Bachelor of Technology (Electronics & Communication Engineering)

Scheme of Studies/Examination

Semester III

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Course Title</th>
<th>Teaching Schedule</th>
<th>Allotment of Marks</th>
<th>Duration of Exam (Hrs)</th>
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* MPC-201N is a mandatory course and student has to get passing marks in order to qualify for the award of degree but its marks will not be added in the grand total.
### Bachelor of Technology (Electronics & Communication Engineering)
#### Scheme of Studies/Examination

**Semester IV**

<table>
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<tr>
<th>S. No.</th>
<th>Course No.</th>
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* MPC-202N is a mandatory course and student has to get passing marks in order to qualify for the award of degree but its marks will not be added in the grand total.

Note: All the students have to undergo six weeks industrial training after IVth semester and it will be evaluated in Vth semester.
### Course Outcomes

**CO1** This section is concerned mainly with Fourier series. However, the underlying ideas can also be extended to nonperiodic phenomena. This leads to Fourier integrals and transforms which are very much useful in solving the initial and boundary value problems.

**CO 2** Students will learn about the formation and solution the partial differential equations. First order PDE of any degree by using Charpit’s method will be discussed in details. In addition, how to solve homogeneous linear PDE with constant coefficients and variable separable method and LPP will be covered under this section.

**CO 3** Complex analysis is concerned with generalization of the familiar real functions of calculus and their detailed knowledge is an absolute necessity in practical work to solve engineering problems.

**CO 4** Probability theory provides models of probability distributions( theoretical models of the observable reality involving chance effects) to be tested by statistical methods which has various engineering applications, for instance, in testing materials, control of production processes, robotics, and automatization in general, production planning and so on.

### UNIT-I

**Fourier Analysis** *(11 hrs)*

**Fourier series:** Euler’s formulae, Orthogonality conditions for the Sine and Cosine functions, Dirichlet’s conditions, Fourier expansion of functions having points of discontinuity, Change of interval, Odd and even functions, Half-range series.

**Fourier Transforms:** Fourier integrals, Fourier transforms, Fourier Cosine and Sine transforms, Properties of Fourier transforms, Convolution theorem, Parseval’s identity, Fourier transforms of the derivative of a function, Application of transforms to boundary value problems (Heat conduction and vibrating string).

### UNIT-II

**Partial Differential Equations and LPP** *(11 hrs)*

Formation and Solutions of PDE, Lagrange’s Linear PDE, First order non-linear PDE, Charpit’s method, Homogeneous linear equations with constant coefficients, Method of separation of variables.

**Solution of linear programming problems:** using Graphical and Simplex methods.

### UNIT-III

**Theory of Complex Variables** *(12 hrs)*


Line integral in complex plane, definition of the complex line integral, basic properties, Cauchy’s integral theorem, and Cauchy’s integral formula, brief of Taylor’s, Laurent’s and Residue theorems (without proofs).

### UNIT-IV
Probability theory: (11 hrs)

A review of concepts of probability and random variables: definitions of probability, addition rule, conditional probability, multiplication rule, Conditional Probability, Mean, median, mode and standard deviation, Bayes’ Theorem, Discrete and continuous random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function.

Standard Distributions: Binomial, Poisson and Normal distribution.

References Books:

Note: The Examiners will set nine questions: first question will be short answer type (covering the entire syllabus) and another eight questions will be set taking two questions from each unit. Students will have to attempt five questions in all; first question will be compulsory and other four questions, selecting one from each unit. All questions will carry equal marks.
Purpose

To familiarize the students with the basic concepts of signals and systems, Random variables, discretisation of analog signals, fourier series, fourier transform and laplace transform.

Course Outcomes

CO1 Introduce and classify signals and systems based on their properties.
CO2 To understand the basic concepts of random variables and Linear time invariant systems.
CO3 Familiarization with the sampling process and spectral analysis of signals using fourier series.
CO4 Apply transform techniques to analyze continuous-time and discrete-time signals and systems

Unit-I

Introduction to Signals: Continuous and discrete time signals, deterministic and stochastic signals, periodic and a periodic signals, even and odd signals, energy and power signals, exponential and sinusoidal signals and singular functions. Signal representation in terms of singular functions, orthogonal functions and their use in signal representation

Introduction to Systems: Linear and non-linear systems, time invariant and time varying systems, lumped and distributed systems, deterministic and stochastic systems, casual and non-causal systems, analog and discrete/digital memory and memory less systems.

Unit-II


Linear Time Invariant Systems: Introduction to linear time invariant (LTI) systems, properties of LTI systems, convolution integral, convolution sum, causal LTI systems described by differential and difference equations. Concept of impulse response

Unit-III

Discretisation of Analog Signals: Introduction to sampling, sampling theorem and its proof. Effect of undersampling, reconstruction of a signal from sampled signal.

Fourier Series: Continuous time fourier series (CTFS), Properties of CTFS, Convergence of fourier series, Discrete time Fourier Series (DTFS), Properties of DTFS, Fourier series and LTI system, Filtering.

Unit-IV


Laplace Transform: Introduction to Laplace transform, Region of convergence for laplace transform, Inverse laplace transform, Properties of laplace transform, Analysis and characterization of LTI systems using laplace transform, System function algebra and block diagram representations, Unilateral laplace transform.

Text Books:


Reference Books:

2. Tarun Kumar Rawat, Signals and Systems, Oxford University Press.

Note: Question paper template will be provided to the paper setter.
### Electronic Devices

<table>
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<th>Lecture</th>
<th>Tutorial</th>
<th>Practical</th>
<th>Theory</th>
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**Purpose**

To familiarize the students with the various electronic devices such as various types of diodes, BJT’s, FET’s and regulated power supplies.

### Course Outcomes

| CO1 | To understand the concept of carrier transport phenomena in semiconductors and various diodes such as p-n junction diode, tunnel diode and schottky diodes. |
| CO2 | To understand the detailed concept of BJT’s and calculation of parameters of transistors using different models. |
| CO3 | Describe the characteristics & parameters of FET’s and MOSFET’s. |
| CO4 | To understand the concept of different types of regulated power supplies. |

### Unit - I

**Carrier Transport Phenomena:** Carrier Drift, Carrier Diffusion, Hall Effect, Mobility and Resistivity. Generation and Recombination of carriers, Fermi energy level, its position and its variation with doping concentration.

**PN Junction:** Basic Structure, Built in potential Barrier, Electric Field, Space charge width, Junction capacitances: Depletion & Diffusion Capacitance, Small signal model of PN Junction Diode. Tunnel Diode, Schottky Diode.

### Unit - II


### Unit - III

**Field Effect Devices:** JFET concepts, Basic Operation, Internal pinch off voltage, Pinch off voltage, Ideal DC current voltage relationship, Transconductance, Channel length modulation, velocity saturation effects, Small Signal Model & Frequency Limitations. Two Terminal MOS structure, Energy band diagrams, Depletion layer thickness, Capacitance Voltage Relationship, Basic MOSFET operation, Small Signal Model.

### Unit - IV

**Regulated Power Supplies:** Voltage Regulation, Zener diode shunt voltage regulator, Transistor series and Transistor shunt voltage regulator, Controlled Transistor Voltage Regulator, Op-Amp Series voltage regulator, Complete power supply and SMPS.

### Text Books:


### Reference Books:

3. Millman & Halkias: Integrated Electronics, TMH.

**Note:** Question paper template will be provided to the paper setter.
**ECE-205N**

<table>
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<th>Lecture</th>
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<td>75</td>
<td>25</td>
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**Purpose**
To familiarize the students with the concepts of topology, transient analysis, network modeling, filters and methods of network analysis and synthesis for solving simple and complex circuits.

**Course Outcomes**

**CO1**
To understand the concept of network topologies and the network analysis in the time domain for solving simple and complex circuits.

**CO2**
Describe the circuit element models, network analysis using Laplace transform and time domain behavior from the pole-zero plots.

**CO3**
Describe the characteristics & parameters of two port networks.

**CO4**
To understand the concept of filters and synthesis of one port network.

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**Unit -I**


**Unit-II**

**Network Analysis (using Laplace Transform):** Circuit Element Models, Transient Response of RC, RL, RLC Circuits to various excitation signals such as step, ramp, impulse and sinusoidal excitations using Laplace transform.

**Network Functions:** Terminal pairs or Ports, Network functions for one-port and two-port networks, poles and zeros of Network functions, Restrictions on pole and zero Locations for driving point functions and transfer functions.

**Unit-III**

**Characteristics and Parameters of Two Port Networks:** Relationship of two-port variables, short-circuit admittance parameters, open circuit impedance parameters, transmission parameters, hybrid parameters, relationships between parameter sets, Inter-connection of two port networks.

**Unit-IV**

**Types of Filters and their Characteristics:** Filter fundamentals, constant-k and m-derived low-pass and high-pass filters.

**Network Synthesis:** Causality & Stability, Hurwitz Polynomials, Positive real functions, Synthesis of one port networks with two kind of elements.

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**Text Books:**
2. Network Analysis: M.E. Van Valkenburg, PHI

**Reference Books:**

**Note:** Question paper template will be provided to the paper setter.
Unit-I

**Introduction to Digital Techniques:** Digital Systems; Logic circuits, Analysis, design and implementation of digital systems, Number Systems and Codes- Positional number system; Binary, octal and hexadecimal number systems; Methods of base conversions; Binary, octal and hexadecimal arithmetic; Representation of signed numbers; Fixed and floating point numbers; Binary codes: BCD codes, Excess-3, Gray codes; Error detection and correction codes - parity check codes and Hamming code.

**Combinational Design using Gates:** Combinational Logic Systems: Definition and specification; Truth table; Basic logic operation and logic gates. Basic postulates and fundamental theorems of Boolean algebra; Standard representation of logic functions : SOP and POS forms; Simplification of switching functions using K-map and Quine-McCluskey tabular methods; Synthesis of combinational logic circuits using AOI, NAND, NOR and other combination of other logic functions.

Unit-II

**Logic families:** Introduction to different logic families; Operational characteristics of BJT in saturation and cut-off regions; Operational characteristics of MOSFET as switch; TTL inverter - circuit description and operation; CMOS inverter - circuit description and operation; Structure and operations of TTL, CMOS and ECL gates; Electrical characteristics of logic gates – logic levels and noise margins, fan-out, propagation delay, transition time, power consumption and power-delay product; interfacing of TTL and CMOS families.

**Combinational design using MST devices:** Encoders, Decoders, multiplexers, demultiplexers and their use as logic elements; Parity circuits and comparators; Arithmetic modules- adders, subtractors, BCD arithmetic circuits.

Unit-III

**Sequential circuits:** Definition of state machines, state machine as a sequential controller; Basic sequential circuits- latches and flip-flops: SR-latch, D-latch, D flip-flop, JK flip-flop, T flip-flop; Timing hazards and races; Analysis of state machines using D flip-flops and JK flip-flops; Design of state machines - state table, state assignment, transition/excitation table, excitation maps and equations, logic realization;

**State machine design:** Designing state machine using ASM charts, Designing state machine using state diagram, Design of registers, counters-asynchronous and synchronous, up/down counter, Ring and Johnson counters.
Unit-IV

Memory – Organization, Functional Diagram, Memory operations, Classification of semiconductor memories, Read and Write Memories, ROM, Programmable Logic Devices-PLAs, PALs and their applications, Generic Array logic devices, Sequential PLDs and their applications; Introduction to field programmable gate arrays (FPGAs) and ASICS.

Text Books:

Reference Books:

Note: Question paper template will be provided to the paper setter.
ECE-209N  |  Analog Communications
---|---
**Lecture** | **Tutorial** | **Practical** | **Theory** | **Sessional** | **Total** | **Time**
3 | 1 | 0 | 75 | 25 | 100 | 3 Hr.
**Purpose** | To familiarize the students with the concepts of basic communication systems and various noises in that system, different analog modulation techniques and also AM&FM transmission & reception with various pulse techniques.

**Course Outcomes**

CO1 | To understand the concept of basic comm. System and various types of noise and analog modulation techniques.
CO2 | To understand the concept of AM transmission & reception.
CO3 | To understand the concept of FM transmission & reception.
CO4 | To understand the concept of SSB transmission & reception and analog pulse techniques.

**Unit-I**

**Communication Systems and Noise:** Constituents of communication system, Modulation, Bandwidth requirement, Noise, Classification of noise, Resistor noise, Multiple resistor noise sources, Network with reactive elements, Noise Temperature, Noise bandwidth, Noise figure, its calculation and measurement, Bandpass noise representation, Noise calculation in Communication Systems, Noise in Amplitude Modulated System, Noise in angle modulated systems, SNR calculation for AM and FM.

**Analog Modulation Techniques:** Theory of amplitude modulation, AM power calculations, AM modulation with a complex wave, Concepts of angle modulation, Theory of frequency modulation, Mathematical analysis of FM, Spectra of FM signals, Narrow band FM, Wide band FM, Phase modulation, Phase modulation obtained from frequency modulation, Comparison of AM, FM & PM.

**Unit-II**

**AM Transmission:** Generation of Amplitude Modulation, Low level and high level modulation, Basic principle of AM generation, Square law modulation, Amplitude modulation in amplifier circuits, Vander bijl modulation, Suppressed carrier AM generation (Balanced Modulator) ring Modulator, Product Modulator/balanced Modulator.

**AM Reception:** Tuned Ratio Frequency (TRF) Receiver, Super heterodyne Receiver, RF Amplifier, Image Frequency Rejection, Cascade RF Amplifier, Frequency Conversion and Mixers, Tracking & and Alignment, IF Amplifier, AM detector, AM detector with AGC, Distortion in diode detectors, Double hetero-dyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics.

**Unit-III**


**FM Reception:** Direct methods of Frequency demodulation, Travis detector/frequency discrimination (Balanced stop detector), Foster seelay of phase discriminator, Ratio detector, Indirect method of FM demodulation, FM detector using PLL, Pre-emphasis / de-emphasis, Limiters, The FM receiver, RF
Amplifier, FM stereo receiver, Square, Triangular, Sinusoidal FM generation Voltage controlled oscillator.

**Unit-IV**


**SSB Reception:** SSB Product Demodulator, Balanced Modulator as SSB Demodulator, Pilot Carrier SSB Receiver, SSB Double Super-hetrodyne Receiver, Compatible SSB (CSSB) Receiver, ISB/Suppressed Carrier Receiver, Modern Communication Receiver.

**Analog Pulse Modulation:** Introduction, Pulse amplitude modulation (PAM), Natural PAM Frequency Spectra for PAM, PAM Time Multiplexing Flat-top PAM, PAM Modulator Circuit, Demodulation of PAM Signals, Pulse Time Modulation (PTM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), PPM Demodulator,

**Text Books:**


**Reference Books:**


**Note:** Question paper template will be provided to the paper setter.
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<th>ECE-211N</th>
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**Course Outcomes**

**CO1**  To understand the basic concepts of MATLAB
**CO2**  To explore properties of various types of signals and systems.
**CO3**  To visualize the relationship between continuous and discrete fourier transforms.
**CO4**  To understand the concept of sampling in time and frequency domain.

**List of Experiments:**

1) To demonstrate some simple signal.

2) To explore the effect of transformation of signal parameters (amplitude-scaling, time-scaling and time-shifting).

3) To explore the various properties of the impulse signals.

4) To visualize the complex exponential signal and real sinusoids.

5) To identify a given system as linear or non-linear.

6) To explore the time variance and time invariance property of a given system.

7) To explore causality and non-causality property of a system.

8) To visualize the relationship between the continuous-time Fourier series and Fourier transform of a signal.

9) To visualize the relationship between the discrete-time Fourier series and Fourier transform of a signal.

10) To visualize the relationship between continuous-time and discrete-time Fourier transform of a signals.

11) To demonstrate the time domain sampling of bandlimited signals (Nyquist theorem).

12) To demonstrate the time domain sampling of non-bandlimited signals and antialiasing filter.

13) To demonstrate the signal reconstruction using zero-order hold and first-order hold filters.

14) To demonstrate the sampling in frequency domain (Discrete Fourier Transform).

15) To demonstrate the spectral analysis using Discrete Fourier Transform.

17) To demonstrate the convolution and correlation of two continuous-time signals.

18) To demonstrate the convolution and correlation of two discrete-time signals.
Course Outcomes

CO1  To understand the concept of TTL gates such as AND, OR, NAND etc.
CO2  To study and verify various combinational circuits such as multiplexers, Comparators etc.
CO3  To understand the concept of sequential circuits such as flip flops, counters etc.
CO4  To design the state machine of four states and to study a sequence detector.

List of Experiments:

1. Study of TTL gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design and realize a given function using K-Maps and verify its performance.
3. To verify the operation of Multiplexer and Demultiplexer.
4. To verify the operation of 2 bit Comparator using gates.
5. To verify the truth table of S-R, J-K, T, D Flip-flops.
6. To verify the operation of Bi-directional shift register.
7. To design and verify the operation of 3-bit asynchronous counter.
8. To design and verify the operation of asynchronous Up/down counter using J-K FFs.
10. To design a sequence detector.
### Course Outcomes

<table>
<thead>
<tr>
<th>CO1</th>
<th>To study various modulation techniques of Amplitude modulation and also demodulation.</th>
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<tbody>
<tr>
<td>CO2</td>
<td>To study the generation techniques of SSB and DSBSC modulation</td>
</tr>
<tr>
<td>CO3</td>
<td>To understand the concept of PLL, its capture range and frequency multiplier using PLL.</td>
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### List of Experiments:

1. i) To study Double Sideband Amplitude Modulation and determine its modulation factor and power in sidebands.
   ii) To study amplitude demodulation by linear diode detector.
2. i) To study Frequency Modulation and determine its modulation factor.
   ii) To study PLL 565 as frequency demodulator
3. To study Sampling and reconstruction of pulse amplitude modulation system.
4. To study the Sensitivity characteristics of superheterodyne receiver.
5. To study the Selectivity characteristics of superheterodyne receiver.
6. To study the Fidelity characteristics of superheterodyne receiver.
7. i) To study Pulse Amplitude Modulation
   a) Using switching method
   b) By sample and hold circuit.
   ii) To demodulate the obtained PAM signal by 2nd order Low pass filter.
8. To study Pulse Width Modulation / Demodulation.
10. To study active filters (Low-pass, High-pass, Band-pass, Notch filter).
UNIT 1


(a) Forest Resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people.
(b) Water Resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
(c) Mineral Resources- Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
(d) Food Resources- World Food Problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
(e) Energy Resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
(f) 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 lifestyle.

UNIT II

Ecosystem-Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological Succession. Food Chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem-

a. Forest Ecosystem
b. Grassland Ecosystem
c. Desert Ecosystem
d. Aquatic Ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Field Work. Visit to a local area to document Environment assets- river/forest/grassland/hill/mountain. Visit to a local polluted site- Urban / Rural
Industrial/Agricultural Study of common plants, insects and birds. Study of simple ecosystems-pond, river, hill, slopes etc. (Field work equal to 5 lecture hours).

UNIT III


Environmental Pollution Definition. Cause, effects and control measures of- (a) Air Pollution (b) Water Pollution (c) Soil Pollution (d) Marine Pollution (e) Noise Pollution (f) Thermal Pollution (g) Nuclear Hazards

Solid waste management- cause, 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

UNIT IV


Text Books

AS-206N  
NUMERICAL ANALYSIS

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<td>75</td>
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**Purpose**
To acquaint the students with the complete procedure to numerically approximate the solution for different kinds of problems occur in science, engineering and technology whose exact solution is difficult to find.

**Course Outcomes**

**CO1**
In this section student will learn the methods to find the roots of nonlinear (algebraic or transcendental) equations, and eigen value problem of a matrix that can be obtained numerically where analytical methods fail to give solution.

**CO2**
Students will learn to solve a large system of linear equations and matrix inversion by various numerical methods and techniques.

**CO3**
Discussion on interpolation will be useful in constructing approximate polynomial to represent the huge amounts of experimental data, and to find the intermediate values. Numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.

**CO4**
Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations will be useful in attempting many engineering problem.

**UNIT - I**

**Solution of Algebraic and Transcendental Equation and Eigen Value Problem:** Solution of algebraic and transcendental equation by the method of bisection, the method of false position, Newton-Raphson method and Graeffe’s Root squaring method. Eigen value problem by power method and Jacobi method.

**UNIT-II**


**UNIT-III**

**Interpolation:** Finite Differences, Relation between operators - Interpolation by Newton’s forward and backward difference formulae for equal intervals. Newton’s divided difference method and Lagrange’s method for unequal intervals. Gauss Central difference formulae, Bessel and Stirling formulae.

**Numerical differentiation:** Newton’s forward difference formula to compute derivatives, Newton’s backward difference formula to compute derivatives, Derivatives using Central difference formulae, to find the maxima and minima of a tabulated function.

**Numerical Integration:** by Newton’s Cotes formulae, Trapezoidal and Simpson’s 1/3rd and 3/8th rules, Romberg method.

**UNIT-IV**

**Solution of Ordinary Differential Equation:** Single step methods: Taylor series method, Picard’s method of successive approximation, Euler, Modified Euler’s and Improved Euler methods, Runge Kutta method of fourth order only. Multistep methods: Milne and Adams–Bashforth methods.

**Curve fitting:** Introduction, Principle of Least squares, Method of Least squares, Fitting of a straight line, parabola and exponential functions.

**References Books:**

Additional Readings:


Note: The Examiners will set nine questions: first question will be short answer type (covering the entire syllabus) and another eight questions will be set taking two questions from each unit. Students will have to attempt five questions in all; first question will be compulsory and other four questions, selecting one from each unit. All questions will carry equal marks.
Data Structures & Algorithms

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Tutorial</th>
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Purpose
To familiarize the students with the concepts of C basics, and basic algorithms using data structures such as searching and sorting, operations of linked lists and basics of trees and graphs.

Course Outcomes

<table>
<thead>
<tr>
<th>CO1</th>
<th>Students will be able to recall ‘C’ basics and design basic algorithms using various data structures</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>Students will be able to design implement various searching and sorting algorithms on arrays.</td>
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</table>

<table>
<thead>
<tr>
<th>CO3</th>
<th>Students will be able to use pointers to perform various operations of linked lists</th>
</tr>
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<tbody>
<tr>
<td>CO4</td>
<td>Students will be able to understand the basics of trees and Graphs.</td>
</tr>
</tbody>
</table>

Unit-I

Overview of ‘C’: History, Characters used in ‘C’, Data Types, ‘C’ Tokens, Structures of ‘C’ program, Operators and Expressions, Flow of Control, I/O functions, Arrays, Structures, user defined data types

Introduction: Overview, Concept of Data Structures, Design of suitable Algorithm, Algorithm analysis

Unit-II

Arrays - Searching and Sorting: Introduction, 1-D arrays - addressing an element in an array, array traversal, insertion and deletion, Multi-D arrays, representation of arrays in physical memory, application of arrays, Searching algorithms: linear search, binary search. Sorting algorithms: selection sort, insertions sort, bubble sort, shell sort, merge sort, radix sort (Algorithm and Analysis).

Stacks and Queues: Stacks operations, Applications of Stacks – Arithmetic operations using Infix to prefix and postfix notations, their conversion and evaluation, Queues operations, Circular, Priority queue and Deque.

Unit-III

Pointers: Introduction, Pointer variables, pointers and arrays, array of pointer, pointers and structures, Dynamic allocation

Linked Lists: Introduction, linked lists, operations on linked lists (Creation, Traversing, Searching, Insertion and Deletion), Circular and doubly linked list, Linked Stacks and Linked Queues, Comparison of sequential and linked storage.

Unit- IV

Trees: Binary Trees, representation of trees (Linear and linked), Traversal of binary trees. Types of binary trees: Expression tree, Binary search tree, Heap tree, threaded binary trees.

Graphs: Introduction, Graph terminology, various representations of Graphs, operations: Insertion, Deletion and traversal.

Text Books:
1. Data Structures using C by A. K. Sharma, Pearson Publication
2. Theory & Problems of Data Structures by Jr. Symour Lipschetz, Schaum’s outline by TMH.

Reference Books:
1. Data Structures using C by A. M. Tenenbaum, Langsam, Moshe J. Augentem, PHI Pub
2. Data Structures and program design in C by Robert Kruse, PHI Expert Data Structures with C by R.B. Patel

Note: Question paper template will be provided to the paper setter.
### Course Outcomes

| CO1 | Students will learn the techniques of measurement of resistance using different bridges |
| CO2 | AC Bridges & Voltage Indicating & Recording Devices will be introduced to the students |
| CO3 | Students will be able to recognize the functioning of different Analog & Digital Instruments |
| CO4 | Transducers & Data Acquisition Systems will be introduced to the students |

## Unit-I

**Measurement and Error:** Functional elements and generalized configuration of a measuring instrument, Characteristics of instruments, errors in measurements and their statistical analysis.

**Measurement of Resistance:** Wheatstone bridge, Carey-Foster Bridge, Kelvin double bridge, Measurement of Insulation resistance.

## Unit-II

**A-C Bridges:** Maxwell Inductance bridge, Maxwell Inductance Capacitance Bridge, Anderson’s Bridge, Hay’s Bridge, De-Sauty’s Bridge, Schering’s bridge and Wein’s bridge.

**Voltage Indicating and Recording Devices:** Analog voltmeters and Potentiometers, Self balancing potentiometer and X-Y recorders, Galvanometers - Oscillographs, Cathode - Ray Oscilloscopes, Magnetic Tape Recorders.

## Unit-III

**Electronic Instruments:** Wave analyzer, Distortion meter: Q-meter. Measurement of Op-Amp parameters.

**Digital Instruments:** Digital Indicating Instruments, Comparison with analog type, digital display methods, digital methods of time and frequency measurements, digital voltmeters.

## Unit-IV

**Transducers:** Classification of Transducers, Strain Gauge, Displacement Transducers - Capacitive Transducers, LVDT, Piezo-electric Transducers, Temperature Transducers – resistance thermometer, Thermocouples and Thermistors, Liquid level measurement Low pressure (vacuum) measurement.

**Data Acquisition Systems:** A to D and D to A converters, Analog and Digital Data Acquisition Systems, Multiplexing, Spatial Encoders, Telemetry.

### Text Book:


### Reference Books:

1. Electronics Instrumentation and Measurement Techniques: Cooper W.D & Helfrick A.D.; PHI

### Note:

Question paper template will be provided to the paper setter.
<table>
<thead>
<tr>
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**Purpose**

To familiarize the students with the concepts of Electric & Magnetic Fields and make them understand the phenomenon of propagation of electromagnetic waves.

**Course Outcomes**

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>CO1</td>
<td>Basics of electrostatics including dielectric properties will be covered.</td>
</tr>
<tr>
<td>CO2</td>
<td>Basics of magneto-statics and Maxwell's equations will be covered.</td>
</tr>
<tr>
<td>CO3</td>
<td>Fundamentals of Uniform plane waves and their propagation in different mediums will be covered.</td>
</tr>
<tr>
<td>CO4</td>
<td>Fundamentals of Transmission Lines and different modes of wave propagation in waveguides will be covered.</td>
</tr>
</tbody>
</table>

**Unit-I**


**Unit-II**


**Unit-III**


**Unit-IV**


**Text Books:**


**References Books:**


**Note:** Question paper template will be provided to the paper setter.
Purpose: To familiarize the students with the concepts of various models of BJT’s and FET’s, multistage amplifiers, concept of feedback and its topologies, oscillators and detail of operational amplifiers with its applications.

Course Outcomes

CO1: To understand the concept of various amplifiers using BJT and FET and various transistor models.

CO2: Describe the frequency response of multistage amplifiers and the detailed concept of feedback topologies.

CO3: To understand the concept of Barkhausen criteria of oscillation and various RC and LC oscillators and their frequency of oscillation.

CO4: To understand the concept of Operational amplifier and its various applications such as current mirror, Schmitt trigger and various op-amp parameters.

Unit -I

Amplifier Models: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Biasing schemes for BJT and FET amplifiers, bias stability, various configurations (such as CE/CS, CB/CG, CC/CD) and their features, small signal analysis, low frequency transistor models, estimation of voltage gain, input resistance, output resistance etc., design procedure for particular specifications, low frequency analysis of multistage amplifiers.

Unit -II

Transistor Frequency Response: High frequency transistor models, frequency response of single stage and multistage amplifiers, cascode amplifier. Various classes of operation (Class A, B, AB, C etc.), their power efficiency and linearity issues.

Feedback Topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

Unit -III

Oscillators: Review of the basic concept, Barkhausen criterion for oscillators, type of RC oscillators: RC phase shift oscillator, Wien bridge oscillator, LC oscillators: Hartley oscillator, Colpitt oscillator, Clapp oscillator, 555 Timer as a monostable and astable multivibrator.

Unit -IV


Text Books:
1. Electronic Devices and Circuits by Millman and Halkias, McGraw Hills, New Delhi

Reference Books:
1. Operational Amplifiers and Linear Integrated Circuits by Ramakant A Gayakwad, PHI.

Note: Question paper template will be provided to the paper setter.
### Course Outline

<table>
<thead>
<tr>
<th>ECE-210N</th>
<th>Computer Architecture &amp; Organization</th>
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<tr>
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**Purpose**
To familiarize the students with the concepts of basic structure of computer hardware & software, Control & processor design and memory & system organisation.

**Course Outcomes**

<table>
<thead>
<tr>
<th>CO1</th>
<th>To understand the concept of basics of computer hardware &amp; software</th>
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</thead>
<tbody>
<tr>
<td>CO2</td>
<td>To understand the concept of control design &amp; processor design</td>
</tr>
<tr>
<td>CO3</td>
<td>To familiarize with the concept of various memory systems.</td>
</tr>
<tr>
<td>CO4</td>
<td>To familiarize with the concept of system organisation.</td>
</tr>
</tbody>
</table>

### Unit-I
**Basic Structure of Computer Hardware and Software:** Introduction to basic computer architecture, register transfer, bus and memory transfers, arithmetic, logic and shift micro operations.

**Central Processing Unit:** Introduction, general register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, RISC, Macros and Subroutines.

### Unit-II
**Control Design:** Micro programmed control, control memory, address sequencing, micro program example, design of control unit, Hardwired Control: design methods, Multiplier Control Unit, CPU Control unit.

**Processor Design:** Decimal arithmetic unit – BCD adder, BCD subtraction, decimal arithmetic operations, ALU design, Forms of Parallel processing classification of Parallel structures, Array Processors, Structure of general purpose Multiprocessors.

### Unit-III
**Memory Organization:**
Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management, hardware multiprocessor architectures and their characteristics, interconnection structures, Random access memories: semiconductor RAMS, Serial – access Memories – Memory organization, Main Memory Allocation.

### Unit-IV
**System Organization:**
Pipeline and Vector Processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing, array processors, Input-output Organisation: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt, DMA, IOP serial communication.

### Text Books:

### Reference Books:

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**Course Outcomes**

| CO1 | Students will be able to recall ‘C’ basics and design basic algorithms using various data structures |
| CO2 | Students will be able to design implement various searching and sorting algorithms on arrays. |
| CO3 | Students will be able to use pointers to perform various operations of linked lists |
| CO4 | Students will be able to understand the basics of trees and Graphs. |

**List of Experiments:**

1. Write a program to print a 2D array.
2. Write a program to find the factorial of an n
   th number using recursion.
3. Write a program to print Fibonacci sequence.
4. Using clock() function of time.h header file, compare the timings of linear search and binary search for an 1D array of 1000 elements.
5. Compare the timings of the following sorting algorithm
   - Bubble sort
   - Selection sort
   - Insertion sort
6. Implement stacks using arrays for the following user defined functions
   - Size of stack
   - Number of elements in the stack
   - Pop with underflow check
   - Push with overflow check
7. Implement queues using arrays for the following user defined functions
   - Size of queue
   - Number of elements in the queue
   - Insert an element with overflow check
   - Delete an element with underflow check
8. Implement linked list for the following user defined functions
   - Create a node and Insert an element
   - Delete an element and its node
   - Find the location of a given value
   - Print the list in forward or reverse order
9. Traverse a tree and print the elements in
   - Preorder
   - Post order
   - In order
10. Traverse a graph and print the elements using
    - Depth first search
    - Breadth first search
## ECE-214N

### Electronics Measurements and Instruments Lab

<table>
<thead>
<tr>
<th>Lecture</th>
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### Course Outcomes

<table>
<thead>
<tr>
<th>CO1</th>
<th>To measure the unknown inductance and capacitance using various AC bridges.</th>
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</thead>
<tbody>
<tr>
<td>CO2</td>
<td>To measure the unknown frequency using different frequency bridges.</td>
</tr>
<tr>
<td>CO3</td>
<td>To understand the concept of calibration of energy meter and B-H curve of different magnetic materials.</td>
</tr>
<tr>
<td>CO4</td>
<td>To understand the concept conversion of voltmeter into ammeter using potentiometer.</td>
</tr>
</tbody>
</table>

### List of Experiments:

1. To measure the unknown Inductance in terms of capacitance and resistance by using Maxwell’s Inductance bridge.
2. To measure unknown Inductance using Hay’s bridge.
3. To measure unknown capacitance of small capacitors by using Schering’s bridge.
4. To measure 3-phase power with 2-Wattmeter method for balanced and unbalanced bridge.
5. To measure unknown capacitance using De-Sauty’s bridge.
6. To measure unknown frequency using Wein’s frequency bridge.
7. To measure unknown low resistance by Kelvin’s Double bridge.
8. To test the soil resistance using Meggar (Ohm meter).
10. To plot the B-H curve of different magnetic materials.
11. To calibrate the Voltmeter using Crompton Potentiometer.
12. To convert the Voltmeter into Ammeter using Potentiometer.
13. Insulation testing of cables using Digital Insulation Tester.
ECE-216N

Analog Electronics Lab

<table>
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<tr>
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Course Outcomes

<table>
<thead>
<tr>
<th>CO1</th>
<th>To design and calculate the gain, frequency response etc of the various configuration of transistor amplifier.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO2</td>
<td>Describe the frequency response of and test the performance of various LC and RC oscillators.</td>
</tr>
<tr>
<td>CO3</td>
<td>To understand and design the various applications of 555 timer such as astable and monostable multivibrator.</td>
</tr>
</tbody>
</table>

List of Experiments:

1. To Design a simple common emitter (CE) amplifier Circuit using BJT and find its gain and frequency response.

2. To Design a differential amplifier using BJT and calculate its gain and frequency response.

3. To design RC coupled Single stage BJT amplifier and determination of the gain, frequency response, input and output impedances.

4. To design a BJT Emitter follower and determination of the gain, input and output impedances.

5. To design and test the performance of BJT-RC Phase shift Oscillator for f0 ≤ 10 KHz.

6. To design and test the performance of BJT – Hartley Oscillators for RF range f0 ≥ 100KHz.

7. To design and test the performance of BJT – Colpitt Oscillators for RF range f0 ≥ 100KHz.

8. To design an astable multivibrator using 555 timer.

9. To design a monostable multivibrator using 555 timer.

10. To design Schmitt trigger using op-amp and verify its operational characteristics.
UNIT-I

Introduction: Types of energy, Conversion of various forms of energy, Conventional and Non-conventional sources, Need for Non-Conventional Energy based power generation.


Energy Audit & Tariffs: Need, Types, Methodology and Approach.

UNIT-II

Conventional Energy sources: Selection of site, working of Thermal, Hydro, Nuclear and Diesel power plants and their schematic diagrams & their comparative advantages- disadvantages.

UNIT-III

Non Conventional Energy sources: Basic principle, site selection and power plant layout of Solar energy, photovoltaic technologies, PV Systems and their components, power plant layout of Wind energy, layout of Bio energy plants, Geothermal energy plants and tidal energy plants.

UNIT-IV

Energy Scenario: Lay out of power system, Role of Energy in Economic development, energy demand, availability and consumption, Commercial and Non-commercial energy, Indian energy scenario, long term energy scenario, energy pricing, energy sector reforms in India, energy strategy for the future.

Text Books:
1. Energy Studies-Wiley and Dream tech India
3. NEDCAP: Non Conventional Energy Guide Lines
4. G.D. Roy :Non conventional energy sources
7. d Solar Energy- Wesley Publications