNIT IV CLASSIFICATION OF RANDOM PROCESSES 12
Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson processes.

UNIT V CORRELATION AND SPECTRAL DENSITIES 12
Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Wiener-Khintchine relation (Statement only) – Relationship between cross power spectrum and cross correlation function

TOTAL: 60

TEXT BOOKS


REFERENCES

LINEAR INTEGRATED CIRCUITS

**ECB205**  
**LINEAR INTEGRATED CIRCUITS**  
**L T P C**  
**3 1 0 4**  
**4 CREDITS**

**Prerequisite**: ECB201

**Goal**: To teach the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
</tr>
<tr>
<td>1. Learn the IC fabrication technology,</td>
<td>1. Enumerate different steps involved in the process of fabrication of integrated circuit,</td>
</tr>
<tr>
<td>2. Know the Op-amp characteristics and its linear applications,</td>
<td>2. Distinguish clearly between an ideal and actual characteristics of an Op-amp. And to learn different linear applications,</td>
</tr>
<tr>
<td>3. Learn comparator, Schmitt-Trigger circuits, Voltage regulator and some linear and nonlinear oscillators,</td>
<td>3. Understand different nonlinear applications,</td>
</tr>
<tr>
<td>4. Study how an Op-Amp can act as a filter on an electrical signal,</td>
<td>4. Understand the advantages of using active filters in place of passive filters,</td>
</tr>
<tr>
<td>5. Learn the theory and applications of PLL, ADC and DAC.</td>
<td>5. Understand how an operational amplifier can be helpful in signal processing.</td>
</tr>
</tbody>
</table>

**UNIT I INTEGRATED CIRCUIT TECHNOLOGY**  

**UNIT II OP-AMP CHARACTERISTICS AND APPLICATIONS**  

**UNIT III COMPARATORS AND SIGNAL GENERATORS**  
Comparators, regenerative comparators, astable multivibrator, Monostable multivibrator, Triangular wave-generators, RC-phaseshift oscillator, Wein’s bridge oscillator, Voltage Regulator, Series op amp regulator, IC voltage regulator, 723 general purpose regulator, Switching Regulator.

**UNIT IV ACTIVE FILTERS, TIMERS AND MULTIPLIERS**  
Low pass, High pass, Band pass and Band Reject filters, Butterworth, Chebychev filters, first and second order filters-switched capacitor filters. 555 Timer functional diagram, monostable and astable operation, multiplier - application.

**UNIT V PLL, ADC AND DAC**  
PLL- basic block diagram and operation, Phase Detector/comparator, VCO, capture range and lock range, IC PLL 565 Block diagram, simple applications of PLL, AM detection, FM detection and FSK demodulation. Weighted resistor DAC, R-2R and inverted R-2R DAC, monolithic DAC. Flash ADC, counter type ADC, successive approximation ADC, dual slope ADC, DAC/ADC specifications.

**TEXT BOOKS**
1. Ramakant A. Gayakwad, ‘OP-AMP and Linear ICs’, Prentice Hall / Pearson Education
2. Coughlin & Driscoll, ‘OP-AMP and Linear ICs’; PHI
REFERENCES
5. D.Roy Choudhry, Shail Jain, ”Linear Integrated Circuits”, New Age International Pvt. Ltd.
UNIT I CONTROL SYSTEM MODELLING
System concept, differential equations and transfer functions. Modeling of electric systems, translational and rotational mechanical systems, Simple electromechanical systems. Block diagram representation of systems – Block diagram reduction methods – Closed loop transfer function, determination of signal flow graph. Mason’s gain formula – Examples.

UNIT II TIME DOMAIN ANALYSIS

UNIT III FREQUENCY DOMAIN ANALYSIS

UNIT IV COMPENSATORS
Realization of basic compensators – cascade compensation in time domain and frequency domain and feedback compensation – design of lag, lead, lag-lead compensator using Bode plot and Root locus. Introduction to P, PI and PID controllers.

UNIT V CONTROL SYSTEM COMPONENTS AND APPLICATION OF CONTROL SYSTEMS

L = 45, T = 15, TOTAL = 60
ANALOG COMMUNICATION

ECB207  ANALOG COMMUNICATION  4 CREDITS

Prerequisite
Nil

Goal
To study the various analog communication fundamentals viz., Amplitude modulation and demodulation; Angle modulation and demodulation, noise performance of various receivers and information theory with source coding theorem.

Objectives
At the end of the course the student should be able to:

1. Understand the need for modulation and amplitude modulation techniques,
2. Understand frequency modulation, demodulation and the comparison of AM and FM,
3. Understand the sources and types of noise in various receivers,
4. Understand the PAM, PPM and PWM techniques,
5. Know the basic information theory and various channel coding theorem.

UNIT I AMPLITUDE MODULATION
Generation and demodulation of AM, DSB-SC, SSB-SC, VSB Signals, Filtering of sidebands, Comparison of Amplitude modulation systems, Frequency translation, Frequency Division multiplexing, AM transmitters – Super heterodyne receiver, AM receiver.

UNIT II ANGLE MODULATION

UNIT III NOISE
UNIT IV PULSE MODULATION
Time Division Multiplexing, Types of Pulse modulation, PAM (Single polarity, double polarity) PWM-Generation & demodulation of PWM, PPM- Generation and demodulation of PPM

UNIT V INFORMATION THEORY
Uncertainty, Information and entropy, Source coding theorem, Data compaction, Discrete memory less channels, mutual information, channel capacity, channel coding theorem, Differential entropy, and mutual information for continuous ensembles, information capacity theorem, implication of the information capacity theorem, rate distortion theory, Compression of information.

TEXT BOOK

REFERENCES

ECB233LINEAR INTEGRATED CIRCUITS LAB

<table>
<thead>
<tr>
<th>ECB233</th>
<th>LINEAR INTEGRATED CIRCUITS LAB</th>
<th>1 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>ECB201</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To study, design and test various applications of linear integrated circuits.</td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>Outcome</td>
<td></td>
</tr>
</tbody>
</table>
Design and testing of
1. Inverting, Non inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier.
5. Astable, Monostable multivibrators using op-amp
6. Schmitt Trigger using op-amp using op-amp
7. Phase shift oscillator using op-amp.
8. Wein bridge oscillator using op-amp.
10. DC power supply using LM317 and LM723.

TOTAL = 45
The course should enable the students to:

1. Learn & implement MATLAB, MATLAB help system,
2. Arrays, Multidimensional arrays, Operations,
3. Functions of MATLAB,
4. Arithmetic and Logical operators,
5. Conditional statements and loops,
6. Plotting, special plotting: 3D plotting,
7. Generation of various signals and sequences,
8. Simulink Basics,
9. Simulink modeling of basic modulation systems,
10. Editing and Debugging MATLAB Programs.

At the end of the course, the student should be able to:

1. Get a clear understanding of the basics of MATLAB, various windows and how to use help system,
2. Learn how to work with matrices, and their operations,
3. Get a Clear understanding of the usage of MATLAB functions relevant to communication engineering,
4. How to perform Arithmetic and Logical operations in MATLAB and beyond,
5. Develop programming skills, usage of loops,
6. Make use of the plotting capabilities of MATLAB to effectively display the outputs,
7. Know signals relevant to communication engineering system design,
8. know the basics of Simulink blocksets for communication engineering,
9. Understand the usage of basic digital modulation schemes using Simulink blocksets,
10. Enable the student to identify programming errors.

TOTAL = 45

REFERENCES

2. MATLAB Tutorial files, www.mathworks.com

ANALOG COMMUNICATION LAB

ECB234 | MATLAB and Simulink Lab | 1 CREDITS
---|---|---
**Prerequisite** |  |
**Goal** | Introduce the MATLAB programming environment and the usage of Simulink blocksets for communication engineering |
**Objectives** | **Outcome** |
The course should enable the students to: | At the end of the course, the student should be able to: |
1. Learn & implement MATLAB, MATLAB help system, | 1. Get a clear understanding of the basics of MATLAB, various windows and how to use help system, |
2. Arrays, Multidimensional arrays, Operations, | 2. Learn how to work with matrices, and their operations, |
3. Functions of MATLAB, | 3. Get a Clear understanding of the usage of MATLAB functions relevant to communication engineering, |
4. Arithmetic and Logical operators, | 4. How to perform Arithmetic and Logical operations in MATLAB and beyond, |
5. Conditional statements and loops, | 5. Develop programming skills, usage of loops, |
6. Plotting, special plotting: 3D plotting, | 6. Make use of the plotting capabilities of MATLAB to effectively display the outputs, |
7. Generation of various signals and sequences, | 7. Know signals relevant to communication engineering system design, |
8. Simulink Basics, | 8. know the basics of Simulink blocksets for communication engineering, |
9. Simulink modeling of basic modulation systems, | 9. Understand the usage of basic digital modulation schemes using Simulink blocksets, |
10. Editing and Debugging MATLAB Programs. | 10. Enable the student to identify programming errors. |
<table>
<thead>
<tr>
<th>ECB235</th>
<th>ANALOG COMMUNICATION LAB</th>
<th>1 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To have a fundamental understanding in analog communication and analog modulation types.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
</tr>
<tr>
<td>1. Study the Amplitude and Frequency modulation and demodulation,</td>
<td>1. Evaluate amplitude and frequency modulation parameters,</td>
</tr>
<tr>
<td>2. Study the characteristics of AM and FM receivers,</td>
<td>2. Characterize AM and FM receivers,</td>
</tr>
<tr>
<td>3. Study the different pulse modulation techniques,</td>
<td>3. Learn about the Pulse modulation techniques,</td>
</tr>
<tr>
<td>4. Design and Analysis of AM and FM modulation and demodulation using Matlab and Pspice.</td>
<td>4. Analyze and Design the AM and FM using Matlab anf Pspice.</td>
</tr>
</tbody>
</table>

**LIST OF EXPERIMENTS**

1. Analog Modulation and Demodulation
2. Frequency Modulation and Demodulation
3. Analysis of AM, FM wave using Spectrum Analyzer.
5. Characteristics of FM receiver (Selectivity & Sensitivity).
7. Line coding & Decoding.
8. Preemphasis and Deemphasis
9. Analog modulation and demodulation using Matlab
10. Frequency modulation and demodulation using Matlab
11. Analog modulation and demodulation using Multisim / Pspice
12. Frequency modulation and demodulation using Multisim / Pspice

**TOTAL = 45**
PURPOSE:
The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential.

INSTRUCTIONAL OBJECTIVES
1. To guide thought process
2. Appear for placement aptitude tests confidently
3. To develop Communication skill
4. To build confidence
5. Acquire aptitude skills for employment

METHODOLOGY:
The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.
1. Group Activities + Individual activities
2. Collaborative learning
3. Interactive sessions
4. Ensure participation
5. Empirical learning

QUANTITATIVE APTITUDE:
Sample Equation, Ratio, Proportion, Variation.
Percentage, Profit & Loss, Partnership.
Averages, Mixtures, Allegations: Simple & Compound Interest.
Time Work, Time Distance.
Geometry & Mensuration.
Permutation, Combination & Probability.
Data Interpretation & Data Sufficiency.

Analytical reasoning:
Non-Verbal Reasoning
Word problem

EVALUATION:
1. Activities assessed by both group and individual participation
2. Continuous assessment based on daily participation

SCHEME OF INSTRUCTION:
Marks allocated for regular participation in all oral activities in class.

SCHEME OF EXAMINATION:
Complete internal evaluation on regular basis.

SEMESTER V
DIGITAL SIGNAL PROCESSING
ECB301 | DIGITAL SIGNAL PROCESSING | 4 CREDITS
---|---|---
Prerequisite | ECB204 | 
Goal | To provide basic knowledge about various signal processing techniques and their importance |
| | | 
**Objectives** | **Outcome** |
The course should enable the students to: | At the end of the course the student should be able to: |
1. Study the FFT and Basics of IIR, FIR Filters, Realization | 1. Understand the concept of Discreet Fourier Transform efficient computation, Realization of IIR and FIR filters. |
2. Study the IIR Filters | 2. Understand the design techniques of IIR and FIR filter types, |
3. Study the FIR filter and Finite Word Length Problems, | 3. Understand the limitations of Digital processors and to handle various Quantization noises due to finite word length problems, |
4. Study the Sampling rate conversion, | 4. Understand to Decimate and interpolate the signal to convert the sampling rate of the known signal, |
5. Study the fundamentals of Digital Signal Processors. | 5. Know the various type of Digital Signal Processors and their special hardware descriptions. |

**UNIT I DIGITAL FILTER STRUCTURES AND FFT**  
12

**UNIT II IIR DIGITAL FILTERS DESIGN**  
12

**UNIT III FIR DIGITAL FILTERS AND FINITE WORD LENGTH EFFECTS**  
12

**UNIT IV MULTIRATE DIGITAL SIGNAL PROCESSING**  
12

**UNIT V DIGITAL SIGNAL PROCESSORS**  
12
Introduction to DSP architecture – Harvard architecture - Dedicated MAC unit - Multiple ALUs, Advanced addressing modes, Pipelining, Overview of instruction set of TMS320C5X and C54X.

\[ L = 45, T = 15, \text{TOTAL} = 60 \]

**TEXT BOOKS**

**REFERENCES**  
78
DIGITAL COMMUNICATION

<table>
<thead>
<tr>
<th>ECB302</th>
<th>DIGITAL COMMUNICATION</th>
<th>4 CREDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>ECB201, ECB205, ECB207</td>
<td></td>
</tr>
</tbody>
</table>

Goal
To introduce the basic concepts of digital modulation techniques to baseband pulse, pass band data transmission, to give an exposure to error control coding and finally to discuss about the spread spectrum modulation schemes.

Objectives

The course should enable the students to:
1. Understand different methods of pulse digital modulation and demodulation schemes,
2. Analyze baseband pulse transmission and reception, its noise occurrence and noise reduction in communication channel,
3. Analyze pass band digital modulation and demodulation schemes and compare its bit error probability,
4. Understand error control codes with different coding techniques and decoding techniques in data transmission channel,
5. Understand the spread spectrum modulation techniques which are used in digital communication.

At the end of the course the student should be able to:
1. Understand the different methods of PCM, PAM, DPCM, DM, ADM schemes which are used in digital communication,
2. Understand the analysis of matched filter, ISI, nyquist's criterion, correlative level coding, adaptive equalization and eye pattern in digital communication channel,
3. Understand the analysis of ASK, FSK, PSK, DPSK, DEPSK, QPSK, MSK and GMSK schemes and comparison of bit error probability,
4. Understand the linear block codes, cyclic codes convolution codes and viterbi decoding techniques in data transmission channel,
5. Understand the PN sequence, DSSS-BPSK, FHSS and gold codes in digital communication.

UNIT I PULSE DIGITAL MODULATION
Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error. PAM and Other forms of pulse modulations Differential PCM system (DPCM), TDM, Delta modulation, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

UNIT II BASE BAND PULSE TRANSMISSION AND RECEIPTION
Base band signal receiver, probability of error, the optimum filter, Matched Filter, probability of error using matched filter, Inter symbol Interference, Nyquist's criterion for Distortion less Base band Binary Transmission, Correlative level coding, Adaptive Equalization, Eye pattern analysis.
UNIT III MODULATION SCHEMES
Introduction of digital modulation techniques- Generation, Detection, Signal space diagram, calculation bit error probability and Power spectra of ASK, FSK, PSK, DPSK, DEPSK, QPSK, MSK and GMSK, similarity of BFSK and BPSK, Comparison of Digital modulation systems using bit error probability.

UNIT IV ERROR CONTROL CODING
Introduction to linear block codes, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Hamming codes, Binary cyclic codes, Algebraic structure, encoding, syndrome calculation, Introduction to convolution codes, encoding of convolution codes, time domain approach, transform domain approach. Graphical approach: state, tree and trellis diagram, decoding using Viterbi algorithm.

UNIT V SPREAD SPECTRUM MODULATION
Pseudo-noise sequences, a notion of spread spectrum – Direct sequence spread spectrum with coherent binary phase shift keying, Signal space Dimensionality and processing gain. Probability of error, Frequency hop spread spectrum -Maximum length and Gold codes.

TEXT BOOKS

REFERENCES

MICROPROCESSORS AND MICROCONTROLLER
L T P C
3 1 0 4
ECB303 | MICROPROCESSORS AND MICROCONTROLLER | 4 CREDITS
---|---|---
Prerequisite | ECB201 | 
Goal | To learn the architecture programming and interfacing of microprocessors and Microcontrollers. | 

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
</tr>
<tr>
<td>1. Study 8085 architecture,</td>
<td>1. Understand the architecture, instruction sets and programming of 8085,</td>
</tr>
<tr>
<td>2. Study 8086 architecture,</td>
<td>2. Understand the architecture, Interrupts and memory interfacing of 8086,</td>
</tr>
<tr>
<td>3. Learn 8086 programming,</td>
<td>3. Program arithmetic and data manipulation using 8086,</td>
</tr>
<tr>
<td>4. Study Interfacing concepts,</td>
<td>4. Understand interfacing concepts using 8056,</td>
</tr>
<tr>
<td>5. Study 8051 Microcontroller.</td>
<td>5. Understand the architecture, instruction sets and programming of 8081.</td>
</tr>
</tbody>
</table>

**UNIT I 8085 MICROPROCESSOR**

**UNIT II 8086 MICROPROCESSOR**

**UNIT III PROGRAMMING OF 8086 PROCESSOR**
Instruction format and addressing modes – Assembly language format – Data transfer, data Manipulation, control and string instructions – Programming: Loop structure with counting Indexing – Look up table – Subroutine instructions stack.

**UNIT IV PHERIPHERAL INTERFACING**
Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8257 PIC, 8251 USART and 8253 Timer/Counter – Inter Integrated Circuits (I²C), Serial Peripheral Interface (SPI) – A/D and D/A converter interfacing.

**UNIT V MICRO CONTROLLER 8051**
Functional block diagram – Instruction format and addressing modes – Interrupt structure – Timer – I/O ports – Serial communication- Data Transfer, Manipulation, Control & I/O instructions – Simple programming

L = 45, T = 15, TOTAL = 60

**TEXT BOOKS**

**REFERENCE BOOKS**
2. Programming and Customizing the 8051 Microcontroller

**DIGITAL SIGNAL PROCESSING LAB**

<table>
<thead>
<tr>
<th>ECB331</th>
<th>DIGITAL SIGNAL PROCESSING LAB</th>
<th>1 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>ECB204</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To Provide hands on training with Mat Lab simulator and DSP processor about various Signal Processing Techniques</td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to understand and test:</td>
<td></td>
</tr>
<tr>
<td>1. Know MatLab simulation software to perform Signal Processing exercises,</td>
<td>1. Mat Lab simulation software to perform various Signal Processing exercises,</td>
<td></td>
</tr>
<tr>
<td>2. Know the DSP processor TMS320c54x blocks in detail,</td>
<td>2. The DSP processor addressing modes and functional blocks and to use it for signal processing applications,</td>
<td></td>
</tr>
<tr>
<td>3. Study Code Composer Studio software.</td>
<td>3. The code composer studio software and be able to convert the high level Language (c) to Machine Language (Assembly) to perform Signal Processing experiments.</td>
<td></td>
</tr>
</tbody>
</table>

**LIST OF EXPERIMENTS**

**USING TMS320C5XX HARDWARE FAMILY**
2. Sampling of input signal and display.
3. Calculation of Linear and circular convolution between two sequences.
4. Calculation of FFT.

**USING MATLAB SIMULATOR**
2. Linear and circular convolution of two sequences.
4. Design of FIR filters.
5. Design of IIR filters.
6. Calculation of FFT of a signal.

**TOTAL = 45**

**DIGITAL COMMUNICATION LAB**
LIST OF EXPERIMENTS

HARDWARE IMPLEMENTATION of

1. Pulse Amplitude Modulation and demodulation
2. Pulse Position Modulation and demodulation and Pulse Width Modulation and demodulation
3. Pulse Code Modulation and Delta Modulation
4. Frequency Shift Keying and Amplitude Shift Keying
5. Phase Shift Keying and DPSK

SIMULATION OF DIGITAL MODULATION TECHNIQUES USING MATLAB

1. Delta Modulation and demodulation
2. Amplitude Shift Keying (ASK)
3. Frequency Shift Keying (FSK)
4. Phase Shift Keying (PSK)
5. Quadrature Phase Shift Keying (QPSK)
6. Differential Phase Shift Keying (DPSK)

TOTAL = 45
<table>
<thead>
<tr>
<th>ECB333</th>
<th>MICROPROCESSORS AND MICROCONTROLLER LAB</th>
<th>1 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>ECB201</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To learn the architecture programming and interfacing of Microprocessors and Microcontrollers.</td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Study 8085 – 8 bit arithmetic,</td>
<td>1. Write the program for arithmetic operations,</td>
<td></td>
</tr>
<tr>
<td>2. Study 8086 – 16 bit arithmetic,</td>
<td>2. Write the program for arithmetic operations,</td>
<td></td>
</tr>
<tr>
<td>3. Study 8086 – serial, parallel,</td>
<td>3. Write program for serial and parallel communications and also the timer program,</td>
<td></td>
</tr>
<tr>
<td>4. Study Interfacing and programming – ADC and DAC, 8279, 8251 and 8253,</td>
<td>4. Write program for peripheral devices,</td>
<td></td>
</tr>
<tr>
<td>5. Study 8051- arithmetic and logical.</td>
<td>5. Write program for arithmetic, logical and interfacing stepper motor.</td>
<td></td>
</tr>
</tbody>
</table>

**LIST OF EXPERIMENTS**

1. Addition and Subtraction of two 8bit numbers using 8085.
2. Multiplication and Division of two 8bit numbers using 8085.
3. Addition and Subtraction of two 16 bit numbers using 8086.
4. Multiplication and Division of two 16 bit numbers using 8086.
5. Programs for String manipulation operations using 8086.
6. Interfacing ADC
7. Interfacing DAC.
8. Parallel Communication between two MP Kits using Mode 1 of 8255.
10. Interfacing and Programming 8253.
11. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller (atleast 2 programs)
12. Interfacing and Programming of Stepper Motor Speed control.
13. Interfacing and Programming of DC Motor Speed control.

Note: Experiment number 1-10 to be conducted using simulation kit.
11, 12, 13 to be conducted using keil software

**TOTAL = 45**

**PROJECT WORK**
### ECB334 PROJECT WORK

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Nil</th>
</tr>
</thead>
</table>

| Goal | To provide practical knowledge on the various components design and manufacturing aspects of a commercially available Electronics & Communication utility. |

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>The course should enable the students to:</strong></td>
<td><strong>At the end of the course the student should be able to:</strong></td>
</tr>
<tr>
<td>1. Actual design aspects by providing hands on skills.</td>
<td>1. Identify various components, materials used, manufacturing process involved and assembly and dismantling of that commercial object.</td>
</tr>
</tbody>
</table>

**EXERCISES:**

- To Dismantle and identify the various components, material used, manufacturing process involved and to assemble the following components & Processing Techniques.
  
  (Resistor, Capacitor, Inductor, Integrated Circuits, Electrical Machines)
PURPOSE:
The Purpose of the course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential.

INSTRUCTIONAL OBJECTIVES:
At the end of the course the students will be able to
1. Acquire the important soft skills for employment
2. Take part in group discussions and job interviews confidently
3. Gain self confidence to face the placement process.

METHODOLOGY:
The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities & Individual activities
2. Collaborative learning
3. Interactive Sessions
4. Ensure Participation
5. Empirical Learning

- Resume writing
- SWOT Analysis
- Interview techniques
- Presentation skills
- Body Language for Interview
- Rules of Group Discussion
- FAQs

EVALUATION:
1. Activities assessed by both group and individual participation
2. Continuous assessment based on daily participation

SCHEME OF INSTRUCTION:
Marks allocated for regular participation in all oral activities in class.

SCHEME OF EXAMINATION:
Complete Internal Evaluation on a regular Basis.
SEMESTER VI
TRANSMISSION LINES AND WAVEGUIDES

<table>
<thead>
<tr>
<th>ECB304</th>
<th>TRANSMISSION LINES AND WAVEGUIDES</th>
<th>4 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>ECB203</td>
<td>Goal</td>
</tr>
<tr>
<td>To lay a strong foundation on the theory of transmission lines and wave guides by highlighting their applications.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course, the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Study transmission lines using circuit theory, for analysis of line, define reflection factor, return loss and lossless line. Representation of lines in different form.</td>
<td>1. Apply transmission line theory to solve problems, understand the signal propagation through transmission lines, solve problems involving Reflection coefficient to know the line behavior, and model the line in a convenient form using circuit theory.</td>
<td></td>
</tr>
<tr>
<td>2. Familiarize students with the Standing waves and standing wave ratio, Study impedance matching techniques, Smith Chart, and Stub matching.</td>
<td>2. Solve problems using SWR, return loss equations, achieve impedance matching in a line, Solve problems using Smith Chart, apply Smith Chart for Stub design,</td>
<td></td>
</tr>
<tr>
<td>3. Develop field equations for wave propagation through various metallic structures, and define various modes of wave propagation, wave impedance and its importance.</td>
<td>3. Know how the electromagnetic waves are propagating through waveguides, solve problems of practical importance using developed theory of wave propagation,</td>
<td></td>
</tr>
<tr>
<td>4. Learn rectangular cross sectioned metallic guided structures, different modes of wave propagation, attenuation and obtain impedance.</td>
<td>4. Develop a strong theoretical understanding of wave propagation in rectangular wave guide, solve problems of rectangular guided structures, and solve problems related to small equations derived to understand the wave phenomena,</td>
<td></td>
</tr>
<tr>
<td>5. Solve wave equation in cylindrical coordinate system, and understand the various modes of wave propagation in cylindrical waveguide.</td>
<td>5. Know how the electromagnetic waves are propagating through circular waveguide, Solve problem using the modal theory of wave propagation, and understand the application of resonators in microwave communication.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT I TRANSMISSION LINE THEORY
Different types of transmission lines – Definition of Characteristic impedance – The transmission line as a cascade of T-Sections - Definition of Propagation Constant. General Solution of the transmission line – The two standard forms for voltage and current of a line terminated by an impedance – physical significance of the equation and the infinite line – The two standard forms for the input impedance of a transmission line terminated by an impedance – meaning of reflection coefficient – wavelength and velocity of propagation. Waveform distortion – distortion less transmission line – The telephone cable – Inductanceloading of telephone cables. Input impedance of lossless lines – reflection on a line not terminated by Zo - Transfer impedance – reflection factor and reflection loss – T and Π Section equivalent to lines.

UNIT II THE LINES AT RADIO FREQUENCIES
Standing waves and standing wave ratio on a line – One eighth wave line – The quarter wave line and impedance matching – the half wave line. The circle diagram for the dissipation less line – The Smith Chart – Application of the Smith Chart – Conversion from impedance to reflection coefficient and vice-
versa. Impedance to Admittance conversion and vice versa – Input impedance of a lossless line terminated by an impedance – single stub matching and double stub matching.

UNIT III GUIDED WAVES

UNIT IV RECTANGULAR WAVEGUIDES

UNIT V CIRCULAR WAVE GUIDES AND RESONATORS
Bessel functions – Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides – wave impedances and characteristic impedance – Dominant mode in circular waveguide – excitation of modes – Microwave cavities, Rectangular cavity resonators, circular cavity resonator, semicircular cavity resonator, Q factor of a cavity resonator for TE101 mode.

L = 45, T = 15, TOTAL = 60

TEXT BOOKS
1. J.D.Ryder “Networks, Lines and Fields”, PHI, New Delhi, 2003. (Unit I & II)

REFERENCES

ANTENNAS AND WAVE PROPAGATION

<table>
<thead>
<tr>
<th>ECB305</th>
<th>ANTEenas AND WAVE PROPAGATION</th>
<th>4 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>ECB203, ECB304</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To enable the student to study the various types of antennas and wave propagation.</td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Study antenna basics and radiation from a current element,</td>
<td>1. Understand the antenna fundamentals and the radiation of the thin linear wire antennas,</td>
<td></td>
</tr>
<tr>
<td>2. Study antenna arrays and loop antennas,</td>
<td>2. Understand the array of point sources and uniform linear arrays and also know about the loop antennas,</td>
<td></td>
</tr>
<tr>
<td>3. Study the travelling wave antennas,</td>
<td>3. Understand the radiation mechanism of travelling wave and wideband antennas,</td>
<td></td>
</tr>
<tr>
<td>4. Learn aperture and lens antennas,</td>
<td>4. Understand the radiation of rectangular aperture, slot, parabolic reflector and lens antennas,</td>
<td></td>
</tr>
<tr>
<td>5. Study radio wave propagation.</td>
<td>5. Know the basic propagation and its types.</td>
<td></td>
</tr>
</tbody>
</table>
UNIT I ANTENNA FUNDAMENTALS AND RADIATION FIELDS OF WIRE ANTENNAS

UNIT II ANTENNA ARRAYS AND LOOP ANTENNAS
Loop Antennas: Radiation from small loop and its radiation resistance. Radiation from a loop with circumference equal to a wavelength and resultant circular polarization on axis. Helical antenna. Normal mode and axial mode operation.

UNIT III TRAVELLING WAVE (WIDEBAND) ANTENNAS

UNIT IV APERTURE AND LENS ANTENNAS

UNIT V PROPAGATION
The three basic types of propagation; ground wave, space wave and sky wave propagation.
Space wave propagation: Reflection from ground for vertically and horizontally polarized waves. Reflection characteristics of earth. Resultant of direct and reflected ray at the receiver. Duct propagation.
Ground wave propagation: Attenuation characteristics for ground wave propagation. Calculation of field strength at a distance.

L = 45, T = 15, TOTAL = 60

TEXTBOOK

REFERENCES

ECB335COMPREHENSIVE VIVA
COMMUNICATION SKILLS AND PERSONALITY DEVELOPMENT

<table>
<thead>
<tr>
<th>ELA331</th>
<th>Communication Skills &amp; Personality Development</th>
<th>Practical Syllabus</th>
<th>1 Credit</th>
</tr>
</thead>
</table>

**Goal**

The goal of the programme is to provide a theoretical input towards nurturing accomplished learners who can function effectively in the English language skills; to cultivate in them the ability to indulge in rational thinking, independent decision-making and lifelong learning; to help them become responsible members or leaders of the society in and around their work/living space; to communicate successfully at the individual or group level on multi-disciplinary activities in particular with the community, and in general with the world at large.

**Objectives**

1. To widen the capacity of the learners to listen to English language at the basic level and understand its meaning.
2. To enable learners to communicate in an intelligible English accent and pronunciation.
3. To assist the learners in reading and grasping a passage in English.
4. To learn the art of writing simple English with correct spelling, grammar and punctuation.
5. To cultivate the ability of the learners to think and indulge in divergent and lateral thoughts.

**Outcome**

1. The learners will have the self-confidence to improve upon their informative listening skills by an enhanced acquisition of the English language.
2. The learners will be able to speak English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.
3. The learners will be able to read, comprehend and answer questions based on literary, scientific and technological texts.
4. The learners will be able to write instructions, recommendations, checklists, process description, letter-writing and report writing.
5. The learners will have the confidence to develop thinking skills and participate in brainstorming, mind-mapping, audiovisual activities, creative thinking and also answer tests in the job-selection processes.

**UNIT I**


**UNIT II**

What is personality development? – Types of personalities as per (i) Heredity (ii) Environment (iii) Situation – the 16 personality factors – MBTI Tests – Personality types – Increasing self awareness: Assessing one’s locus of control, Machiavellianism, self-esteem, self-monitoring, risk-taking, Type A, Type B personality elements – Intellectual and physical abilities for jobs -- Personality tests.
UNIT III

UNIT IV

UNIT V

Online examination / Oral Presentations/Debates/Group Discussions
**DATA COMMUNICATION AND NETWORKS LAB**

<table>
<thead>
<tr>
<th>ECB336</th>
<th>DATA COMMUNICATION AND NETWORKS LAB</th>
<th>2 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To Provide hands on training with OPNET simulator and Networking Hardware equipments.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the students should be able to understand and test:</td>
</tr>
<tr>
<td>1. Know the various Networking Hardware equipments and their functions,</td>
<td>1. Various Networking Hardware equipments to evaluate their performance measurements,</td>
</tr>
<tr>
<td>2. Study the OPNET / Qualnet simulator in detail to measure Network parameters,</td>
<td>2. The OPNET / Qualnet simulator in detail to create the Network scenario to measure Network parameters,</td>
</tr>
<tr>
<td>3. Study the various Routing program and Socket Processing techniques.</td>
<td>3. The various Routing program for the given Network size and Socket Processing techniques using TCP &amp; UDP protocols.</td>
</tr>
</tbody>
</table>

**The following experiments are conducted using the Hardware.**

1. PC to PC Communication.
   - Parallel Communication using 8 bit parallel cable.
   - Serial communication using RS 232C.
2. Ethernet LAN protocol.
   - To create scenario and study the performance of CSMA/CD protocol ethrol simulation.
3. Token bus and token ring protocols.
   - To create scenario and study the performance of token bus and token ring protocols through simulation.
4. Wireless LAN protocols
   - To create scenario and study the performance of network with CSMA / CA protocol and
   - Compare with CSMA/CD protocols.
5. Implementation of distance vector and Link state routing algorithm.
6. Transfer of files from PC to PC using Windows / Unix socket processing.
The following experiments are conducted using either QUALNET/OPNET simulators.

7. Simulate a three nodes point-to-point network with duplex links between them. Set the queue size vary the bandwidth and find the number of packets dropped.

8. Simulate a four node point-to-point network, and connect the links as follows: n0-n2, n1-n2 and n2-n3. Apply TCP agent between n0-n3 and UDP n1-n3. Apply relevant applications over TCP and UDP agents changing the parameter and determine the number of packets by TCP/UDP.

9. Simulate the different types of Internet traffic such as FTP a TELNET over a network and analyze the throughput.

10. Simulate the transmission of ping message over a network topology consisting of 6 Nodes and find the number of packets dropped due to congestion.

11. Simulate an Ethernet LAN using N-nodes (6-10), change error rate and data rate and Compare the throughput.

TOTAL = 60
### ECM401 - MICROWAVE ENGINEERING

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>ECB201, ECB204</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
</tr>
<tr>
<td>1. Describe the construction, principle of operation of various microwave tubes,</td>
<td>1. Understand principle of operation of various microwave tubes as sources and amplifiers and their performance characteristics,</td>
</tr>
<tr>
<td>2. Describe microwave transistor and diodes,</td>
<td>2. Understand limitations of Microwave BJTs and principles of operation of microwave solid state devices and their applications,</td>
</tr>
<tr>
<td>3. Explain the basic working principle and representation of passive microwave components by means of S-parameters,</td>
<td>3. Demonstrate familiarity with the passive microwave components and their S-Parameters,</td>
</tr>
<tr>
<td>4. Study Microstrip lines and microwave integrated circuits fabrication methods,</td>
<td>4. Describe types of Microstrip lines and Microwave integrated circuits fabrication methods,</td>
</tr>
<tr>
<td>5. Study various measurement setup procedure and techniques for various parameters of microwave devices and circuits.</td>
<td>5. Enumerate a variety of microwave measuring devices, their applications and the methodology used in making measurements on them.</td>
</tr>
</tbody>
</table>

### UNIT I MICROWAVE LINEAR-BEAM TUBES (O TYPE) and MICROWAVE CROSSED FIELD TUBES (M TYPE) 12


### UNIT II MICROWAVE DIODES AND TRANSISTORS 12


### UNIT III MICROWAVE DEVICES AND S - PARAMETERS 9

Microwave Hybrid Circuits, Waveguide Tees, Magic Tees (Hybrid Trees), Hybrid Rings (Rat-Race Circuits), Waveguide Corners, Bends and Twists, Directional Couplers, Two-Hole Directional Couplers, Z & ABCD Parameters- Introduction to S parameters, S Matrix of a Directional Coupler, Hybrid Couplers, Circulators and Isolators, Microwave Circulators, Microwave Isolators.
UNIT IV STRIP LINES and MONOLITHIC MICROWAVE INTEGRATED CIRCUITS


UNIT V MICROWAVE MEASUREMENTS:

Slotted line VSWR measurement, VSWR through return loss measurements, power measurement, impedance measurement insertion loss and attenuation measurements, measurement of scattering parameters – Measurement of 1 dB, dielectric constant measurement of a solid using waveguide

\[ L = 45, \ T = 15, \ TOTAL = 60 \]

TEXT BOOKS

REFERENCES
2. David M.POZAR : Microwave Engineering. – John Wiley

VLSI DESIGN

ECB402 VLSI DESIGN 4 CREDITS

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>ECB201</th>
</tr>
</thead>
</table>

Goal

To introduce the technology, design concepts and testing of Very Large Scale Integrated Circuits and to learn the concepts of modeling a digital system using Hardware Description Language.

Objectives

The course should enable the students learn about:

1. CMOS Technology,
2. MOS Transistor Theory,
3. Specification using Verilog HDL,
4. CMOS Chip Design,
5. CMOS Testing.

Outcome

On completion of this course the student should be able to:

1. Get an overview of Silicon semiconductor technology and CMOS technology,
2. Understand MOS AC characteristics, complementary CMOS inverter DC characteristics,
3. Understand VLSI Design flow, Verilog Hardware Description Language,
4. Know logic design with CMOS, ASIC design flow,
5. Know about need for testing, Chip level and system level test techniques.

UNIT I CMOS TECHNOLOGY

An overview of Silicon semiconductor technology, Basic CMOS technology: n well, P well, Twin tub and SOI Process. Interconnects, circuit elements: Resistors, capacitors, Electrically alterable ROMs, bipolar transistors, Latch up and prevention.
Layout design rules, physical design: basic concepts, CAD tool sets, physical design of logic gates: Inverter, NAND, NOR, Design Hierarchies.
UNIT II MOS TRANSISTOR THEORY
NMOS, PMOS Enhancement transistor, Threshold voltage, Body effect, MOS DC equations, channel length modulation, Mobility variation, MOS models, small signal AC characteristics, complementary CMOS inverter DC characteristics, Noise Margin, Rise time, fall time, power dissipation, transmission gate, tristate inverter.

UNIT III SPECIFICATION USING VERILOG HDL
Basic Concepts: VLSI Design flow, identifiers, gate primitives, value set, ports, gate delays, structural gate level and switch level modeling, Design hierarchies, Behavioral and RTL modeling: Operators, timing controls, Procedural assignments conditional statements, Data flow modeling and RTL. Structural gate level description of decoder, equality detector, comparator, priority encoder, D-latch, D-flip, half adder, Full adder, Ripple Carry adder.

UNIT IV CMOS CHIP DESIGN
Logic design with CMOS: MOSFETS as switches, Basic logic gates in CMOS, Complex logic gates, Transmission gates: Muxes and latches, CMOS chip design options: Full custom ASICs, Std. Cell based ASICs, Gate Array based ASICs Channelled, Channel less and structured GA, Programmable logic structures; 22V10, Programming of PALs, Programmable Interconnect, Reprogrammable GA: Xilinx programmable GA, ASIC design flow.

UNIT V CMOS TESTING
Need for testing, manufacturing test principles, Design strategies for test, Chip level and system level test techniques.

TOTAL: 60

TEXT BOOKS

REFERENCES
**LIST OF EXPERIMENTS:**

1. Study of Reflex Klystron Repeller mode characteristics
2. Measurement of low and high VSWR
3. Study of GUNN Diode characteristics
4. Determination of frequency of line and impedance of an unknown load
5. Study of Radiation pattern of Dipole antenna

**ECB431** | **Microwave and Optical Communication lab** | **1 CREDITS**
--- | --- | ---
**Prerequisite** | ECB201, 203 |  
**Goal** | To familiarize the students with the fundamentals of Microwave systems, measurement techniques and optical devices |  
**Objectives** |  
1. Study of Reflex Klystron repeller mode characteristics,
2. Measure low and high VSWR of a Primary transmission line,
3. Study GUNN Diode characteristics,
4. Determine the frequency of line and impedance of an unknown load,
5. Study Radiation pattern plotting of Dipole antenna,
6. Study Radiation pattern plotting of Horn antenna,
7. Study Radiation pattern plotting of Yagi uda antenna,
8. Perform Power coupling using directional coupler,
9. Study the characteristics of MagicTee,
10. Study the radiation pattern of Microstrip patch antennas,
11. Study Numerical Aperture and attenuation losses of optical fiber,
12. Study the characteristics of LED and Photodiode using optical transceiver kit,
13. Simulate Dense Wavelength Division Multiplexing (DWDM) modeling using OptSIM,
14. Simulate ISI measurement and performance analysis of WDM using OptSIM,
15. Simulate and study of EDFA-optical amplifier using OptSIM.

**Outcome** | At the end of the course the student should be able to:
1. Explain the mode characteristics of reflex Klystron,
2. Have a clear understanding of standing waves in a line due to impedance mismatch and reflection,
3. Understand the operation of GUNN diode as a low frequency oscillator,
4. Obtain the unknown load impedance using Smith Chart,
5. Understand the power distribution of Dipole Antenna,
6. Understand the power distribution of Horn Antenna,
7. Understand the power distribution of Yagi uda Antenna,
8. Understand the principle of coupler and determine its directivity, insertion and isolation losses,
9. Understand the characteristics of magic Tee,
10. Understand the power distribution of a Micro strip patch antenna,
11. Have a clear Understanding of NA and attenuation losses of fibers,
12. Understand and observe the performance of LED and Photodiode,
13. Design and analyse DWDM system using OptSIM,
14. Have a clear understanding of ISI and its effects,
15. Design and analyze EDFA.
6. Study of Radiation pattern of Horn antenna  
7. Study of Radiation pattern of 3 and 5 element yagi uda antenna  
8. Power coupling using directional coupler  
9. Study of characteristics of MagicTee  
10. Study of radiation pattern of Microstrip patch antenna  
11. Study of Numerical Aperture and attenuation losses of optical fiber  
12. Study of characteristics of LED and Photodiode using optical transceiver kit  
13. Dense Wavelength Division Multiplexing (DWDM) modeling using OptSIM  
14. ISI measurement and performance analysis of WDM using OptSIM  
15. Study of EDFA- optical amplifier using OptSIM  

TOTAL: 45

**VLSI DESIGN LAB**

**List of Experiments**

**I. FPGA Based Experiments**

1. HDL based design entry and simulation of combinational circuits, simple counters, adders (8-bit), multiplier (4bit).
2. Synthesis, Place and Route and P&R simulation of components simulated in above experiment.
4. Design and implementation of simple combinational and sequential circuits on FPGA board.

**II. IC Design Experiments (based on Cadence/MAGMA/Tanner)**

1. Design and simulation of simple CMOS logic circuits.
2. Layout generation, parasitic extraction and re-simulation of the circuit designed in the above experiment.

**TOTAL: 45**
SEMESTER VIII
PROJECT & VIVA VOCE

ECB441 PROJECT WORK 6 CREDITS

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<th>6</th>
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</table>

<table>
<thead>
<tr>
<th>Goal</th>
<th>To develop the student’s skills and enable innovation in design and fabrication work from the theoretical and practical skill acquired from the previous semesters.</th>
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</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
</tr>
<tr>
<td>1. Select and work on real life application in the field of Electronics &amp; Communication, 2. Implement their skills acquired in the previous semesters to practical problems, 3. Apply and enhance the knowledge acquired in the related field, 4. Make the students come up with new ideas in his area of interest.</td>
<td>1. Appreciate various aspects of the curriculum which support students in increasing their mastery, 2. Get an idea and develop confidence in designing, analyzing and executing the project, 3. Develop knowledge of latest trends in fabrication relate their ideas to industrial applications, 4. Have complete understanding of making a product.</td>
</tr>
</tbody>
</table>

NOTE:

The objective of the project work is to enable the students in convenient groups of not more than 4 members on a project involving theoretical and experimental studies related to the branch of study. Every project work shall have a guide who is a member of the faculty of the institution. Twenty Four per week shall be allotted in the timetable and this time shall be utilized by the student to receive the directions from the guide, on library reading, laboratory work, computer analysis or field work as assigned by the guide and also to present in periodic seminars on the progress made in the project.

Each student will be assigned any one of the following types of project/thesis work:
(a) Industrial case study  
(b) Preparation of a feasibility report  
(c) Thesis by experimental research, and  
(d) Design and development of equipment.

Each report must contain student's own analysis or design presented in the approved format. Sessional marks will include
(a) Evaluation of the student's progress,  
(b) Degree of involvement and participation,  
(c) Merit of the project.

A student will have to defend his project/thesis and credit will be given on the merits of presentation and viva-voce examination.
OBJECTIVES

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving numerically different kinds of problems in engineering. At the end of the course, the students would be acquainted with the basic concepts in numerical methods and their uses.

1. **SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS**  

2. **INTERPOLATION AND APPROXIMATION**
   - Lagrangian Polynomials – Divided difference – Interpolation with a cubic spline – Newton forward and backward difference formulae.

3. **NUMERICAL DIFFERENTIATION AND INTEGRATION**
   - Derivatives from difference table – Divided difference and finite difference – Numerical integration by Trapezoidal and Simpson’s 1/3 and 3/1 rules – Romberg’s method – Two and three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpson’s rules.

4. **INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS**

5. **BOUNDARY VALUE PROBLEMS**
   - Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation by implicit and explicit methods – one dimensional wave equation and two dimensional Laplace and Poisson equations.

**TOTAL: 45**
UNIT I  16/32 BIT MICROPROCESSOR
Organization of 8086, 80286, 80386, 80486 microprocessors - Minimum maximum mode of 8086 - Pipeline Architecture - Registers - Addressing modes of 8086 - Memory Segmentation - Bus structure and timing - exception handling.

UNIT II ASSEMBLY LANGUAGE PROGRAMMING
Instruction set of 8086 - Data transfer instruction - Arithmetic instruction - Branch instructions - Loop instructions - NOP and HALT instructions - Flag manipulation instructions - Logical instructions - Shift and rotate instructions - Assembly language programming of 8086 microprocessor - linking and relocation - stacks procedure - Interrupts and interrupt routines - Macros - Byte and string manipulations.

UNIT III DIGITAL INTERFACING
Programming Parallel ports - Handshake input/output - interfacing a microprocessor to a keyboard, interfacing to alphanumeric displays, interfacing a microcomputer to high power devices, Optical motor shaft encoders - interfacing of Sensors and Transducers - D/A converter interfacing with 8086 - A/D converter - types & interfacing, A 8086 based process control system.

UNIT IV MULTIPROCESSOR CONFIGURATIONS, ADVANCED MICROPROCESSOR ARCHITECTURE, INTRODUCTION TO THE MICROPROGRAMMABLE MICROPROCESSORS
Queue status and lock facilities - 8086 / 8088 based multiprocessor system, 8087 numeric data processor, 8089 I/O processor, Introduction to Motorola 68HC11 processor, Pentium4 Microprocessor - Architecture, Instruction set and addressing modes, Organization of bit-slice processor, bit-slice processor architecture for micro-programmed machines.

UNIT V HIGH PERFORMANCE RISC ARCHITECTURE
ARM: The ARM7 architecture – ARM7 organization and implementation - The ARM7 instruction set - The thumb instruction set - Basic ARM7 Assembly language program - ARM CPU cores.

TOTAL: 45

TEXT BOOKS
REFERENCE BOOKS

NANOELECTRONICS AND DEVICES

<table>
<thead>
<tr>
<th>ECC352</th>
<th>NANO ELECTRONICS AND DEVICES</th>
<th>3 CREDIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>To introduce the student to various Nanoelectronic Devices and Technology.</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Study the types of Nanotechnology and nanomachines,</td>
<td>1. Understand the molecular Nanotechnology and Nanomaterials,</td>
<td></td>
</tr>
<tr>
<td>2. Study the fundamentals of logic devices and classifications,</td>
<td>2. Understand the dynamic properties, physical limits and classifications,</td>
<td></td>
</tr>
<tr>
<td>3. Study Silicon MOSFET devices and Quantum transport tunneling devices,</td>
<td>3. Enumerate the concepts of Silicon MOSFET devices and Quantum transport devices,</td>
<td></td>
</tr>
<tr>
<td>4. Study Quantum carbon tubes and its applications for memory devices,</td>
<td>4. Explain the types, formation and synthesis of carbon nano tubes,</td>
<td></td>
</tr>
<tr>
<td>5. Study the function of molecular electronic devices and MEMs.</td>
<td>5. Understand fabrication, simulation and testing of molecular electronic devices and MEMs.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT I INTRODUCTION TO NANOTECHNOLOGY

UNIT II FUNDAMENTALS OF NANOELECTRONICS
UNIT III  SILICON MOSFETS & QUANTUM TRANSPORT DEVICES  

UNIT IV CARBON NANOTUBES  

UNIT V MOLECULAR ELECTRONICS  

TOTAL= 45

TEXTBOOKS  

EMBEDDED AUTOMOTIVE SYSTEMS  
Prerequisite: Nil

Goal: To provide basic knowledge about the embedded automotive systems and their real time development.

Objectives: The course should enable the students to:
1. Understand the trends in automobiles, security and warning systems.
2. Understand the Electronic management of chassis systems and different sensors.
3. Understand the Electronic ignition systems.
4. Understand the recent advances in embedded automotive systems.
5. Understand the real time design methodology of embedded automotive systems.

Outcome: At the end of the course the student should be able to:
1. Know about the trends in automobiles, electromagnetic principles, security and warning systems.
2. Know about the Electronic management of chassis systems and operation of different sensors.
3. Know about the Electronic ignition systems principles, types and operation.
4. Know about the recent advances in embedded automotive systems and multiprocessor communication.
5. Know about the real time development of embedded automotive systems.
UNIT-I: INTRODUCTION TO AUTOMOBILES

UNIT-II: ELECTRO CHASSIS SYSTEMS
Electronic management of chassis systems; Vehicle motion control, Sensors and actuators and their interfacing. Basic sensor arrangement, types of sensors such as: oxygen sensors, crank angle position sensors- Fuel metering/ vehicle speed sensors and destination sensors, Attitude sensor, Flow sensor, exhaust temperature, air mass flow sensors, throttle position sensor, solenoids, stepper motors and relays.

UNIT-III: ELECTRONIC IGNITION SYSTEMS
Electronic ignition systems; Types of solid state ignition systems and their principle of operation; Digital engine control system, Open loop and closed loop control system, Engine Cranking and warm up control, Acceleration enrichment, Deceleration learning and ideal speed Control, Distributor less ignition – Integrated engine control system, Exhaust emission control Engineering.

UNIT-IV: EMBEDDED AUTOMOTIVE SYSTEMS
Automotive Embedded systems. PIC, free scale microcontroller based system. Recent advances like GLS, GPSS and GMS; Multiprocessor communication using CAN bus.

UNIT-V: REAL TIME STUDY OF AUTOMOTIVE SYSTEMS
Case study- cruise control of car, Artificial Intelligence and engine management.

L = 45, TOTAL=45

Text books:

REFERENCES:
UNIT I BASIC MEASUREMENT CONCEPTS

UNIT II BASIC ELECTRONIC MEASUREMENTS
Force on charge in electric field – Motion of Charge in uniform and time varying electric fields – Force on a moving charge in a magnetic field – Cathode ray oscilloscopes – block schematic – applications – special oscilloscopes – Q meters – Vector meters – RF voltage and power measurements.

UNIT III SIGNAL GENERATORS AND ANALYZERS

UNIT IV DIGITAL INSTRUMENTS

UNIT V DATA ACQUISITION SYSTEMS AND FIBER OPTIC MEASUREMENTS

TEXT BOOKS

REFERENCES
AIM
To provide the students a basic understanding of the structure and function of the human body.

OBJECTIVES
After completing the course the students will be able to:
1. Relate basic human body functions and life processes
2. Name the major human body systems and relate their functions and
3. Name the major components of each system and describe briefly their anatomical locations, structures and their physiological functions.

UNIT I
CELL

UNIT II
CARDIAC AND NERVOUS SYSTEM

UNIT III
RESPIRATORY SYSTEM AND MUSCULO SKELETAL SYSTEM
Physiological aspects of respiration – Trachea and lungs - Exchange of gases – Regulation of Respiration - Disturbance of respiration function - Pulmonary function test - Muscles - tissue - types - structure of skeletal muscle - types of muscle and joints.

UNIT IV
DIGESTIVE AND EXCRETORY SYSTEM

UNIT V
EYE, EAR, ENDOCRINE GLANDS

TEXT BOOKS
2. Ranganathan, T.S. Text Book of Human Anatomy , S.Chand &Co. Ltd., Delhi, 1996

REFERENCE BOOKS
BIO-MEDICAL INSTRUMENTATION

<table>
<thead>
<tr>
<th>ECC356</th>
<th>BIOMEDICAL INSTRUMENTATION</th>
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<tr>
<td>Prerequisite</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To make students understand the applications of electronics in diagnostic and therapeutic area.</td>
<td></td>
</tr>
</tbody>
</table>

**Objectives**

The course should enable the students to:

1. Learn Electro-physiology and Bio-Potential recording,
2. Understand bio-chemical and non electrical parameter measurement,
3. Learn about assist devices and bio-telemetry,
4. Study radiological equipments,
5. Study recent trends in Medical Instrumentation.

At the end of the course the student should be able to:

1. Know the origin of Bio-potentials, recording methods of various bio signals,
2. Know about measurement and analysis of various bio signals,
3. Know about cardiac pacemakers, DC Defibrillator, Bio-telemetry,
4. Know about Diagnostic x-ray equipments, Radiation Therapy,
5. Know about Endoscopy unit, Laser in medicine and Electrical safety in medical equipment.

**UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING**

The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

**UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT**

PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

**UNIT III ASSIST DEVICES AND BIO-TELEMETRY**

Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry, radio-pill and tele-stimulation.
UNIT IV RADIOLOGICAL EQUIPMENTS
Ionosing radiation, Diagnostic x-ray equipments, use of Radio Isotope in diagnosis, Radiation Therapy.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION
Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment.

TOTAL: 45

TEXTBOOKS

REFERENCES
SEMESTER-VI

TELECOMMUNICATION SWITCHING AND NETWORKS

ECC357

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Goal</th>
<th>3 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To introduce fundamental functions of a telecom switching office and mathematical model for the analysis of telecommunication traffic.</td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Learn the concept of frequency multiplexing, TDM and digital multiplexing with digital hierarchy namely SONET / SDH,</td>
<td>1. Understand the concepts of Frequency and Time division multiplexing, digital multiplexing and digital hierarchy namely SONET / SDH,</td>
<td></td>
</tr>
<tr>
<td>2. Learn the concept of switching,</td>
<td>2. Understand the concepts of space switching, time switching and combination switching,</td>
<td></td>
</tr>
<tr>
<td>3. Study the need for network synchronization and synchronization issues.</td>
<td>3. Understand the need for network synchronization, study synchronization issues, outline network control and management issues,</td>
<td></td>
</tr>
<tr>
<td>4. Study the enhanced local loop systems in digital environment,</td>
<td>4. Understand enhanced local loop systems in digital environment, ISDN, DSL / ADSL, and fiber optic systems in subscriber loop,</td>
<td></td>
</tr>
<tr>
<td>5. Learn statistical modeling of telephone traffic and queuing system characteristics.</td>
<td>5. Understand the concepts of statistical modeling of telephone traffic, blocking system characteristics and queuing system characteristics.</td>
<td></td>
</tr>
</tbody>
</table>

3 0 0 3

UNIT I MULTIPLEXING


UNIT II DIGITAL SWITCHING

Switching Functions, Space Division Switching, Time Division Switching, two-dimensional Switching: STS Switching, TST Switching, No.4 ESS Toll Switch, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Elements of SSN07 signaling.

UNIT III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT


UNIT IV DIGITAL SUBSCRIBER ACCESS

UNIT V TRAFFIC ANALYSIS
TOTAL: 45

TEXTBOOK

REFERENCE

ECC358 SOFTWARE DEFINED RADIO

UNIT 1: SDR Introduction

UNIT 2: Architecture

UNIT 3: Front End Technology

UNIT 4: Baseband Processing and Reconfiguration
Base band component technologies, Design tools, Methodologies- Antenna requirements- Reconfiguration of network elements- user requirement of SDR terminals- Reconfiguration strategies, requirements and management techniques.

UNIT 5: GNU Radio Platform
Software Radio platforms: Low Cost SDR Platform- GNU radio- Python introduction, developing GNU Radio, signal processing blocks, scheduler, Basic GR development flow, Universal Software radio peripherals (USRP).
TOTAL: 45 PERIODS

Reference Books:
5. Eugene Grayver, Implementing Software Defined Radio, Springer
Course Learning objectives:
To provide students with the knowledge of
1. Basic characteristics of speech signal in relation to production and hearing of speech by humans.
2. Fundamentals of DSP
3. Human speech production
4. Speech processing techniques
5. Speech coding techniques and speech recognition

Course Outcomes:
The students will get familiarity with
1. The basic characteristics of speech signal and hearing perception.
2. The fundamental concepts of digital signal processing
3. Fundamentals of Human speech production
4. The analysis of speech model
5. The basic algorithms of speech analysis common to many applications. The applications like recognition, synthesis, coding.

UNIT I  INTRODUCTION TO DIGITAL SPEECH PROCESSING
9

UNIT II  FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING
9

UNIT III  FUNDAMENTALS OF HUMAN SPEECH PRODUCTION
9

UNIT IV  THE CEPSTRUM AND HOMOMORPHIC SPEECH PROCESSING
9
Homomorphic Systems for Convolution, Homomorphic Analysis of the Speech Model, Computing the Short-Time Cepstrum and Complex Cepstrum of Speech, Homomorphic Filtering of Natural Speech, Cepstrum Analysis of All-Pole Models, Cepstrum Distance Measures, Linear Predictive Analysis of Speech Signals, Computation of the Gain for the Model.

UNIT V  SPEECH CODING AND RECOGNITION
9
Digital Coding of Speech Signals, Sampling Speech Signals, A Statistical Model for Speech Instantaneous Quantization, Adaptive Quantization, Quantizing of Speech Model Parameters, Analysis-by-Synthesis Speech Coders, Open-Loop Speech Coders, Applications of Speech Coders, Frequency-Domain Coding of Speech and Audio, Sub band Coding, Adaptive Transform Coding,
Automatic Speech Recognition and Natural Language Understanding, Building a Speech Recognition System.

TOTAL = 45 Periods

TEXTBOOK:


REFERENCES:


ECC360 -MOBILE COMMUNICATION

L T P C
3 0 0 3

COURSE OBJECTIVES

To impart the fundamentals concepts of mobile communication systems.
To introduce various technologies and protocols involved in mobile communication.
Examine Theory Research in Mobility
Examine Systems Research in Mobility

UNIT 1  OVERVIEW OF CELLULAR MOBILE COMMUNICATION AND CELLULAR CONCEPT
Overview to wireless communication: Evolution & Generation of mobile communication. Existing mobile communication technology and current Status. Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and system Capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems

UNIT 2  2G SYSTEMS
GSM – Architecture - Location tracking and call setup - GSM Mobility management– Security - GSM SMS - International roaming for GSM - Call recording functions - subscriber and service data management - Mobile Number portability. GPRS – Architecture

UNIT 3  3G SYSTEMS

UNIT 4  Over view of 4G and 3GPP
Over view and operation of Wi-Fi, WiMAX, OFDM, OFDMA, OFDM-IDMA, MIMO, Cognitive Radio, LTE.

UNIT 5  MOBILE NETWORK AND TRANSPORT LAYERS

TOTAL = 45 Periods

TEXT / REFERENCE BOOKS

DIGITAL IMAGE PROCESSING

**ECC361**

**DIGITAL IMAGE PROCESSING**

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>3 CREDITS</th>
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</thead>
<tbody>
<tr>
<td>To introduce the students to various image processing techniques.</td>
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</tbody>
</table>

**UNIT I DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS** 9


**UNIT II IMAGE ENHANCEMENT TECHNIQUES** 9


**UNIT III IMAGE RESTORATION** 9


**UNIT IV IMAGE COMPRESSION** 9


**UNIT V IMAGE SEGMENTATION AND REPRESENTATION** 9


**TOTAL = 45**

**TEXT BOOK**

REFERENCES

BIO-MEDICAL INSTRUMENTATION

<table>
<thead>
<tr>
<th>ECC362</th>
<th>BIOMEDICAL INSTRUMENTATION</th>
<th>3 CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Nil</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>To make students understand the applications of electronics in diagnostic and therapeutic area.</td>
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<tr>
<td>Objectives</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
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<tr>
<td>6. Learn Electrophysiology and Bio-Potential recording,</td>
<td>Know the origin of Bio-potentials, recording methods of various bio signals,</td>
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<tr>
<td>7. Understand bio-chemical and non electrical parameter measurement,</td>
<td>6. Know about measurement and analysis of various bio signals,</td>
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<tr>
<td>8. Learn about assist devices and bio-telemetry,</td>
<td>7. Know about cardiac pacemakers, DC Defibrillator, Bio-telemetry,</td>
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</tr>
<tr>
<td>9. Study radiological equipments,</td>
<td>8. Know about Diagnostic x-ray equipments, Radiation Therapy,</td>
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</tr>
<tr>
<td>10. Study recent trends in Medical Instrumentation.</td>
<td>9. Know about Endoscopy unit, Laser in medicine and Electrical safety in medical equipment.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING
The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, EOG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT
PH, PO2, PCO2, PHCO3, Electrophoresis, colorimeter, photometer, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

UNIT III ASSIST DEVICES AND BIO-TELEMETRY
Cardiac pacemakers, DC Defibrillator, Telemetry principles, frequency selection, Bio-telemetry, radiopill and tele-stimulation.

UNIT IV RADIOLOGICAL EQUIPMENTS
Ionising radiation, Diagnostic x-ray equipments, use of Radio Isotope in diagnosis, Radiation Therapy.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION
Thermograph, endoscopy unit, Laser in medicine, Diathermy units, Electrical safety in medical equipment.

TOTAL: 45

TEXTBOOKS

REFERENCES
DIGITAL SYSTEM DESIGN WITH HDL

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>DIGITAL SYSTEM DESIGN WITH HDL</th>
<th>3 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>To learn VHDL and to describe the digital system design using VHDL.</td>
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</tbody>
</table>

**Course Objectives**

- To learn basic Concepts in HDL
- Learn different types of statements and different levels of modeling in HDL.
- Provide knowledge about the functionality of combinational circuit.
- Learn about sequential circuits and state diagram implementation of digital circuits.
- Provide knowledge of the concept of microcomputer and programmable logic devices.

**Course Outcome**

- At the end of the course the student should be able to:
  1. Summarize and make use of HDL language to write code for simple logic circuits.
  2. Make use of the concepts and describe combinational logic circuit using HDL.
  3. Design of combination logic circuit using HDL.
  4. Design of sequential logic circuit using HDL.
  5. Design of Microcomputer and programmable device using HDL.

**UNIT I: INTRODUCTION TO HDL**

Introduction to Computer-aided design tools for digital systems. Hardware description languages; introduction to HDL data objects, classes and data types, Operators, Overloading, logical operators. Types of delays Entity and Architecture declaration. Introduction to behavioral dataflow and structural models.

**UNIT II: HDL STATEMENTS**

Assignment statements, sequential statements and process, conditional statements, case statement Array and loops, resolution functions, Packages and Libraries, concurrent statements. Subprograms: Application of Functions and Procedures, Structural Modeling, component declaration, structural layout and generics.

**UNIT III: COMBINATIONAL CIRCUIT DESIGN**

HDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders, code converters, comparators, implementation of Boolean functions, Serial and Parallel adder.

**UNIT IV: SEQUENTIAL CIRCUIT DESIGN**

HDL Models and Simulation of Sequential Circuits Flip flops, Shift Registers, Counters, Basic RAM, ROM and Finite State machine.

**UNIT V: DESIGN OF MICROCOMPUTER & PROGRAMMABLE DEVICE**

Basic components of a computer, specifications, architecture of a simple microcomputer system, implementation of a simple microcomputer system using HDL Programmable logic devices: PLAs, PALs, CPLDs and FPGAs. Design implementation using CPLDs and FPGAs.
**TEXT BOOKS:**


**REFERENCE BOOKS:**

1. Ashenden - Digital design,Elsevier

**ECC364-BIO- SENSORS AND SIGNAL PROCESSING**

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<td>3</td>
</tr>
</tbody>
</table>

**AIM**

To study the signal processing methods and analysis of bio signals

**OBJECTIVES**

To study of DFT and its computation
To study the design techniques for digital filters
To study bio-signal analysis.
To study special techniques like Heart rate variability Analysis

**UNIT I**

**DISCRETE – TIME SIGNALS AND SYSTEMS**


**UNIT II**

**INFINITE IMPULSE RESPONSE DIGITAL FILTERS**


**UNIT III**

**FINITE IMPULSE RESPONSE DIGITAL FILTERS**


**UNIT IV**

**ANALYSIS OF BIO – SIGNALS**

- Removal of artifacts-ECG ,Event detection –ECG,P wave, QRS Complex, T wave, correlation analysis of ECG signals ,Averaging of signals-PCG,ECG and EMG.

**UNIT V**

**SPECIAL TOPICS IN BSP**

Heart rate variability Analysis ,Analysis of PCG signals, Analysis of Time variant systems, Fixed segmentation – STFT, ACF, SEM and GLR.

**TEXT BOOKS**

2. Rangaraj.M.Rangayyan. Biomedical signal processing

**REFERENCES**
ECC365-MEDICAL IMAGE PROCESSING  

**AIM**

To expose the students to the fundamentals of medical image acquisition, processing and storage.

**OBJECTIVES**

After completing the course the students will be able to:

1. Study the image fundamentals and mathematical transforms necessary for image processing.
2. Study the image enhancement techniques
3. Study image restoration procedures.
4. Study the image compression procedures.

**UNIT I  DIGITAL IMAGE FUNDAMENTAL**

Elements of digital image processing systems, Elements of Visual perception, Image sampling and quantization, Some Basic relationships between pixels, Matrix and Singular Value representation of discrete images.

**UNIT II  IMAGE TRANSFORMS**

1D DFT, 2D DFT, Cosine, Sine Hadamard, Haar, Slant, KL transform and their properties.

**UNIT III  IMAGE ENHANCEMENT**

Histogram – Modification and specification techniques, Enhancement by point processing Image smoothening, Image sharpening, generation of spatial masks from frequency domain specification, Homomorphic filtering, color image processing.

**UNIT IV  IMAGE RESTORATION AND RECONSTRUCTION OF MEDICAL IMAGES**

Image degradation models, Unconstrained and Constrained restoration, inverse filtering, least mean square filter, Image reconstruction from projections – Radon transforms, Filter back projection algorithm, 3D tomography, Fourier reconstruction of MRI Images.

**UNIT V  MEDICAL IMAGE COMPRESSION TECHNIQUES**

Run length, Huffman coding, arithmetic coding, Pixel coding, transform coding, JPEG Standard, predictive techniques, Application of image processing techniques in thermography, SPECT, PET images.

**TEXT BOOKS**


**REFERENCE BOOKS**


ECC366-BIOMATERIALS AND ARTIFICIAL ORGANS  

**AIM**

1. To understand the properties of the Bio-compatible materials
2. To study the different types of Biomaterials
3. To study artificial organs made using tissue materials.

**OBJECTIVES**

This course will enable the students:

To study the characteristics and classification of Biomaterials
To study the artificial organ developed using these materials

To learn about polymeric materials and combinations that could be used as a tissue replacement implants

UNIT I INTRODUCTION TO MATERIALS
Definition and classification of biomaterials - Mechanical Properties, Surface and Physical Properties of Biomaterials,
Classes of materials used: Polymers, metals, ceramics and composite as biomaterials for implantation.

UNIT II BIOCOMPATIBILITY
Introduction-Wound Healing and foreign Body response, Biomaterials testing, In-Vitro and In-Vivo assessment of
tissue compatibility, Methods of test for biological performance, Degradation effects on Metals.

UNIT III POLYMERIC IMPLANT MATERIALS
Polymerisation- Synthesis, Mechanical & Thermal properties, Polymeric Biomaterials-polyacrylic acid,
Polyacrylamide, Biodegradable Polymers, Medical fibers and Biotextiles- In vitro Applications. Polymers-Medical
applications

UNIT IV ARTIFICIAL ORGANS
Cardiovascular medical devices, Implantable Cardiac Assist devices(artificial heart, cardiac valves), Orthopedic
applications- Internal fracture fixation, Joint replacements, Dental Implantation, Bio—electrodes.

UNIT V APPLICATIONS OF MATERIALS IN MEDICINE
Skin Substitutes and Burn Dressings, Soft Tissue replacements, Sutures, Bio-medical Sensors and Biosensors

TEXT BOOKS

REFERENCE BOOKS
2. Piskin and A S Hoffmann, Polymeric Biomaterials(Eds) , Martinus Nijhoff Publishers.(Dordrecht) 1986
4. A.Rembaum & M. Shen, Biomedical Polymers , Mercer Dekkar Inc. 1971

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**ECC451**
**HIGH SPEED NETWORKS**
**3 CREDITS**

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Goal</th>
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<tbody>
<tr>
<td></td>
<td>To provide the knowledge of features of different technologies involved in high speed networking and their performance.</td>
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<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to: 1. Understand ATM and Frame relay, 2. Understand Congestion and Traffic management, 3. Understand TCP and ATM congestion control, 4. Understand Integrated and differentiated services, 5. Understand Protocols for QoS support.</td>
<td>At the end of the course the student should be able to: 1. Know the basics of ATM and Frame relay, 2. BE familiarize with the up-to-date developments in High Speed Networks and know the effects of congestion and Traffic management, 3. Know the techniques involved to support real-time traffic and congestion control in TCP and ATM networks, 4. Know Integrated and differentiated services and the queuing disciplines, 5. Know the different levels of quality of service (Q.S) in different applications.</td>
</tr>
</tbody>
</table>
HIGH SPEED NETWORKS

UNIT I HIGH SPEED NETWORKS


UNIT II CONGESTION AND TRAFFIC MANAGEMENT


UNIT III TCP AND ATM CONGESTION CONTROL


UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ,PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

UNIT V PROTOCOLS FOR QOS SUPPORT


TOTAL = 45

TEXT BOOK


REFERENCES


WIRELESS NETWORKS

Prerequisite

Goal

To familiarize the student with the analysis and design of different types of Wireless Network.

Objectives

Outcome

The course should enable the students to:
1. Understand physical and wireless MAC layer alternatives techniques,
2. Learn operation of wireless networks & WAN,
3. Study wireless Transport Layer concept,
4. Understand the concept of Different types

At the end of the course the student should be able to:
1. Analyze & design issues of different types of Wireless Modems,
2. Understand the basic operation of different Wireless Networks,
3. Understand the Issues of Transport Layer,
4. Understand the concept of current issues of...

REFERENCES
**ECC453**  
**REMOTE SENSING**  
**3 CREDITS**

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Nil</th>
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<tbody>
<tr>
<td>Goal</td>
<td>To enable the student to explore the fundamental principles of remote sensing as they relate to engineering and environmental problems</td>
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</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
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</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
</tr>
<tr>
<td>1. Understand the principles of remote sensing techniques by outlining a sensor design according to spectral responses of Earth's surfaces and the atmosphere, 2. Understand the processing and enhancement of satellite images for identifying geological structures, 3. Recognize coastal morphology from space, 4. Recognize global changes and environmental monitoring with data from special sensors, 5. Understands the spectral characteristics of earth.</td>
<td>1. Understand the principles of remote sensing techniques and spectral responses, 2. Identify Geological Structures and satellite Images, 3. Recognize Coastal morphology, 4. Know optical and microwave remote sensing, 5. To Interpret Satellite Images.</td>
</tr>
</tbody>
</table>

**REMOTE SENSING**  
**L T P C**  
**3 0 0 3**

**UNIT I REMOTE SENSING**

**UNIT II EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS**

**UNIT III OPTICAL AND MICROWAVE REMOTE SENSING**

**UNIT IV GEOGRAPHIC INFORMATION SYSTEM**

121
UNIT V MISCELLANEOUS TOPICS
Visual Interpretation of Satellite Images – Elements of Interpretation - Interpretation Keys
Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification -
Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban
Applications - Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS –
Global positioning system – an introduction.

TOTAL: 45

TEXT BOOKS
& 2).
3, 4 & 5).

REFERENCES
1996.
**TELECOMMUNICATION SYSTEM MODELING AND SIMULATION**

<table>
<thead>
<tr>
<th>ECC454</th>
<th>TELECOMMUNICATION SYSTEM MODELING AND SIMULATION</th>
<th>3 CREDITS</th>
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<tbody>
<tr>
<td><strong>Prerequisite</strong></td>
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<tr>
<td><strong>Goal</strong></td>
<td>To enable the students to model the random variables and random process applied to telecommunication system and to learn the methods of system simulation and performance evaluation.</td>
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<tr>
<td><strong>UNIT I SIMULATION OF RANDOM VARIABLES RANDOM PROCESS</strong></td>
<td>9</td>
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</tr>
<tr>
<td>Generation of random numbers and sequence, Guassian and uniform random numbers Correlated random sequences, Testing of random numbers generators, Stationary and uncorrelated noise, Goodness of fit test.</td>
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<tr>
<td><strong>UNIT II MODELING OF COMMUNICATION SYSTEMS</strong></td>
<td>9</td>
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</tr>
<tr>
<td>Radio frequency and optical sources, Analog and Digital signals, Communication channel and models, Free space channels, Multipath channel and discrete channel noise and interference.</td>
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<tr>
<td><strong>UNIT III ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION</strong></td>
<td>9</td>
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<tr>
<td>Quality of estimator, Estimation of SNR, Probability density function and bit error rate, Monte Carlo method, Importance sampling method, Extreme value theory.</td>
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<tr>
<td><strong>UNIT IV SIMULATION AND MODELING METHODOLOGY</strong></td>
<td>9</td>
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<tr>
<td>Simulation environment, Modeling considerations, Performance evaluation techniques, error source simulation, Validation.</td>
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<tr>
<td><strong>UNIT V CASE STUDIES</strong></td>
<td>9</td>
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<tr>
<td>Simulations of QAM digital radio link in environment Light wave communication link and satellite system.</td>
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<td><strong>TEXT BOOK</strong></td>
<td></td>
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<tr>
<td><strong>REFERENCES</strong></td>
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</table>

ECC455 RADAR SYSTEMS

UNIT I AN INTRODUCTION TO RADAR & THE RADAR EQUATION
Basic Radar-The simple form of Radar Equation-Radar Block Diagram-Radar Frequencies-Application of Radar-The origins of Radar.


UNIT II MTI AND PULSE DOPPLER RADAR & TRACKING RADAR
Introduction to Doppler & MTI Radar- Delay Line Cancelers- Staggered Pulse Repetition Frequencies- Doppler Filter Banks – Digital MTI Processing –Moving Target Detector- Limitations to MTI Performance- MTI from a Moving Platform(AMTI) – Pulse Doppler Radar- Other Doppler Radar Topics.
Tracking with Radar-Monopulse Tracking – Conical Scan and Sequential Lobbing- Limitations to Tracking Accuracy- Low-Angle Tracking- Tracking in Range- Other Tracking Radar Topics- Comparison of Trackers – Automatic Tracking with Surveillance Radars (ADT).

UNIT III DEDUCTION OF SIGNALS IN NOISE

UNIT IV THE RADAR ANTENNA & RADAR TRANSMITTERS

UNIT V PROPOGATION OF RADAR WAVES & RADAR RECEIVERS
Introduction to the Radar Receiver – Receiver Noise Figure – Superheterodyne Receiver – Duplexers and Receiver Protectors – Radar Displays

TEXT BOOKS:


REFERENCE:

The Programme gives exposure to the theoretical issues involved in pattern recognition system design. The student will have a clear working knowledge of implementing pattern recognition techniques in Real time Environment.

The course should enable the students to:

1. Widen the capacity of the learners to understand the concept of Pattern Recognition.
2. Understand the concept on Statistical Pattern Recognition.
3. Enrich the knowledge on Syntactic Pattern Recognition.
4. Gain Knowledge on Neural Pattern recognition Systems
5. To know Web Applications

At the end of the course the student should be able to:

1. Have the fundamental knowledge on pattern Recognition System
2. Have a strong foundation on Statistical Pattern recognition.
3. Explain the concept on syntactic recognition via Parsing
4. Understand the concept on pattern recognition Systems
5. Understand the Applications of Image Processing in Medical Field.

UNIT I - PATTERN RECOGNITION OVERVIEW
Pattern recognition, Classification and Description- Patterns and feature Extraction-Training and Learning in PR systems - Statistical pattern recognition – Syntactic pattern recognition – Neural pattern recognition – other approaches to PR

UNIT II - STATISTICAL PATTERN RECOGNITION
Introduction to statistical Pattern Recognition - supervised Learning using Parametric and Non Parametric Approaches. Linear Discriminant Functions Introduction—Discrete and binary Classification problems—Techniques to directly Obtain Linear Classifiers

UNIT III - SYNTACTIC PATTERN RECOGNITION
Overview of Syntactic Pattern Recognition— Syntactic recognition via parsing and other Grammars– Graphical Approaches to syntactic pattern recognition—learning via grammatical Inference.

UNIT IV - NEURAL PATTERN RECOGNITION
Introduction to Neural networks—Feedforward Networks and training by Back Propagation—Content Addressable Memory Approaches and Unsupervised Learning in Neural PR.

UNIT V - APPLICATIONS AND CASE STUDIES
Web Applications – Audio and Video Analysis – Medical Applications – Image processing –Financial Applications - Related case studies

TOTAL = 45

TEXT BOOK
REFERENCES

ECC457 FUNDAMENTALS OF VIDEO PROCESSING
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3 0 0 3

Course Outline
The course is comprehensive and state-of-the art approach to video processing, basically intended for post graduate students in the branch of ECE and CSE. The present course discusses different video coding techniques, which includes content dependent and scalable techniques for video coding. It also covers, processing and communications of stereoscopic and multi-view video and video streaming over Internet, which is one of the most popular video communication applications. The present course gives a basic resource idea for the professional engineers, researchers and graduate students.

COURSE LEARNING OUTCOMES (CO/CLO)

| CO/CLO-1 | Recall the basics of Video representations and their characteristics |
| CO/CLO-2 | Outline the Motion estimation techniques and Compare them |
| CO/CLO-3 | Explain the functions of various Video coding schemes. |
| CO/CLO-4 | Examine the characteristics of Error control mechanisms of Video communication |
| CO/CLO-5 | Explain the streaming video concepts over the internet |

UNIT I Introduction To Video Processing
Principles of colour video processing, Video display, Composite versus component video, Progressive and interlaced scan, Sampling and Interpolation of video signals.

UNIT II Motion Detection and Estimation
General methodologies- Pixel based motion estimation-Block matching algorithm- Mesh based motion estimation- Global motion estimation- Region based motion estimation- Multi -resolution motion estimation- Direct motion Estimation

UNIT III Video coding techniques
Basic Video coding techniques- Wave form based coding, Block-based transform coding, Predictive coding, temporal prediction and transform coding
Content based Video coding techniques- Region based video coding, Object based coding, Knowledge based coding, Semantic coding and layered coding system
Application of motion estimator in video coding
UNIT VI Error control in video communications
Overview of approaches- Video applications and communication networks- Transport level error control- Error resilient encoding- Encoder-decoder interactive error control- Error resilience Tools in H.263 and MPEG-4

UNIT V Streaming video over the internet
Overview of video streaming systems- Video compression- Application layer QoS control for streaming video- Continuous media Distribution services- Streaming servers- Media synchronization- Protocols for streaming video

REFERENCES
5. M.E.A.Mualla, C. N. Canagarajah and D. R. Bull, “Video Coding for Mobile

SATELLITE COMMUNICATION

<table>
<thead>
<tr>
<th>ECC458</th>
<th>SATELLITE COMMUNICATION</th>
<th>3 CREDITS</th>
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</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>Goal</td>
<td>Objectives</td>
</tr>
<tr>
<td></td>
<td>To enable the student to become familiar with satellites and satellite services.</td>
<td></td>
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<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Study the overview of satellite systems in relation to other terrestrial systems.</td>
<td>1. Understand the overview of satellite systems in relation to other terrestrial systems.</td>
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<tr>
<td>2. Study of satellite orbits and launching.</td>
<td>2. Understand the concepts of satellite orbits and launching.</td>
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<tr>
<td>3. Study of earth segment and space segment components</td>
<td>3. Understand the concepts of earth segment and space segment components</td>
<td></td>
</tr>
<tr>
<td>4. Study of satellite access by various users.</td>
<td>4. Understand the concepts of satellite access by various users.</td>
<td></td>
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<tr>
<td>5. Study of DTH and compression standards.</td>
<td>5. Understand the concepts DTH and compression standards.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT I OVERVIEW OF SATELLITE SYSTEMS, ORBITS AND LAUNCHING METHODS

UNIT II GEOSTATIONARY ORBIT & SPACE SEGMENT
UNIT III EARTH SEGMENT & SPACE LINK

UNIT IV SATELLITE ACCESS

UNIT V DIRECT BROADCAST SATELLITE SERVICES

TOTAL: 45

TEXT BOOK

REFERENCES
UNIT I ELEMENTS OF LIGHT AND SOLID STATE PHYSICS

UNIT II DISPLAY DEVICES AND LASERS

UNIT III OPTICAL DETECTION DEVICES
Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT IV OPTOELECTRONIC MODULATOR

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS
Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated Circuits, Integrated transmitters and Receivers, Guided wave devices.

TOTAL: 45

REFERENCES:

**OPTICAL COMMUNICATION**

<table>
<thead>
<tr>
<th>ECC460</th>
<th>OPTICAL COMMUNICATION</th>
<th>3 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prerequisite</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Goal</strong></td>
<td>To introduce the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber and to study about various optical sources and optical detectors and their use in the optical communication system. Finally to discuss about digital transmission and its associated parameters on system performance.</td>
<td></td>
</tr>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Learn the basic elements of optical fiber transmission link, fiber modes configurations and structures,</td>
<td>1. Understand the optical fiber link and fiber modes &amp; configurations,</td>
<td></td>
</tr>
<tr>
<td>2. Understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length,</td>
<td>2. Have knowledge in different types of losses, signal distortion in optical fibers and design optimization for fibers,</td>
<td></td>
</tr>
<tr>
<td>3. Learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers,</td>
<td>3. Know the types of optical sources and fiber networking components,</td>
<td></td>
</tr>
<tr>
<td>4. Learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration,</td>
<td>4. Understand the various optical receivers and their performance,</td>
<td></td>
</tr>
<tr>
<td>5. Learn digital transmission system, operational principles WDM.</td>
<td>5. Understand the working of digital transmission system, SONET / SDH.</td>
<td></td>
</tr>
</tbody>
</table>

**UNIT I INTRODUCTION TO OPTICAL FIBERS**

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key
Modal concepts- Linearly Polarized Modes –Single Mode Fibers-Graded Index fiber structure, Photonic Crystal Fibers(PCF) and characteristics

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS

UNIT III FIBER OPTICAL SOURCES, COUPLING and OPTICAL NETWORKING COMPONENTS

UNIT IV FIBER OPTICAL RECEIVERS

UNIT V DIGITAL TRANSMISSION SYSTEM

TOTAL = 45

TEXT BOOKS
3. Ai-Qun Liu.,“Photonics MEMS Devices”.,CRC Press,Tailor and Francis Group,2009

REFERENCES
1. Optical Communication essentials by Keiser

EMBEDDED SYSTEMS

<table>
<thead>
<tr>
<th>ECC461</th>
<th>EMBEDDED SYSTEMS</th>
<th>3 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>To provide basic knowledge about embedded systems design and understand the RTOS concepts</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Understand the embedded systems hardware and software,</td>
<td>1. Know the concepts of embedded processors hardware, software and System on a Chip,</td>
<td></td>
</tr>
<tr>
<td>2. Understand the devices and buses used for embedded networking,</td>
<td>2. Know about the embedded interfacing devices, buses and networking protocols,</td>
<td></td>
</tr>
<tr>
<td>3. Understand the programming concepts and embedded programming in C and C++,</td>
<td>3. Know the embedded programming concepts in C and C++,</td>
<td></td>
</tr>
<tr>
<td>4. Understand the real time operating system concepts and inter-task</td>
<td>4. Know the concepts of real time operating system, inter process communication and synchronization,</td>
<td></td>
</tr>
</tbody>
</table>
5. Understand the Vx Works RTOS functions.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS
Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC) and the use of VLSI designed circuits.

UNIT II DEVICES AND BUSES FOR DEVICES NETWORK
I/O Devices - Device I/O Types and Examples – Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices - Examples of Internal Serial-Communication Devices - UART and HDLC - Parallel Port Devices - Sophisticated interfacing features in Devices/Ports - Timer and Counting Devices - '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses - ISA, PCI, PCI-X, cPCI and advanced buses.

UNIT III PROGRAMMING CONCEPTS AND EMBEDDED PROGRAMMING IN C, C++

UNIT IV REAL TIME OPERATING SYSTEMS – PART - 1

UNIT V REAL TIME OPERATING SYSTEMS – PART - 2
Study of Micro C/OS-II or Vx Works or Any other popular RTOS – RTOS System Level Functions – Task Service Functions – Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions – Mailbox Related Functions – Queue Related Functions – Case Studies of Programming with RTOS – Understanding Case Definition – Multiple Tasks and their functions – Creating a list of tasks – Functions and IPCs – Exemplary Coding Steps.

TOTAL = 45

TEXTBOOK

REFERENCES
MEDICAL IMAGING SYSTEMS

**ECC462 MEDICAL IMAGING SYSTEMS 3 CREDITS**

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>1. To Study the Production of X-rays and its applications to different medical Imaging techniques, 2. To study the different types of Radio diagnostic techniques, 3. To study the special imaging techniques used for visualizing the cross sections of the body, 4. To study the imaging of soft tissues using ultrasound technique.</td>
<td>At the end of the course the student should be able to: 1. Understand the clear domain knowledge about the various Medical Imaging techniques, 2. Demonstrate the various diagnostic applications of the medical imaging techniques,</td>
</tr>
</tbody>
</table>

**UNIT I PRINCIPLES OF RADIOGRAPHIC EQUIPMENT**

X-Ray tubes, cooling systems, removal of scatters, Fluoroscopy- construction of image Intensifier tubes, angiographic setup, mammography, digital radiology, DSA.

**UNIT II COMPUTED TOMOGRAPHY**

Need for sectional images, Principles of sectional scanning, CT detectors, Methods of reconstruction, Iterative, Back projection, convolution and Back-Projection. Artifacts, Principle of 3D imaging

**UNIT III RADIO ISOTOPIC IMAGING**

Alpha, Beta and Gamma radiation, Radiation detectors, Radio isotopic imaging equipments, Radio nuclides for imaging, Gamma ray camera, scanners, Positron Emission tomography, SPECT, PET/CT.

**UNIT IV ULTRASONIC SYSTEMS**

Wave propagation and interaction in Biological tissues, Acoustic radiation fields, continuous and pulsed excitation, Transducers and imaging systems, Scanning methods, Imaging Modes, Principles and theory of image generation.

**UNIT V MAGNETIC RESONANCE IMAGING**

NMR, Principles of MRI, Relaxation processes and their measurements, Pulse sequencing and MR image acquisition, MRI Instrumentation, Functional MRI.

**TEXT BOOKS**


**REFERENCES:**

PATTERN RECOGNITION TECHNIQUES AND APPLICATIONS

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. The objective of this course is to enable the students to understand the fundamentals of Pattern recognition.</td>
<td>1. Develop an idea about the fundamentals of Pattern recognition.</td>
<td></td>
</tr>
<tr>
<td>2. The students should learn to choose an appropriate feature, pattern classification algorithm for a pattern recognition problem, properly implement the algorithm.</td>
<td>2. Acquire the knowledge of fuzzy systems &amp; its applications.</td>
<td></td>
</tr>
<tr>
<td>3. To enrich the students knowledge with fuzzy systems and its applications.</td>
<td>3. Recent advancements in life science &amp; technology using Fuzzy techniques.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT I OVERVIEW OF PATTERN RECOGNITION 9


UNIT II UNSUPERVISED CLASSIFICATION 9

Clustering for unsupervised learning and classification, clustering concepts hierarchical clustering, Partitional clustering, k- means algorithm - Validity of clustering solutions.

UNIT III FEATURE EXTRACTION AND STRUCTURAL PATTERN RECOGNITION 9


UNIT IV FUZZY SYSTEMS 9


UNIT V RECENT ADVANCES AND APPLICATIONS 9

TEXT BOOKS


REFERENCES:


WAVELET TRANSFORMS AND ITS APPLICATIONS

<table>
<thead>
<tr>
<th>ECC464</th>
<th>WAVELET TRANSFORMS AND ITS APPLICATIONS</th>
<th>3 CREDITS</th>
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<tbody>
<tr>
<td>Prerequisite</td>
<td>Objectives</td>
<td>Outcome</td>
</tr>
<tr>
<td></td>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
</tr>
<tr>
<td></td>
<td>1. To introduce the fundamentals concepts of wavelet transforms,</td>
<td>1. The students will be able to apprehend the detailed knowledge about the Wavelet transforms &amp; its applications,</td>
</tr>
<tr>
<td></td>
<td>2. To study system design using Wavelets,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. To learn the different wavelet families &amp; their applications.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT I  INTRODUCTION TO WAVELETS

Introduction to Multirate signal processing- Decimation and Interpolation, Quadrature Mirror Filters, Subband coding, Limitations of Fourier transform, Short time Fourier transform and its drawbacks, Continuous Wavelet transform, Time frequency representation, Wavelet System and its characteristics, Orthogonal and Orthonormal functions and function space

UNIT II MULTiresOLUTION CONCEPT AND DISCRETE WAVELET TRANSFORM


UNIT III WAVELET SYSTEM DESIGN
Refinement relation for orthogonal wavelet systems, Restrictions on filter coefficients, Design of Daubechies orthogonal wavelet system coefficients, Design of Coiflet and Symlet wavelets.

**UNIT IV WAVELET FAMILIES**


**UNIT V WAVELET APPLICATIONS**

Denoising of Signals and Images, Image enhancement, Edge detection, Image Fusion, Image compression, Wavelet based feature extraction, Analysis of phonocardiogram signals, Analysis of EEG signals, Speech enhancement for hearing aids

\[ L = 45, \ T = 0, \ TOTAL = 45 \]

**TEXT BOOKS**


**REFERENCES:**


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**Engineering Electives Courses**

**INTRODUCTION TO COMMUNICATION SYSTEMS**

<table>
<thead>
<tr>
<th>ECD251</th>
<th>INTRODUCTION TO COMMUNICATION SYSTEMS</th>
<th>L T P C</th>
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<td>3 0 0 3</td>
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</table>

<table>
<thead>
<tr>
<th>Goal</th>
<th>To impart knowledge about basic concepts of transmission and reception of signals and its applications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td>The course will enable the students to:</td>
<td>After completion of the course the students are expected to be able to:</td>
</tr>
<tr>
<td>(i) Know about Basic signals, analog modulation, and demodulation and radio receivers.</td>
<td>(i) Understand the basic concept of communications.</td>
</tr>
<tr>
<td>(ii) Learn the characteristics and model of transmission medium.</td>
<td>(ii) Explain digital communication and its application in telecommunication</td>
</tr>
<tr>
<td>(iii) Understand Source digitization, digital multiplexing and modulation.</td>
<td>(iii) Characterize the different types of transmission medium</td>
</tr>
<tr>
<td>(iv) Understand Data communication system and techniques.</td>
<td>(iv) Describe different types of satellite systems and solve basic communication problems in satellite system</td>
</tr>
<tr>
<td>(v) Learn the basics of satellite and optical fiber communication systems.</td>
<td>(v) Know the latest technology in telecommunications system</td>
</tr>
</tbody>
</table>

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**UNIT - I: -MODULATION SYSTEMS**

9
Time and frequency domain representation of signals, amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver- Frequency division multiplexing- Pulse width modulation.

**UNIT II: TRANSMISSION MEDIUM**

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

**UNIT III: DIGITAL COMMUNICATION**


**UNIT IV: DATA COMMUNICATION AND NETWORK PROTOCOL**

Data Communication codes, error control. Serial and parallel interface, telephone network, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

**UNIT V: SATELLITE AND OPTICAL FIBER COMMUNICATIONS**

Orbital satellites, geostationary satellites, look angles, satellite system link models, satellite system link equations; advantages of optical fiber communication - Light propagation through fiber, fiber loss, light sources and detectors.

L = 45  TOTAL = 45

**TEXT BOOKS**


**REFERENCE BOOKS**

LINEAR CIRCUITS

ECD252  LINEAR CIRCUITS  3 CREDITS

Prerequisite

Goal  To teach the basic concepts in the design of electronic circuits using linear circuits and their applications in the processing of analog signals.

Objectives  Outcome

The course should enable the students to:  At the end of the course the student should be able to:

1. Know the Op -amp characteristics and its linear applications, 1. Distinguish clearly between ideal and actual characteristics of an Op-amp and design different linear circuits using Op-amps.

2. Study how an Op-Amp can act as a filter on an electrical signal and as a regulator 2. Understand the advantages of using active filters in place of passive filters and design regulators

3. Learn Voltage regulator and some linear and nonlinear oscillators, 3. Understand different nonlinear applications,

4. Understand how an operational amplifier can be helpful in signal processing, 4. Design timer and control circuits using IC555 and AM and FM detectors using IC565.

5. Learn the types and basics of ADC and DAC circuits. 5. Apply the knowledge about DAC and ADC and design simple data convertors.

UNIT I OPERATIONAL AMPLIFIER AND ITS APPLICATIONS  9


UNIT II ACTIVE FILTERS AND REGULATORS  9


UNIT III OSCILLATORS AND WAVEFORM GENERATORS  9

Oscillator types and principle of operation – RC, Wien and quadrature type, Waveform generators – triangular, sawtooth, square wave and VCO.

UNIT IV IC-555 & IC 565 APPLICATIONS  9


UNIT V Data Converters  9

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Different Types of ADCs - Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.
TOTAL = 45

TEXT BOOKS

REFERENCES

ANALOG ELECTRONICS

<table>
<thead>
<tr>
<th>ECD253</th>
<th>ANALOG ELECTRONICS</th>
<th>3 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Goal</strong></td>
<td>To impart knowledge on construction, theory, characteristics and applications of electronic devices, operation of amplifiers, oscillators and special semiconductor devices.</td>
<td></td>
</tr>
<tr>
<td><strong>OBJECTIVES</strong></td>
<td><strong>OUTCOMES</strong></td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Understand the Diode operation and its applications</td>
<td>1. Develop knowledge on the behavior and characteristics of diodes</td>
<td></td>
</tr>
<tr>
<td>2. Know about the physical structure, basic operation of BJT, their characteristics and biasing techniques</td>
<td>2. Acquire knowledge about principle, operation, input, output characteristics and various biasing techniques of BJT</td>
<td></td>
</tr>
<tr>
<td>3. Know about the physical structure, basic operation of FET, MOSFET their characteristics and biasing techniques</td>
<td>3. Acquire knowledge about principle, operation, input, output characteristics and various biasing techniques of FET and MOSFET</td>
<td></td>
</tr>
<tr>
<td>4. Learn types of feedback amplifiers and oscillators</td>
<td>4. Identify and select a suitable amplifier/oscillator for a specific application.</td>
<td></td>
</tr>
<tr>
<td>5. Study the characteristics of special semiconductor diodes.</td>
<td>5. Understand the operation of various special semiconductor diodes.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT I DIODES


UNIT II BIPOLAR JUNCTION TRANSISTORS


UNIT III FIELD-EFFECT TRANSISTORS

UNIT IV FEEDBACK AMPLIFIERS AND OSCILLATORS 9


Oscillators: Oscillator principles – Hartley, Colpitts, Clapp, Phase shift, Wien bridge and Crystal oscillators and their analysis and design.

UNIT V SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only) 9

SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

TEXT BOOKS

REFERENCE BOOKS
# DIGITAL ELECTRONICS

**ECD254**

**DIGITAL ELECTRONICS**

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>To learn the basic methods and provide the fundamental concepts used in the design of digital systems.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student are able to:</td>
</tr>
<tr>
<td>1. Learn number systems, binary arithmetics and code generation,</td>
<td>1. perform binary arithmetic, generate codes</td>
</tr>
<tr>
<td>2. Gain knowledge of Boolean expressions, Boolean postulates and theorems, minimization</td>
<td>2. Use Boolean postulates and theorems, different graphical methods for the simplification of complex logical expressions,</td>
</tr>
<tr>
<td>3. Understand the procedures for the analysis and design of combinational circuits, HDL</td>
<td>3. Use the design methodology for combinational logic circuits to realize digital systems, HDL implementation</td>
</tr>
<tr>
<td>4. Learn about sequential circuits, and its design</td>
<td>4. capable of designing the sequential circuits</td>
</tr>
<tr>
<td>5. Provide knowledge of the concept of memories and programmable logic devices.</td>
<td>5. Realization of memory, design using PAL and PLA, understanding FPGA</td>
</tr>
</tbody>
</table>

## UNIT I NUMBER SYSTEMS AND CODES
Introduction to Number Systems, Positional Number Systems and conversions: binary, octal, hexadecimal, decimal, Binary codes: gray code, excess-3 code, 8421 code and 2421 code, Alphanumeric codes: ASCII code, EBCDIC code, Binary arithmetic: addition, subtraction using 1’s complement and 2’s complement.

## UNIT II BOOLEAN FUNCTIONS AND MINIMIZATION
Logic Gates, POS and SOP, Boolean postulates and Demorgan’s theorems for minimization, Karnaugh maps and Quine McClusky’s method of minimization and their comparison.

## UNIT III ARITHMETIC AND COMBINATIONAL CIRCUITS
Design of Adders and Subtractors – Binary parallel adders, Parallel subtractors, Binary decoders, encoders, Multiplexers and Demultiplexers- Introduction to Hardware Description Language (HDL Arithmetic Module Only)

## UNIT IV SEQUENTIAL CIRCUITS

## UNIT V MEMORIES AND PROGRAMMABLE LOGIC DEVICES

L = 45, TOTAL=45

**TEXT BOOKS:**
REFERENCE BOOKS:

ECD255 BASICS OF DIGITAL SIGNAL PROCESSING TECHNIQUES

<table>
<thead>
<tr>
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<tr>
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<td>0</td>
<td>3</td>
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</tbody>
</table>

Course Objective

This course will provide the student with an intuitive and practical understanding of the fundamental concepts of discrete-time signal processing. The intended audience include: All engineering senior-level undergraduates; Students in related fields which may require a technical understanding of the fundamentals used in digital signal processing; industry-based students requiring a foundation in discrete-time systems. The intention is to also provide the student with the necessary background for taking advanced level courses in signal and image processing, and ideally, for reading technical literature in DSP. Further, computer simulation exercises are intended to familiarize the student with implementation aspects and the application of theoretical knowledge to practical problems.

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

CLO1: characterize discrete time signals and LTI signal processing systems mathematically.
CLO2: analyze the functions performed by simple discrete-time systems.
CLO3: Develop the discrete Fourier transform (DFT) over time domain signals, its applications and its implementation by FFT techniques.
CLO4: apply the design techniques for FIR type digital filters known as the “windowing method”.
CLO5: design IIR type digital filters over the given specifications.

UNIT I Introduction to Signal and Systems
Basic Signals and Systems – properties and basic operations-1-D Signals and Filters - Random Signals - Multi-dimensional Signals – Analog and Digital signals and their conversion techniques-Convolution process, Filtering process, Z-transform concepts

UNIT II Time domain analysis and Characteristics
Correlation and Discrete sequences: notation, signal characteristics, and operations Discrete linear time invariant systems -Properties and analysis of discrete linear time invariant systems Periodic sampling: aliasing and low pass filtering

UNIT III Frequency domain Analysis
Discrete Fourier transforms (DFT) DFT properties: symmetry, linearity, magnitudes, frequency axis, and shifting Inverse DFT - Fast Fourier transform (FFT): relationship to DFT, implementation considerations, radix-2 algorithm, and input/output indexing FFT: butterfly algorithm structures

UNIT IV FIR filter design
FIR filters – Introduction-Basic properties-Design using Hamming, Hanning Windows - Realization of FIR filters

UNIT V IIR filter design
Review of design of analogue Butterworth Filters, - Design of IIR digital filters using impulse invariance technique - Realization using direct, cascade and parallel forms.

TOTAL : 45
References

ECD256 - DATA COMMUNICATION AND NETWORK SYSTEM

AIM
To study the details regarding communication of voice and video, networks and its functions, data conversions, controlling of errors, switching information and its devices, internetworking device and different layers of TCP/IP.

OBJECTIVES
i. To study about the physical arrangement of networks, types and modes of networks, data conversions and transmission medium.
ii. To study the detection and correction of errors, link control and link protocols of data link layer.
iii. To study the access method, electrical specification and implementation of different networks, types of switching.
iv. To study about the standardized data interface and it's working principle.
v. To study the logic of link mechanisms used in networks and different layers of TCP/IP.

UNIT I. DATA COMMUNICATION
Transmission media: Guided media – Unguided media

UNIT II ERROR CONTROL AND DATA LINK PROTOCOLS

UNIT III NETWORKS AND SWITCHING
Switching: Circuit switching – Packet switching – Message switching.

UNIT IV X.25, FRAME RELAY, ATM AND SONET/SDH

UNIT V NETWORKING DEVICES AND TCP/IP PROTOCOL SUITE

Total = 45

TEXT BOOK
REFERENCE BOOKS

MICROPROCESSOR AND EMBEDDED SYSTEMS

<table>
<thead>
<tr>
<th>ECD257</th>
<th>MICROPROCESSOR AND EMBEDDED SYSTEMS</th>
<th>3 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>To learn the architecture programming and interfacing of microprocessors and Microcontrollers.</td>
<td></td>
</tr>
<tr>
<td>Goal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Objectives</td>
<td>Outcome</td>
<td></td>
</tr>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
</tr>
<tr>
<td>1. Study 8085 architecture</td>
<td>1. Understand the architecture, instruction set and programming of 8085</td>
<td></td>
</tr>
<tr>
<td>2. Study 8086 architecture</td>
<td>2. Understand the architecture, Interrupts and memory interfacing of 8086</td>
<td></td>
</tr>
<tr>
<td>3. Learn 8086 programming</td>
<td>3. Program arithmetic and data manipulation using 8086</td>
<td></td>
</tr>
<tr>
<td>4. Study Interfacing concepts</td>
<td>4. Understand interfacing concepts using 8085</td>
<td></td>
</tr>
<tr>
<td>5. Study 8051 Microcontroller and ARM processor.</td>
<td>5. Understand the architecture, instruction set of 8051 and ARM processor.</td>
<td></td>
</tr>
</tbody>
</table>

UNIT I 8085 MICROPROCESSOR

UNIT II 8086 MICROPROCESSOR
Functional block diagram – signals – Memory interfacing – Interrupt structure.

UNIT III PROGRAMMING OF 8086 PROCESSOR
Instruction format and addressing modes – Assembly language format – Data transfer, data Manipulation, control and string instructions – Simple Programming

UNIT IV PHERIPHERAL INTERFACING
Study of Architecture and programming of ICs: 8279, 8255 PPI, 8251 USART and 8253 Timer/Counter – Inter Integrated Circuits (I²C)

UNIT V MICRO CONTROLLER AND ARM
Functional block diagram 8051 – Instruction format and addressing modes – Interrupt structure – Timer – I/O ports, The ARM7 architecture – ARM7 organization and implementation - The ARM7 instruction set

L = 45, TOTAL = 45

TEXT BOOKS
REFERENCE BOOKS
2. Programming and Customizing the 8051 Microcontroller

ECD351- MOBILE COMMUNICATION ENGINEERING

<table>
<thead>
<tr>
<th>ECD351</th>
<th>MOBILE COMMUNICATION ENGINEERING</th>
<th>3 CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prerequisite</td>
<td>To enable the student to understand the real time wireless communication</td>
<td></td>
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<tr>
<td>Goal</td>
<td>The course should enable the students to:</td>
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<tr>
<td></td>
<td>1. Understand the concept of Existing mobile Communication technology and current Status,</td>
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<td></td>
<td>2. Understand the concept of Different modulation Techniques,</td>
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<td>3. Understand the concept of Types of Coding.</td>
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<td></td>
<td>4. Understand the concept of Wireless Network and standards</td>
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<td></td>
<td>5. Understand B3G mobile Communication</td>
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<tr>
<td>Objectives</td>
<td>At the end of the course the student should be able to:</td>
<td></td>
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<tr>
<td></td>
<td>1. Know the Current issues for Mobile communication,</td>
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<tr>
<td></td>
<td>2. Know the concept of Bit error rate in Different modulation Techniques,</td>
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<td>3. Know the different types of coding and reduction of the bit rate.</td>
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<td>4. Know the concept of various wireless Network,</td>
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<td>5. Know about B3G Systems</td>
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</tbody>
</table>

UNIT I OVERVIEW OF CELLULAR MOBILE COMMUNICATION AND CELLULAR CONCEPT
Overview to wireless communication: Evolution & Generation of mobile communication. Existing mobile communication technology and current Status. Cellular Concept: Frequency reuse, channel assignment, hand off, Interference and system Capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems

UNIT II MODULATION TECHNIQUES
Modulation Techniques: Minimum Shift Keying, Gauss ion MSK, M-ary QAM, M-ary FSK,MIMO-OFDM

UNIT III CODING AND MULTIPLE ACCESS TECHNIQUES
Coding: Vocoder, Linear Predictive Coders, Selection of Speech Coders for Mobile Communication, GSM Codec, RS codes for CDPD. Multiple Access Techniques: FDMA, TDMA,CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

UNIT IV WIRELESS NETWORKS AND STANDARDS
Second and Third Generation Wireless Networks and Standards,WLL,Bluetooth,AMPS, GSM,VoIP service for Mobile Networks, GPRS,IS-95 and DECT.

UNIT V BEYOND 3G MOBILE COMMUNICATION
Architectures,Operations,Features and application of Wi-Fi, WiMax, LTE

TEXT BOOK
REFERENCES

ECD352 RADAR AND OPTICAL COMMUNICATION

COURSE OBJECTIVE

1. To expose the students to the basics of signal propagation through optical fibers, fiber impairments, components, devices and system design.
2. Learn the various optical source materials and optical receivers.
3. Learn digital transmission system, operational principles of WDM.
4. To study about the radar equations, its principles, and different types of radars.
5. To apply pulsed Doppler radar principle and to understand tracking radars through pulsed wave form.

COURSE OUTCOMES

Students are able to,
1. CO1: classify the structures of Optical fiber, types, and discuss the channel impairments like losses and dispersion.
2. CO2: classify the Optical sources and detectors and to discuss their principle.
3. CO3: familiar with Design considerations of fiber optic system.
4. CO4: Know the block diagram of a simple pulse radar and description of the various blocks and different types of radar.
5. CO5: know the Principles of Pulsed Doppler Radar, Spectral Charities of a Pulsed Waveform.

UNIT I INTRODUCTION TO OPTICAL FIBERS & SIGNAL DEGRADATION

UNIT II FIBRE OPTICAL COUPLING, SOURCES AND RECEIVERS
Optical Power Launching and Coupling - Lensing schemes for coupling improvement - Fiber-to-fiber joints - Splicing techniques - Optical fiber connectors - Optical sources and detectors - Laser fundamentals - Semiconductor Laser basics - LEDs, PIN and Avalanche photodiodes - Optical Tx/Rx Circuits.

UNIT III DIGITAL TRANSMISSION SYSTEMS
Design considerations of fiber optic systems - Analog and digital modulation - Noise in detection process - Bit error rate - Optical receiver operation - Power Budget and Rise time Budget - WDM.

UNIT IV RADAR PRINCIPLES
Radar system - Simple form of radar equation - Radar block diagram - radar frequencies - Prediction of range performance - minimum detectable signal - receiver noise - pulse reception - frequency and range ambiguities - antenna parameter - Doppler effect - system losses and propagation effects.

UNIT V TYPES AND AIRBORNE PULSED DOPPLER RADAR
Text Books

Reference Books

ECD353 PROGRAMMING IN MATLAB

COURSE OBJECTIVES
To understand basic representation of Matrices and vectors in MATLAB
To learn various programming structures in MATLAB
To study built in and user defined functions in MATLAB.
To become conversant with 2D as well as 3D graphics in MATLAB
To make a Graphical User Interface (GUI) in Matlab in order to achieve interactivity
To Design simple Applications with Simulink (mdl files) and (M files) MATLAB.

UNIT 1 INTRODUCTION TO MATLAB
Menus & Tool bars, Variables - Matrices and Vectors - initializing vectors - Data types- Functions – User defined functions - passing arguments - writing data to a file-reading data from a file - using functions with vectors and matrices- cell arrays & structures - Strings - 2D strings-String comparing - Concatenation - Input and Output statements - Script files .

UNIT 2 LOOPS & CONTROL STATEMENTS
Introduction; Relational & Logical operations - Example programs - Operator precedence - Control & Decision statements- IF - IF ELSE - NESTED IF ELSE - SWITCH - TRY & CATCH - FOR - WHILE - NESTED FOR - FOR with IF statements, MATLAB program organization, Debugging methods - Error trapping using eval & lastern commands.

UNIT 3 PLOTS IN MATLAB & GUI
Basic 2D plots, Labels, Line style, Markers, plot, subplot, LOG, LOG-LOG, SEMILOG-POLAR-COMET, Grid axis, labeling, fplot, ezplot, ezpolar, polyval, exporting figures, HOLD, STEM, BAR, HIST, Interactive plotting, Basic Fitting Interface – Polyfit - 3D plots – Mesh - Contour - Example programs. GUI - Creation Fundamentals – Capturing mouse actions

UNIT 4 MISCELLANEOUS TOPICS

UNIT 5 SIMULINK & APPLICATIONS
How to create & run Simulink, Simulink Designing - Using SIMULINK Generating an AM signal & 2nd ordersystems - Designing of FWR & HWR using Simulink - Creating a subsystem in Simulink.
Applications Programs - Frequency response of FIR & IIR filters, Open Loop gain of OPAMP, I/P characteristics of BJT, Plotting the graph between Breakdown voltage & Doping Concentration. PCM, DPCM.

TOTAL = 45

TEXT / REFERENCE BOOKS

2. Duane Hanselman, Bruce LittleField, “Mastering MATLAB 7”, Pearson Education Inc, 2005

ECD354 IMAGE PROCESSING AND PATTERN RECOGNITION

L T P C
3 0 0 3

Course Learning Objectives:

This subject aims to teach the students how a computer can emulate functions typical of human vision and enable them:

1. To be familiar with Image model, digital image representation, properties of human visual system, various applications.
2. Different image processing operations for improving image quality through enhancement, restoration and filtering etc.
3. Image segmentation for partitioning into objects and background and mathematical morphology.
5. Familiar with the various estimation methods.

Course Outcomes:

At the end of the course the student will be able to

1. Get adequate background knowledge about image processing.
2. Get adequate background knowledge in image pre-processing techniques.
3. Get practical knowledge and skills about image segmentation methods and morphology.
4. Get basic knowledge and skills about pattern recognition tools.
5. Get necessary knowledge to design and implement a prototype of an image processing and pattern recognition application.

UNIT-I DIGITAL IMAGEFUNDAMENTALS

Elements of visual perception, steps in digital image processing, applications of image processing, image function, image representation, basic relationship between pixels, sampling, quantization, color images, metrics and topological properties of digital images, image quality, noise image.

UNIT-II IMAGE PREPROCESSING

Pixel brightness transformation, position dependent brightness correction, gray scale transformation; geometric transformation, local pre-processing, spatial filtering: smoothing, sharpening filters,
frequency domain filters: smoothing, sharpening filters, edge detectors, zero-crossing, various edge detection methods, parametric images, local preprocessing and adaptive neighborhood preprocessing, image restoration- in the presence of noise only spatial filtering.

UNIT-III IMAGE SEGMENTATION & MATHEMATICAL MORPHOLOGY 9

Threshold detection methods, optimal thresholding, global thresholding, adaptive thresholding, edge based image segmentation- edge linking and boundary detection, region based segmentation.

Basic morphological concepts, four morphological principles, binary dilation, erosion, Hit or miss transformation, opening and closing; thinning and skeleton algorithms; Morphological segmentation.

UNIT-IV BASICS OF PATTERN RECOGNITION & UNSUPERVISED LEARNING 9

Bayesian decision theory, classifiers, discriminant functions, decision surfaces, normal density and discriminant functions, discrete features.

Unsupervised learning and clustering, criterion functions for clustering, K-means and hierarchical clustering, cluster validation.

UNIT-V PARAMETRIC AND NON-PARAMETRIC ESTIMATION METHODS 9

Maximum likelihood estimation, Gaussian mixture models, expectation – maximization method, Bayesian estimation.

K-nearest neighbor method, linear discriminant functions based classifiers, support vector machines.

TOTAL = 45 Periods

TEXT BOOKS:

REFERENCES:
# Digital Design and Implementation Using HDL & VHDL

<table>
<thead>
<tr>
<th>ECD355</th>
<th>Digital Design and Implementation Using HDL &amp; VHDL</th>
<th>3 Credits</th>
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</table>

**Prerequisite**
To learn VHDL and to describe the digital system design using VHDL.

**Goal**
To learn VHDL and to describe the digital system design using VHDL.

**Objectives**
The course should enable the students to:

1. To Learn basic Concepts in VHDL
2. To Learn VHDL functions and File handling concept.
3. Provide knowledge about the functionality of combinational circuit.
4. Learn about sequential circuits and state diagram implementation of digital circuits.
5. Provide knowledge of programmable logic devices.

**Outcome**
At the end of the course the student should be able to:

1. Summarize and make use of VHDL language to write code for simple logic circuits.
2. Make use of the concepts and describe digital system using VHDL.
3. Design of combination logic circuit using VHDL.
4. Design of sequential logic circuit using VHDL.
5. Design of programmable device using VHDL.

## UNIT I: INTRODUCTION TO VHDL

- Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements.

## UNIT II: VHDL FUNCTIONS AND FILE HANDLING

- Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

## UNIT III: COMBINATION CIRCUIT DESIGN USING VHDL

- Combinational logic circuit design and VHDL implementation of following circuits – first adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits.

## UNIT IV: SEQUENTIAL CIRCUIT DESIGN USING VHDL

- Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC)

## UNIT V: PROGRAMMABLE LOGIC DEVICES

- Asynchronous sequential circuit design – primitive flow table, concept of race, critical race and hazards, Programmable logic devices: PLAs, PALs, CPLDs and FPGA. Design implementation using CPLDs and FPGAs.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
ECD356 - BASICS OF SATELLITE COMMUNICATION

L T P C
3 0 0 3

AIM
To enable the student to become familiar with satellites and satellite services.

OBJECTIVES
- Overview of satellite systems in relation to other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

UNIT I SATELLITE ORBITS
8

UNIT II SPACE SEGMENT AND SATELLITE LINK DESIGN
12
Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

UNIT III SATELLITE ACCESS:
10
Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Brocast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption

UNIT IV EARTH SEGMENT
5
Earth Station Technology-- Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain.

UNIT V SATELLITE APPLICATIONS
10
INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E-mail, Video conferencing, Internet

TOTAL = 45 PERIODS

TEXT BOOKS:

REFERENCES

151

**ECD451 FUNDAMENTALS OF WIRELESS SENSOR NETWORKS**

<table>
<thead>
<tr>
<th>ECD451</th>
<th>FUNDAMENTALS OF WIRELESS SENSOR NETWORKS</th>
<th>3 CREDITS</th>
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</thead>
<tbody>
<tr>
<td><strong>Prerequisite</strong></td>
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<tr>
<td><strong>Goal</strong></td>
<td>Introduce the students to the diverse literature on sensor networks, and expose them to the fundamental issues in designing and analyzing sensor network</td>
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<tr>
<td><strong>Objectives</strong></td>
<td><strong>Outcome</strong></td>
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<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
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<tr>
<td>1. Describe the current technology trends and unique issues for the implementation in sensor networks</td>
<td>1. Explain the basic wireless sensor technology and its applications.</td>
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<tr>
<td>2. Learn the concept of MAC protocols the sensor networks</td>
<td>2. Explain the MAC protocols of WSN.</td>
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<tr>
<td>3. Learn routing strategies and design issues in WSN</td>
<td>3. Explain the challenges in designing routing protocols and routing techniques in WSN</td>
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</tr>
<tr>
<td>4. Understand the various tools and programming challenges for simulating an environment for sensor systems using Motes.</td>
<td>4. Understand the operating system of WSN and its components</td>
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<tr>
<td>5. Understand design issues performance and traffic management of WSN</td>
<td>5. Explain the working models and performance of a WSN.</td>
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</tbody>
</table>

**Unit 1 : Introduction and Overview of Wireless Sensor Networks**


**Unit 2 : Medium Access Control Protocols for Wireless Sensor Networks**


**Unit 3 : Routing Protocols for Wireless Sensor Networks**


**Unit 4: Operating Systems for Wireless Sensor Networks**

Unit 5: Performance and Traffic Management of Wireless Sensor Networks

WSN Design Issues, MAC Protocols, Routing Protocols, Transport Protocols, Performance Modeling of WSNs, Performance Metrics, Basic Models, Network Models,

TEXT BOOKS

REFERENCE BOOKS
2. Philip Levis, “TinyOS Programming”
3. Anna Ha’c, “Wireless Sensor Network Designs”, John Wiley & Sons Ltd,

TELECOMMUNICATION SWITCHING TECHNIQUES

<table>
<thead>
<tr>
<th>ECD452</th>
<th>TELECOMMUNICATION SWITCHING TECHNIQUES</th>
<th>3 CREDITS</th>
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<tbody>
<tr>
<td>Prerequisite</td>
<td>To introduce fundamental functions of a telecom switching office and analysis of telecommunication traffic.</td>
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</table>

Objectives
The course should enable the students to:
1. Learn the concepts of different switching.
2. Learn the principle of different stages networks
3. Study the need for network synchronization and synchronization issues.
4. Learn statistical modeling of telephone traffic and queuing system characteristics
5. Study about basic concepts of cellular Telecommunication

Outcome
At the end of the course the student should be able to:
1. Understand the concepts of message, circuit, manual, 2-D switching
2. Understand the concepts of different stages networks.
3. Understand the need for network synchronization, study synchronization issues, outline network control and management issues.
4. Understand the concepts of statistical modeling of telephone traffic, blocking system characteristics and queuing system characteristics.
5. Understand the concepts of cellular telecommunication

UNIT I DEVELOPMENT OF TELECOMMUNICATION SWITCHING SYSTEMS 9


UNIT II Switching Networks
Single Stage Networks, Grading: Principle, Design of progressive grading, other grading, Traffic capacity of grading, Applications of grading. Link Systems: General, Two stage networks, three stage networks, four stage networks. Grades of service of link systems: General, Two stage networks, three stage networks, four stage networks Call packing, SS.7.

UNIT III NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT 9
UNIT IV TRAFFIC ANALYSIS


UNIT V CELLULAR TELEPHONE CONCEPTS

Mobile telephone services, cellular telephone, Frequency reuse, Interference, Cellular system topology, Roaming and handoffs, Cellular telephone network components, Cellular telephone call processing. Cellular Telephone systems: Digital cellular telephone, IS–95. GSM GPRS for Mobile communications, Personal Satellite communication system

TOTAL: 45

TEXTBOOK
1. Thiagarajan Vishwanathan, “Telecommunication Switching Systems and Networks”; PHI Publications

REFERENCE
1. 1. J. E. Flood, “Telecommunications Switching, Traffic and Networks”, Pearson Education

FUNDAMENTALS OF SDR

<table>
<thead>
<tr>
<th>ECD453</th>
<th>FUNDAMENTALS OF SDR</th>
<th>3 CREDITS</th>
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<tr>
<td>Prerequisite</td>
<td>To understand how SDR platform provides easy access to wireless network system.</td>
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<table>
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<tr>
<th>Objectives</th>
<th>Outcome</th>
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</thead>
<tbody>
<tr>
<td>The course should enable the students to:</td>
<td>At the end of the course the student should be able to:</td>
</tr>
<tr>
<td>1. Learn the Characteristics and benefits of a Software Radio</td>
<td>1. Explain the Characteristics and benefits of a Software Radio</td>
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<tr>
<td>2. Gain knowledge of various basic SDR architectures and functions</td>
<td>2. Analyze basic SDR architectures and functions</td>
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<tr>
<td>3. Learn about several structural and behavior of both Transmitter and Receiver</td>
<td>3. design structural and behavior of both Transmitter and Receiver</td>
</tr>
<tr>
<td>4. Understand various function of Key Hardware devices</td>
<td>4. Differentiate the function of Key Hardware devices</td>
</tr>
<tr>
<td>5. Study the need of smart antennas for SDR</td>
<td>5. Summarize the need of smart antennas for SDR</td>
</tr>
</tbody>
</table>

UNIT 1: SDR Introduction


154
UNIT 2: Architecture

Ideal SDR architecture- SDR Based End to- End Communication. 2G Radio Architectures Hybrid
Radio Architecture- Basic Software Defined Radio Block Diagram- Digital Frequency Conversion
Partitioning- Operating Environment (OE).

UNIT 3: Front End Technology

Radio Frequency translation, Transmitter specifications, Architecture, - Receiver specifications,
Architecture, considerations- Front end Implementation- Data conversions- Zero IF receivers, Preselect
Filters.

UNIT 4: Hardware requirements

Digital hardware choices- Key hardware elements, DSP processors, Field Programmable Gate
Arrays, Trade-offs in using DSPs, FPGAs, and ASICs, Power management issues, Combination of
DSPs, FPGAs, and ASICs

UNIT 5: Smart Antenna systems for SDR

Analog to digital and digital to analog conversion Parameters of ideal data converters, Parameters of
practical data converters, Techniques to improve data converter performance, Common ADC and
DAC architectures -Antenna requirements -Benefits of smart antennas, Structures for beam forming
systems -Diversity and space-time adaptive signal processing

Reference Books:

1. Bard, Kovarik: Software Defined Radio, The Software Communications Architecture,
2. J H Reed, Software defined Radio, Prentice Hall, 2002
4. Software Radio Architecture: Object-Oriented Approaches to Wireless Systems