# Bachelor of Technology (Electronics Engineering) Kurukshetra University, Kurukshetra

*SCHEME OF STUDIES/EXAMINATIONS****(w.e.f. 2018-19 onwards)***

**Semester–III (Common with B.Tech 3rd Sem ECE)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.** **No.**  | **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  |  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Hours/ Week**  | **Theory**  | **Sessional**  | **Practical**  | **Total**  |
| 1  | AS-201N | [Mathematics –III](#MATHEMATICSIII) | 3  | 1  | 0  | 4  | 75  | 25  | 0  | 100  | 3  |
| 2  | ECE-201N | Signal and System | 3  | 1  | 0  | 4  | 75  | 25  | 0  | 100  | 3  |
| 3 | ECE-203N  | Electronic Devices | 3 | 1  | 0 | 4  | 75  | 25  | 0  | 100  | 3  |
| 4 | ECE-205N | Network Analysis and Synthesis | 3 | 1 | 0 | 4 | 75 | 25 | 0 | 100 | 3 |
| 5 | ECE-207N  | Digital Electronics | 3  | 1  | 0  | 4  | 75  | 25  | 0  | 100  | 3  |
| 6 | ECE-209N | Analog Communication  | 3 | 1 | 0 | 4 | 75 | 25 | 0 | 100 | 3  |
| 7  | ECE-211N  | Signal and System Lab  | 0  | 0  | 2  | 2  | 0  |  40 | 60 | 100 | 3  |
| 8 | ECE-213N | Digital Electronics Lab | 0  | 0  | 2  | 2  | 0  |  40 | 60 | 100 | 3  |
| 9 | ECE-215N | [Analog Communication Lab](#MATSC) | 0 | 0 | 2 | 2 | 0 |  40 | 60 | 100 | 3 |
|  |  | Total  | 18 | 6 | 6 | 30 | 450 | 270 | 180 | 900  | 27 |
| 10 | MPC-201N | [Environmental Studies](#environmentalstudies)\*  | 3  | 0  | 0  | 3  | 75  | 25  | 0  | 100  | 3  |

*\** 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 Engineering) Kurukshetra University, Kurukshetra

*SCHEME OF STUDIES/EXAMINATIONS****(w.e.f. 2018-19 onwards)***

**Semester–IV (Common with B.Tech 4th Sem ECE)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **S.** **No.**  | **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  |  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Hours/ Week**  | **Theory**  | **Sessional**  | **Practical**  | **Total**  |
| 1  |  AS-202N | Numerical Analysis | 3 | 1 | 0 | 4 | 75 | 25 | 0 | 100 | 3 |
| 2  | ECE-202N | Data Structure and Algorithms | 3 | 1 |  0 | 4 | 75  | 25  | 0  | 100  | 3  |
| 3  | ECE-204N | Electronic Measurement and Instruments | 3 | 1 |  0 | 4 | 75  | 25  | 0  | 100  | 3  |
| 4  | ECE-206N | Electromagnetic Theory  | 3 | 1 |  0 | 4 | 75  | 25  | 0  | 100  | 3 |
| 5  | ECE-208N | Analog Electronics  | 3 | 1 |  0 | 4 | 75  | 25  | 0  | 100  | 3  |
| 6 | ECE-210N | Computer Architecture and Organization | 3 | 1 | 0 | 4 | 75 | 25 | 0 | 100 | 3 |
| 7 | ECE-212N | Data Structure Lab | 0  | 0  | 2 | 2 | 0  | 40  | 60 | 100 | 3  |
| 8 | ECE-214N | Electronic Measurement and Instruments Lab |  0 |  0 | 2 | 2 | 0  | 40  | 60 | 100 | 3  |
| 9  | ECE-216N | Analog Electronics Lab |  0 | 0  | 2 | 2 | 0  | 40  | 60 | 100 | 3  |
|  |  | Total  | 18 | 6 | 6 | 30 | 450 | 270 | 180  | 900  | 27 |
| 10 |  MPC-202N | [Energy Studies](#environmentalstudies)\*  | 3  | 0  | 0  | 3  | 75  | 25  | 0  | 100  | 3  |

*\*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.*

*\* Students shall devote 6 weeks to industrial training after Fourth semester exam outside the college campus at approved works.*

# Bachelor of Technology (Electronics Engineering) Kurukshetra University, Kurukshetra

*SCHEME OF STUDIES/EXAMINATIONS****(w.e.f. 2019-2020 onwards)***

**Semester–V**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.No | Subject code | Course Title | Teaching Schedule |  Allotment of Marks | Duration of Exam |
| L | T | P | Total | Theory | Sessional | Practical | Total |   |
| 1 | EL-301N | Linear Integrated Circuits | 4 | 1 |  0 | 5 | 75 | 25 |   | 100 | 3 |
| 2 | EL-303N | VLSI Technology | 4 | 1 |  0 | 5 | 75 | 25 |   | 100 | 3 |
| 3 | EL-305N | Control Systems Engineering | 4 | 1 |  0 | 5 | 75 | 25 |   | 100 | 3 |
| 4 | EL-307N | Antenna & wave Propagation | 3 | 1 |  0 | 4 | 75 | 25 |   | 100 | 3 |
| 5 | EL-309N |  Digital System Design | 3 | 1 |  0 | 4 | 75 | 25 |   | 100 | 3 |
| 6 | EL-311N | Linear Integrated Circuits Lab |  0 |  0 | 3 | 3 |  | 40 | 60 | 100 | 3 |
| 7 | EL-313N | Control Systems EngineeringLab |  0 |  0 | 3 | 3 |  | 40 | 60 | 100 | 3 |
| 8 | EL-315N | Digital System Design Lab |  0 |  0 | 3 | 3 |  | 40 | 60 | 100 | 3 |
| 9 | EL-317N  | Industrial Training Seminar |   |   |   |   |   |   | 100 | 100 | 3 |
|  |   | Total | 18 | 5 | 9 | 32 | 375 | 245 | 280 | 900 | 27 |

**Bachelor of Technology (Electronics Engineering)Kurukshetra University, Kurukshetra**

*SCHEME OF STUDIES/EXAMINATIONS****(w.e.f. 2019-2020 onwards)***

**Semester – VI**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S. No. | **Course No.** | **Course Title** | **Teaching Schedule** | **Allotment of Marks** | **Duration of Exam****(Hrs.)** |
| **L** | **T** | **P** | **Hours/****Week** | **Theory**  | **Sessional** | **Practical** | **Total** |
| 1 | EL-302N | Digital Signal Processing | 4 | 1 | 0 | 5 | 75 | 25 | 0 | 100 | 3 |
| 2 | EL-304N | Microprocessor & Interfacing | 3 | 1 | 0 | 4 | 75 | 25 | 0 | 100 | 3 |
| 3 | EL-306N | Digital CMOS Design | 3 | 1 | 0 | 4 | 75 | 25 | 0 | 100 | 3 |
| 4 | EL-308N | Microwave & Radar Engg. | 3 | 1 | 0 | 4 | 75 | 25 | 0 | 100 | 3 |
| 5 | EL-310N | Biomedical Instrumentation | 3 | 1 | 0 | 4 | 75 | 25 | 0 | 100 | 3 |
| 6 | EL-312N | [Digital Signal Processing Lab](#icgtlab) | 0 | 0 | 3 | 3 | 0 | 40 | 60 | 100 | 3 |
| 7 | EL-314N | Microprocessor & Interfacing Lab | 0 | 0 | 3 | 3 | 0 | 40 | 60 | 100 | 3 |
| 8 | EL-316N | Microwave Lab | 0 | 0 | 3 | 3 | 0 | 40 | 60 | 100 | 3 |
|  |  | Total | 16 | 05 | 09 | 30 | 375 | 245 | 180 | 800 | 24 |

\* ***Note:*** *All the students have to undergo six weeks industrial training after VIth semester and it will be evaluated in VIIth semester.*

# Bachelor of Technology (Electronics Engineering) Kurukshetra University, Kurukshetra

*SCHEME OF STUDIES/EXAMINATIONS****(w.e.f. 2020-21 onwards)***

**Semester–VII**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.No | Subject code | Course Title | Teaching Schedule |  Allotment of Marks | Duration of Exam |
|  |   |   | L | T | P | Total | Theory | Sessional  | Practical | Total |   |
| 1 | EL-401N |  Fuzzy Logics and Neural Network | 4 | 1 |   | 5 | 75 | 25 |   | 100 | 3 |
| 2 |   | \*Departmental Elective- I | 3 | 1 |   | 4 | 75 | 25 |   | 100 | 3 |
| 3 |   | \*\*Departmental Elective- II | 3 | 1 |   | 4 | 75 | 25 |   | 100 | 3 |
| 4 | EL-403 N | Embedded Systems Design | 4 | 1 |   | 5 | 75 | 25 |   | 100 | 3 |
| 5 | EL-407N | Neural Networks Lab |   |   | 3 | 3 |  | 40  | 60 | 100 | 3 |
| 6 | EL-411N | Minor Project |   |   | 10 | 10 |  | 50 | 50 | 100 | 3 |
| 7 | EL-413N | Summer Training Report |   |   |   |   |  | 100 |   | 100 | 3 |
|  |   | Total | 14 | 4 | 13 | 31 | 300 | 290 | 110 | 700 | 21 |
|  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Sr. No. | Code |   | \*Departmental Elective -I |  |  |  |  |  |  |
| 1 |  EL-421N |  Robotics |  |  |  |  |  |  |
| 2 | EL-423N |   |  Microcontrollers |  |  |  |  |  |  |
| 3 | EL-425N |   | Renewable Energy Sources |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| Sr. No. | CODE |   | \*\*Departmental Elective -II |  |  |  |  |  |  |
| 1 | EL-431N |   | MEMS |  |  |  |  |  |  |
| 2 | EL-433N |   | Nano-electronics |  |  |  |  |  |  |
| 3 | EL-435N |   | Electronic Waste Management |  |  |  |  |  |  |

 **Bachelor of Technology (Electronics Engineering) Kurukshetra University, Kurukshetra**

*SCHEME OF STUDIES/EXAMINATIONS****(w.e.f. 2020-2021 onwards)***

**Semester–VIII**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S.No. | Subject code | Course Title | Teaching Schedule |  Allotment Of Marks | Duration of Exam |
| L | T | P | Total | Theory | Sessional  | Practical | Total |   |
| 1 | EL-402N | Computer Communication Network | 3 | 1 |   | 4 | 75 | 25 |   | 100 | 3 |
| 2 |   | \*Departmental Elective - I | 3 | 1 |   | 4 | 75 | 25 |   | 100 | 3 |
| 3 | EL-404N | Optical Communication | 3 | 1 |   | 4 | 75 | 25 |   | 100 | 3 |
| 4 |   | \*\*Departmental Elective-II | 3 | 1 |   | 4 | 75 | 25 |   | 100 | 3 |
| 5 | EL-406N | Optical Communication Lab |   |   | 2 | 2 |  | 25 | 25 | 50 | 3 |
| 6 | EL-408N | Major Project |   |   | 12 | 12 |  | 75 | 75 | 150 |   |
| 7 | EL-410 N | Comprehensive Viva |   |   |   |   |  | 75 |   | 75 |   |
| 8 | EL-412 N | General Proficiency Viva |   |   |   |   |  |   | 75 | 75 |   |
|  |   | Total | 12 | 4 | 14 | 30 | 300 | 275 | 175 | 750 | 15 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Sr. No.** | **Code** | \*Departmental Elective -I |  |  |  |  |  |  |
| 1 | EL-422N | Operation Research |  |  |  |  |  |  |
| 2 | EL-424N | Artificial Intelligence and expert system |  |  |  |  |  |  |
| 3 | EL-426N | Analog Filter Design |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |
| **Sr. No.** | **Code** | \*\*Departmental Elective -II |  |  |  |  |  |  |
| 1 | EL-432N | Electronic systems Design |  |  |  |  |  |  |
| 2 | EL-434N | Electronic Switching Theory |  |  |  |  |  |  |
| 3 | EL-436N | Quality and Reliability of Electronics system |  |  |  |  |  |  |

**Semester-III**

|  |
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| [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **AS-201N**  | Mathematics-III | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To acquaint the students with the basic use of PDE, Linear Programming problems, Fourier series and transforms, Complex variables and Probability. |
| **Course Outcomes (CO)**  |
| **CO-1**  | This section is concerned mainly with Fourier series and Fourier transform 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 and its applications in the field of engineering. |
| **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**  | Students will learn about concept of Probability theory and its applications in the field of engineering. |

## **UNIT-I**

Fourier Analysis

Fourier series**:** Euler’s formulae, Orthogonality conditions for the Sine and Cosine function, 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

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

A review of concept of functions of a complex variable, Limit, continuity, differentiability and analyticity of a function. Basic elementary complex functions (exponential functions, trigonometric & Hyperbolic functions, logarithmic functions) Cauchy-Riemann Equations.

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:

A review of concepts of probability and randomvariables: 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.

 **Text Books:**

1. E. Kreyszig : Advanced Engineering Mathematics, Wiley India.
2. B. V. Ramana: Engineering Mathematics, Tata McGraw Hill.

Reference Books:

1. R.K. Jain, S.R.K. Iyengar: Advanced Engineering Mathematics, Taylor & Francis.
2. Michael D. Greenberg: Advanced Engineering Mathematics, Pearson Education,

Prentice Hall.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-201N** | Signal and System  | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***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 (CO)**  |
| **CO-1**  | Introduce and classify signals and systems based on their properties. |
| **CO-2**  | To understand the basic concepts of random variables and Linear time invariant systems. |
| **CO-3**  | Familiarization with the sampling process and spectral analysis of signals using Fourier series. |
| **CO-4**  | Apply transform techniques to analyze continuous-time and discrete-time signals and system.  |

**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**

Random Variables: Introduction to Random Variables, pdf, cdf, moments, distributions, correlation functions

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 signalfrom 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**

Fourier Transform: Continuous Time Fourier Transform (CTFT), Properties of CTFT, Systems characterized by linear constant- coefficient differential equations. Discrete time Fourier transform (DTFT), Properties of DTFT, Duality, Systems characterized by Linear constant coefficient difference equations.

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:

1. Alan V. Oppenheim, Alan S. Willsky, S. Hamid Nawab, Signals and Systems, Prentice Hall India, 2nd Edition, 2009

Reference Books:

 1. Simon Haykins – “Signal & Systems”, Wiley Eastern

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

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-203N** | Electronic Devices | 3  | 1 | 0 | 75  | 25  | 100  | 3 |
| ***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 (CO)**  |
| **CO-1**  | To understand the concept of carrier transport phenomena in semiconductors and various diodes such as p-n junction diode, tunnel diode and schottky diodes. |
| **CO-2**  | To understand the detailed concept of BJT’s and calculation of parameters of transistors using different models. |
| **CO-3**  | Describe the characteristics & parameters of FET’s and MOSFET’s. |
| **CO-4** | 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**

Bipolar Junction Transistor: Basic principle of operation, Forward Active mode & other modes. Non Ideal Effects: Base Width Modulation, Current Crowding, High Injection. Ebers-Moll Model, Frequency Limitations of BJT’S, Hybrid Pi Model, Introduction to H-Parameters, Hetrojunction Bipolar Transistors.

 **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:

1. Millman & Halkias: Integrated Electronics, TMH.

2. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi,

Reference Books:

1. E S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.

2. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.

3. Boylestad&Nashelsky: Electronic Devices & Circuit Theory, PHI.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-205N** | Network Analysis and Synthesis | 3  | 1 | 0 | 75  | 25  | 100  | 3 |
| ***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 (CO)**  |
| **CO-1**  | To understand the concept of network topologies and the network analysis in the time domain for solving simple and complex circuits. |
| **CO-2**  | Describe the circuit element models, network analysis using Laplace transform and time domain behavior from the pole-zero plots. |
| **CO-3**  | Describe the characteristics & parameters of two port networks. |
| **CO-4** | To understand the concept of filters and synthesis of one port network. |

## **UNIT-I**

Introduction: Principles of network topology, graph matrices, Network Analysis (Time-Domain): Singularity Functions, Source-Free RC, RL, Series RLC, Parallel RLC circuits, Initial & Final Conditions, Impulse & Step Response of RC, RL, Series RLC, Parallel RLC circuits.

## **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 Parametersof 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 kinds of elements.

 Text Books:

1. Fundamentals of Electric Circuits: Charles K. Alexander, Matthew N. O. Sadiku, McGraw

 Hill Education

1. Network Analysis: M.E. Van Valkenburg, PHI

Reference Books:

 1. Circuits & Networks: Sukhija & Nagsarkar, Oxford Higher Education.

2. Network Analysis & Synthesis: F. F. Kuo, John Wiley.

3. Basic Circuit Theory: Dasoer Kuh, McGraw Hill Education.

4. Circuit Analysis: G.K. Mithal; Khanna Publication Electronics principles: Malvino : McGraw Hill.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-207N** | Digital Electronics | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To familiarize the students with the concepts of Digital Electronics covering the contents of digital techniques, logic gates & logic families etc. |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | Students will be able to design a minimum circuit for any function. |
| **CO-2**  | Students will be able to analyze various logic families available to design digital components. |
| **CO-3**  | Students will be able to design state machine circuits using sequential and combinational circuits. |
| **CO-4**  | Students will be able to understand the basics of various PLD’s. |

**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.

Combinatonial Design usingGates: Combinatonial 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:

1. R.P.Jain: Modern Digital Electronics, 3rd edition, TMH.2003
2. Anand.Kumar: Fundamentals of digital circuits,2nd edition, Prentice Hall of India

Reference Books:

1. M.M.Mano and M.D.Ciletti: Digital design4th edition, Prentice Hall.2006

2. A.P.Malvino and D.P.Leach: Digital principles and applications,6th edition,TMH,2008

3. Z. Kohavi, Switching and Finite Automata Theory, McGraw Hill, 1970.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-209N** | Analog Communication | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***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 (CO)**  |
| **CO-1**  | To understand the concept of basic comm. System and various types of noise and analog modulation techniques. |
| **CO-2**  | To understand the concept of AM transmission & reception. |
| **CO-3**  | To understand the concept of FM transmission & reception. |
| **CO-4**  | 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 hetro-dyne receiver, AM receiver using a phase locked loop (PLL), AM receiver characteristics.

 **Unit-III**

FM Transmission: FM allocation standards, Generation of FM by direct method, Varactor diode Modulator, Indirect generation of FM, The Armstrong method RC phase shift method, Frequency stabilized reactance FM transmitter, FM stereo transmitter, Noise triangle.

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 Transmission: Introduction, Advantages of SSB Transmission, Generation of SSB, The Filter method The Phase Shift Method, The Third Method, AM Compatible SSB Modulation, Pilot Carrier SSB, Independent Side-band Systems (ISB), Vestigial Side-band Modulation (VSB), VSB-SC, Application of AM and FM in TV transmission.

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:

1. Proakis, J. G. and Salehi, M., Fundamentals of Communication Systems, Dorling Kindersley (2008) 2nd ed.

2. Mithal G K, Radio Engineering, Khanna Pub.

Reference Books:

1. Taub, H., Principles of Communication Systems, McGraw-Hill (2008) 3rd ed.

2. Haykin, S., Communication Systems, John Willey (2009) 4th ed

3. Kennedy, G., Electronic Communication Systems, McGraw-Hill (2008) 4th ed.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **Practical**  | **Total**  |
| **ECE-211N** | Signal and System Lab | 0  | 0  | 2  | 40 | 60 | 100  | 3  |
| ***Purpose***  | To Learn about the MATLAB and the representation of signals in MATLAB. |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | To understand the basic concepts of MATLAB. |
| **CO-2**  | To explore properties of various types of signals and systems. |
| **CO-3**  | To visualize the relationship between continuous and discrete Fourier transforms. |
| **CO-4**  | 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.

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

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

 transient response of RC circuit.

**Note: Any 12 experiments from the above list are required to be performed by students in the laboratory.**

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| [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **Practical**  | **Total**  |
| **ECE-213N** | Digital Electronics Lab | 0  | 0  | 2  | 40 | 60 | 100  | 3  |
| ***Purpose***  | To make the students aware of realization of different digital circuits on the board. |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | To understand the concept of TTL gates such as AND, OR, NAND etc. |
| **CO-2**  | To study and verify various combinational circuits such as multiplexers, Comparators etc. |
| **CO-3**  | To understand the concept of sequential circuits such as flip flops, counters etc. |
| **CO-4**  | 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.

9. Design a state machine of 4 states.

10. To design a sequence detector.

**Note: Any 8 experiments from the above list and 2 more experiments (as developed by institute) are required to be performed by students in the laboratory.**

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| [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **Practical**  | **Total**  |
| **ECE-215N** | Analog Communication Lab | 0  | 0  | 2  | 40 | 60 | 100  | 3  |
| ***Purpose***  | To make the students aware of various types of modulation techniques, Transmitter and receiver and their uses in Electronics applications.  |
| **Course Outcomes (CO)**  |
| **CO-1**  | To study various modulation techniques of Amplitude modulation and also demodulation. |
| **CO-2**  | To study the generation techniques of SSB and DSBSC modulation. |
| **CO-3**  | To understand the concept of PLL , its capture range and frequency multiplier using PLL. |

**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.

1. 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 superhetrodyne receiver.

 5. To study the Selectivity characteristics of superhetrodyne receiver.

 6. To study the Fidelity characteristics of superhetrodyne 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 IInd order Low pass filter.

 8. To study Pulse Width Modulation / Demodulation.

 9. To study Pulse Position Modulation / Demodulation.

 10. To study active filters (Low-pass, High-pass, Band-pass, Notch filter).

**Note: At least eight experiments should be performed from above list. Remaining two experiments may either be performed from above list or designed & set by concerned institution as per scope of syllabus.**

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| . [**B. Tech. 3rdSemester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule** | **Allotment of Marks** | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **MPC-201** | Environmental Studies | 3  | 0  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To learn the multidisciplinary nature, scope and importance of Environmental Studies  |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | Basic concepts of Various kinds of Microscopy and Centrifugation Techniques |
| **CO-2**  | To learn the theoretical and practical aspects of Electrophoresis and Chromatography Techniques |
| **CO-3**  | To learn the concepts of different kinds of Spectroscopy and Colourimetry |
| **CO-4**  | To understand the concept of radioisotope techniques and their applications in research |

 **UNIT 1**

The multidisciplinary nature of environmental studies. Definition, Scope and Importance. Need for public awareness. Natural Resources: Renewable and Non-Renewable Resources: Natural resources and associated problems.

1. Forest Resources: Use and over-exploitation, deforestation, case studies. Timber eztraction, mining, dams and their effects on forests and tribal people.
2. Water Resources- Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
3. Mineral Resources- Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
4. Food Resources- World Food Problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
5. Energy Resources- Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies.
6. 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-

1. Forest Ecosystem
2. Grassland Ecosystem
3. Desert Ecosystem
4. Aquatic Ecosystems(ponds, streams, lakes, rivers, oceans, estuaries

Field Work:Visit to a local area to document Environment ssetsriver/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**

Biodiversity and its conservation. Introduction, Definition: genetic, species and ecosystem diversity. Biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity of global, National and local levels. India as a mega-diversity nation Hot spots of Biodiversity. Threats to biodiversity: Habitat loss, poaching of wild life, man-wildlife conflicts. Endangered and endemic species of India.Conservation of Biodiversity- In situ and Ex-Situ conservation of biodiversity.

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**

Social Issues and the Environment.From unsustainable to sustainable development. Urban problems related to energy. Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people: Its problems and concerns. Case Studies.Environmental ethics-issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.Wasteland ReclamationConsumerism and waste products.Environment Protection Act.Air (Prevention and Control of Pollution) Act.Water (Prevention and Control of Pollution) Act.Wildlife Protection Act.Forest Conservation Act. Issues involved in enforcement of environmental legislation. Public Awareness. Human population and the Environment.Population growth, variation among nations. Population explosion-Family Welfare Programme. Environment and human health.Human rights.Value Education.HIV/AIDS, Women and Child Welfare.Role of Information Technology in Environment and Human Health.Case Studies.

Text Books:

1. Environmental Studies- Deswal and Deswal. Dhanpat Rai & Co.
2. Environmental Science & Engineering Anandan, P. and Kumaravelan, R. 2009. Scitech Publications (India) Pvt. Ltd., India

Reference Books:

1. Environmental Studies. Daniels Ranjit R. J. and Krishnaswamy. 2013. Wiley India.
2. Environmental Science-Botkin and Keller. 2012. Wiley, India

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Semester-IV**

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| [**B. Tech. 4th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **AS-202N** | Numerical Analysis  | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***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 (CO)**  |
| **CO-1**  | 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. |
| **CO-2**  |  Students will learn to solve a large system of linear equations and matrix inversion by various numerical methods and techniques. |
| **CO-3**  | Discussion on interpolation will be useful in constructing approximate polynomial to represent the huge amounts of experimental data, and to find the intermediate values. |
| **CO-4**  |  Study of ordinary differential equations and its solutions with various methods and applications in the field of Engineering. |

**UNIT-I**

Solution of Algebraic and TranscendentalEquation and Eigen Value Problem**:** 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**

Solution of Systemof Equations and Matrix Inversion: Solution of linear algebraic equation: Gauss elimination and Gauss-Jordan methods- Method of Triangularization and Crout’s reduction. Iterative methods: Gauss-Jacobi, Gauss-Seidel and Relaxation methods. Matrix inversion by Gauss - Jordan elimination, Crout’s , Doolittle and Choleski Methods.

**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.

Text Books:

1. M. K. Jain, SRK Iyengar and R.K. Jain, Numerical Methods For Scientific• & Engg 6e, New Age International (P) Ltd (2008).

2. Kendall E. Atkinson, An Introduction to Numerical Analysis, Wiley; 2 edition.

Reference Books :

1. S. C. Chapra and Raymond P Canale, Numerical Methods for Engineers,Tata McGraw

Hill,Indian Edition.

1. James Scarborough, Numerical Mathematical Analysis, Oxford & IBH Publishing Co.

Pvt. Ltd.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 4th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-202N**  | Data Structure and Algorithms | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***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 (CO)**  |
| **CO-1**  | Students will be able to recall ‘C’ basics and design basic algorithms using various data structures. |
| **CO-2**  | Students will be able to design implement various searching and sorting algorithms on arrays. |
| **CO-3**  | Students will be able to use pointers to perform various operations of linked lists. |
| **CO-4**  | Students will be able to understand the basics of trees and Graphs. |

**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:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 4th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-204N** | Electronic Measurement and Instruments | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To familiarize the students with the concepts of Electronics Measurements like measurement of voltage, current & resistance etc. |
| **Course Outcomes (CO)**  |
| **CO-1**  | Students will learn the techniques of measurement of resistance using different bridges. |
| **CO-2**  | AC Bridges & Voltage Indicating & Recording Devices will be introduced to the students. |
| **CO-3**  | Students will be able to recognize the functioning of different Analog & Digital Instruments. |
| **CO-4**  | 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: Wheat stone 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.

VoltageIndicating 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 Books:

1. A Course in Electrical and Electronics Measurements and Instrumentation: A.K. Sawhney; Dhanpat Rai & Sons.

Reference Books:

1. Electronics Instrumentation and Measurement Techniques: Cooper W.D & Helfrick A.D.; PHI
2. Doeblin E.O., Measurement Systems: Application & Design, Mc Graw Hill.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 4th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-206N**  | Electromagnetic Theory | 3 | 1  | 0  | 75  | 25  | 100  | 3  |
| ***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 (CO)**  |
| **CO-1**  | Basics of electrostatics including dielectric properties will be covered. |
| **CO-2**  | Basics of magneto-statics and Maxwell's equations will be covered. |
| **CO-3**  | Fundamentals of Uniform plane waves and their propagation in different mediums will be covered. |
| **CO-4**  | Fundamentals of Transmission Lines and different modes of wave propagation in waveguides will be covered. |

**UNIT-I**

Electric Field and Current: Introduction to Vectors:Addition, Subtraction, Multiplication & Differentiation. Coordinate Systems: Rectangular, Cylinderical & Spherical. Coulomb's law. Electric Field Intensity, Electric Potential,Field of a Line Charge, Field of a Sheet of Charge, Electric Flux Density,Electric Dipole, Current Density, Continuity of Current, Gauss's Law and Applications, Electric Field Behaviour in Dielectrics, Boundary Conditions at Interface between Two Dielectrics, Method of Images,Capacitance of Two Wire Line, Poisson's and Laplace’s Equations, Uniqueness Theorem.

**UNIT-II**

Magnetic Field and Maxwell Equations: Biot - Savart Law. Ampere's law, Magnetic Vector potentials, Force on a moving charge, Differential Current Element, Force and Torque on a Closed Circuit, Magnetic Boundary Conditions, the Magnetic Circuit,Faraday's Law, Maxwell's Equations in Point and Integral form for Free space, Good Conductors & Lossy Dielectric for Sinusoidal Time Variations& Static Fields, Retarded potentials.

**UNIT-III**

The Uniform Plane Wave: Plane Waves & its Properties, Wave Equation for Free Space and Conducting Medium, Propagation of Plane Waves in Lossy Dielectrics,Good Dieletrics& Good Conductors. The Poynting Vector and Power considerations, Skin Effect, Reflection of Uniform Plane Waves (Normal & Oblique Incidence).

**UNIT-IV**

Transmission Lines and Waveguides: The Transmission Line Equations, Graphical Methods, Smith chart, Time-domain and Frequency- domain Analysis, Reflection in Transmission Lines, SWR. TE, TM, TEM waves, TE and TM modes in Rectangular and Circular Waveguides, Cut-off & Guided Wavelength, Wave Impedance and Characteristic Impedance, Dominant Modes, Power Flow in waveguides, Excitation of Waveguides, Dielectric Waveguides.

Text Books: 1. Hayt W H., Engineering Electromagnetics, Tata McGraw Hill, 6th Edition.

References Books:

1 Jordan E C & Balmain K G, Electromagnetic Waves and Radiating Systems, PHI.

2 David K. Chang, Field and Waves Electromagnetics, Addison Wesley.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech.**](#SEM3)  **4th  Semester Electronics Engineering** |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-208N**  | Analog Electronics  | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***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 (CO)**  |
| **CO-1**  | To understand the concept of various amplifiers using BJT and FET and various transistor models. |
| **CO-2**  | Describe the frequency response of multistage amplifiers and the detailed concept of feedback topologies. |
| **CO-3**  | To understand the concept of Barkhausen criteria of oscillation and various RC and LC oscillators and their frequency of oscillation. |
| **CO-4**  | 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 transresistance 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, Collpit oscillator , Clapp oscillator ,555 Timer as a monostable and astable multivibrator.

**UNIT-IV**

Op-Amp Applications: Schmitt trigger and its applications. Current mirror: Basic topology and its variants, V-I characteristics, output resistance and minimum sustainable voltage (VON), maximum usable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain, common mode gain, CMRR and ICMR. OP-AMP design: design of differential amplifier for a given specification, design of gain stages and output stages.

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.

 2. A.S. Sedra & K.C.Smith, Microelectronics Circuits, Oxford University Press

 3. Robert L. Boylestad & Louis Nashelsky, Electronic Devices & Circuit Theory,Pearson

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech.**](#SEM3)  **4th Semester Electronics Engineering** |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **ECE-210N** | Computer Architecture and Organization  | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To familiarize the students with the concepts of basic structure of computer hardware & software, Control & processor design and memory & system organization. |
| **Course Outcomes (CO)**  |
| **CO-1**  | To understand the concept of basics of computer hardware & software. |
| **CO-2**  | To understand the concept of control design & processor design. |
| **CO-3**  | To familiarize with the concept of various memory systems. |
| **CO-4**  | To familiarize with the concept of system organization. |

 **Unit-I**

Basic Structure of Computer Hardware andSoftware: 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, auxillary 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:

1. Morris Mano, “Computer System Architecture”, PHI.

2. J.F. Heys, “Computer Organization and Architecture”, TMH.

Reference Books:

1. J. Hennessy and D. Patterson, Computer Architecture A Quantitative Approach, 3rd Ed, Morgan Kaufmann, 2002.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 4thSemester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **Practical**  | **Total**  |
| **ECE-212N**  | Data Structure Lab | 0  | 0  | 2  | 40 | 60 | 100  | 3  |
| **Course Outcomes (CO)** |
| **CO-1**  | Students will be able to recall ‘C’ basics and design basic algorithms using various data structures. |
| **CO-2**  | Students will be able to design implement various searching and sorting algorithms on arrays. |
| **CO-3** | Students will be able to use pointers to perform various operations of linked lists. |
| **CO-4** | 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 nth 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

i)Bubble sort

ii)Selection sort

iii)Insertion sort.

1. Implement stacks using arrays for the following user defined functions
2. Size of stack
3. Number of elements in the stack
4. Pop with underflow check
5. Push with overflow check
6. Implement queues using arrays for the following user defined functions

a. Size of queue

b. Number of elements in the queue

c. Insert an element with overflow check

d. Delete an element with underflow check

1. Implement linked list for the following user defined functions

a. Create a node and Insert an element

b. Delete an element and its node

c. Find the location of a given value

d. Print the list in forward or reverse order .

1. Traverse a tree and print the elements in

a. Preorder b. Post order c. In order

1. Traverse a graph and print the elements using
2. Depth first search b. Breadth first search.

**Note: Any 8 experiments from the above list and 2 more experiments (as developed by institute) are required to be performed by students in the laboratory.**

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| [**B. Tech. 4thSemester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **Practical**  | **Total**  |
| **ECE-214N**  | Electronic Measurement and Instruments Lab | 0  | 0  | 2  | 40 | 60 | 100  | 3  |
| **Course Outcomes (CO)** |
| **CO-1**  | To measure the unknown inductance and capacitance using various AC bridges. |
| **CO-2**  | To measure the unknown frequency using different frequency bridges. |
| **CO-3** | To understand the concept of calibration of energy meter and B-H curve of different magnetic materials. |
| **CO-4** | To understand the concept conversion of voltmeter into ammeter using potentiometer. |

**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).

9. To calibrate Energy meter using standard Energy 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.

**Note: Any 8 experiments from the above list and 2 more experiments (developed by institute) are required to be performed by students in the laboratory.**

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| [**B. Tech. 4th Semester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **Practical**  | **Total**  |
| **ECE-216N**  | Analog Electronics Lab | 0  | 0  | 2  | 40 | 60 | 100  | 3  |
| ***Purpose***  | To make the students aware of different analog devices & amplifiers  |
| **Course Outcomes (CO)** |
| **CO-1**  | To design and calculate the gain , frequency response etc of the various configuration of transistor amplifier. |
| **CO-2**  | Describe the frequency response of and test the performance of various LC and RC oscillators. |
| **CO-3** | To understand and design the various applications of 555 timer such as astable and mono stable multivibrator |

**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.

**Note: Any 8 experiments from the above list and 2 more experiments (developed by institute) are required to be performed by students in the laboratory.**

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| [**B. Tech. 4th Semester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **MPC-202** | Energy Studies | 3  | 0  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To make the students conversant with the basics concepts and conversion of various form of Energy  |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | An overview about Energy , Energy Management, Audit and tariffs  |
| **CO-2**  | Understand the Layout and working of Conventional Power Plants  |
| **CO-3**  | Understand the Layout and working of Non-Conventional Power Plants  |
| **CO-4**  | To understand the role of Energy in Economic development and Energy Scenario in India  |

**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 Management**:** General Principles of Energy Management, Energy Management Strategy.

Energy Audit**:** 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 of Solar energy power plant, photovoltaic technologies, PV Systems and their components, Wind energy power plant, Bio energy plants, Geothermal energy plant sand tidal energy plants.MHD

**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 Dream tech India.
2. G.D. Roy :Non conventional energy sources

 Reference Books:

 1. Non-conventional energy resources- Shobhnath Singh, Pearson.

 Gayakwad,PHI.

 2. Soni, Gupta, Bhatnagar: Electrical Power Systems – Dhanpat Rai& Sons

 3. NEDCAP: Non Conventional Energy Guide Lines

 **Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

**Semester-V**

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| [**B. Tech. 5th Semester Electronics Engineering**](#RANGE!SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam (Hrs.)** |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-301N**  | Linear Integrated Circuits | 4 | 1 | 0 | 75 | 25 | 100 | 3 |
| ***Purpose***  | To familiarize the students with the concepts of Operational Amplifiers, its different configurations and applications. This is to make student aware of different filters and other special ICs using OP Amp. |
| **Course Outcomes (CO)**  |
| **CO-1** | To understand significance of Op Amps, its parameters and different configurations used for different applications. This section builds the basic foundation on amplifiers. |
| **CO-2** | This section focus on the frequency response of Op-amp and its various applications. Frequency response section acquaints the students with the knowledge of filters also. |
| **CO-3** | A part of this course makes the student aware of active filters, oscillators, comparators and converters. This makes the students able to use OP Amp to as A/D or D/A Converters. |
| **CO-4** | The course also includes Specialized IC Applications like 555 timer, this helps the students as a basic building block in their upcoming projects. |

**UNIT-I**

Differential and Cascade Amplifier: Balanced and unbalanced output differential amplifier, FET differential amplifier, current mirrors, level translators, cascade or CB-CE configuration of amplifier, operational amplifier, block diagram representation of op-amp, introduction to idea op-amp, characteristics, parameters, interpretation of data sheets, data specification of op-amp & main parameter like CMMR, thermal drift, offset voltage & current practical op-amp and its equivalent circuit, op-amp circuit configurations.

**UNIT-II**

Frequency response of an Op-amp: Frequency response compensating network, frequency response of internally compensated and non-compensated op-amp. High frequency op-amp equivalent circuit, open loop and closed loop frequency response, circuit stability, slew rate.

Operational Amplifier with feedback: Block diagram representation of feedback amplifier, voltage series feedback, voltages shunt feedback, differential amplifier.

Op-amp application: DC and AC amplifier, peaking amplifier, summing, scaling, averaging and instrumentation amplifier, differential input and output amplifier, voltage to current converter, current to voltage converter, very high input impedance circuit, integrator, differentiator, voltage limiters, voltage regulator, voltage to frequency converter & frequency to voltage converter.

**UNIT-III**

Active filters & Oscillators: Introduction to active filters, Butter worth and Chebyshev approximation to low pass filter and high pass, band pass filters. Oscillators, criterion for oscillation, phase shift, Wein bridge, Quadrature, square wave, saw tooth and voltage controlled oscillator.

Comparators & Converters:- Introduction to basic comparator, zero crossing detector, Schmitt trigger, comparator characteristics, analog to digital & digital to analog converters, sample & hold circuit, peak detector.

**UNIT-IV**

Specialized IC Applications:-Universal active filters, switched capacitor filter, the 555 & 556 timers and their applications. Phase locked loop and voltage regulators.

 Text Books:

 1. R.A.Gayakwad: Op-amp & Linear Integrated Circuits(PHI).

 2. Integrated-Circuit Op-amp: George B. Rutkoswaki (PHI).

References Books:

(1)D.Roy Chodury :- Linear Integrated Circuits(New age Internation

(2) Millman & Halkias : Integrated Electronics (TMH)

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 5th Semester Electronics Engineering**](#RANGE!SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam (Hrs.)** |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-303N**  | VLSI Technology | 4 | 1 | 0 | 75 | 25 | 100 | 3 |
| **Course Outcomes (CO)**  |
| **CO-1** | Students will be able estimate oxide thickness, growth rate, etch rate, deposition rate, and perform pattern etching etc. using knowledge of mathematics, science, engineering and practices. |
| **CO-2** | Students can design and conduct experiments such as oxidation, metallization and analyze growth / deposition rate, thickness etc. |
| **CO-3** | Shall be able to understand system, design such as CVD reactor, PVD chamber etc. |
| **CO-4** | Understanding of professional and ethical responsibility while working in clean rooms. |

**UNIT-I**

Clean Room Technology - Clean room concept – Growth of single crystal Si, surface contamination, cleaning & etching, cleaning of p-type & n-type Si-wafer by solvent method & RCA cleaning, Fabrication process of p-n diode.

**UNIT-II**

Oxidation – Growth mechanism and kinetic oxidation, oxidation techniques and systems, oxide properties, oxide induced defects, charactrisation of oxide films, Use of thermal oxide and CVD oxide; growth and properties of dry and wet oxide, dopant distribution, oxide quality, Isolation Techniques with reference to VLSI circuits

**UNIT-III**

Solid State Diffusion – Fick's equation, atomic diffusion mechanisms, measurement techniques, diffusion in polysilicon and silicon di-oxide diffusion systems. Ion implantation – Range theory, Equipments, annealing, shallow junction, high energy implementation.

**UNIT-IV**

Mask making, E-beam writing, Lithography – Optical lithography, Lift-off technique, Some Advanced lithographic techniques, Physical Vapour Deposition – APCVD, Plasma CVD, MOCVD. Metallisation - Different types of metallisation, uses & desired properties, Fabrication process of Schottky diodes, VLSI Process integration and NMOS fabrication process

 Text Books:

1. VLSI Technology, Author: Sze, S.M.; Notes: Wiley, 1985;
2. An Introduction to Semiconductor Microtechnology, Author: Morgan, D.V., and Board

Reference Book:

 1. Semiconductor Devices Physics and Technology, Author: Sze, S.M.; Notes: Wiley, 1985

Notes:*Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 5th Semester Electronics Engineering**](#RANGE!SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam (Hrs.)** |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-305N**  | Control System Engineering | 4 | 1 | 0 | 75 | 25 | 100 | 3 |
| ***Purpose***  | The purpose of this course is to create awareness about the various types of control systems with the techniques to analyze them so that the learner is able to mathematically design and evaluate the conditions for which a control system can provide stable output with improved performance. |
| **Course Outcomes (CO)**  |
| **CO-1** | Learner will be able to design and simplify the mathematical and graphical models of a control system through block diagram and signal flow graph method.  |
| **CO-2** | This section interprets and applies block diagram representations of control systems and design PID controllers based on empirical tuning rules.  |
| **CO-3** | This acquaints the learner to compute gain and phase margins from Bode diagrams and Nyquist plots and understand their implications in terms of robust stability. |
| **CO-4** | Learner will able to apply the compensation technique using state variable approach to covert an unstable system into a stable system under certain conditions. |

**UNIT-I**

Concept of control, Classification of control systems, Block diagram reduction techniques ,mathematical modeling of physical system (Electrical, Mechanical and Thermal), calculation of transfer function using signal flow graphs, Effect of feedback and parameter variation on system performance.

**UNIT-II**

Time – Domain Analysis: Standard Test signals, Transient response of first, second & higher order systems to(unit step, unit ramp and unit impulse signal), steady state errors and static error constants in unity feedback control systems, generalized error constants, P, I, D, P/I, P/D, P/I/D and ON/OFF control action.

**UNIT-III**

Time Domain Stability Analysis: Concept of absolute, relative and absolute stability, Routh – Hurwitz criterion, Root-locus analysis of control systems.

Frequency Domain Analysis: frequency domain specifications, Polar and inverse polar plots, Nyquist plot(Gain and phase margins), Logarithmic plots (Bode plots), gain and phase margins to relative stability for open loop response and close loop response.

**UNIT-IV**

Compensation Techniques: Concept of compensation, Lag, Lead and Lag-Lead networks, design of closed loop systems using compensation techniques, feedback compensation.

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability

Text Books:

1. I. J. Nagrath & M. Gopal, “ Control system Engineering New Age International”, 1999
2. K. Ogata, “Modern control Engineering”, Pearson 2002.

Reference Books:

1. Liner Control System by R.S. Chauhan, (Umesh Publications)
2. B. C. Kuo, “Automatic control system”, Prentice Hall of India, 7th edition 2001.
3. Feedback control system Analysis and Synthesis by D’Azzo and Houpias.
4. Automatic control systems S. Hasan Saeed (S.K. Kataria & sons)

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 5th Semester Electronics Engineering**](#RANGE!SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam (Hrs.)** |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-307N**  | Antennas & Wave Propagation | 3 | 1 | 0 | 75 | 25 | 100 | 3 |
| ***Purpose***  | To familiarize the students with the performance parameters of antenna, methods of analysis of antenna, antenna used for various applications and different ways of propagating the signal. |
| **Course Outcomes (CO)**  |
| **CO-1** | To understand the performance parameters of antenna and apply principles of electromagnetic to explain antenna radiation. This also explains various antenna parameters. |
| **CO-2** | Understanding the mechanism of calculating the radiated fields of antenna and to calculate the radiated fields of some common Antennas. |
| **CO-3** | To understand the requirements, principals, and structures for an antenna to be broadband and aperture type antenna. |
| **CO-4** | To understand the different ways of signal propagation and describe effects of atmosphere on radio wave propagation, also derive expressions for ground. |

**UNIT – I**

Basic Principles And Definitions**:** Retarded vector and scalar potentials, Radiation and induction fields. Radiation from elementary dipole (Hertzian dipole, short dipole, linear current distribution), half wave dipole, Antenna parameters: Radiation resistance, Radiation pattern, Beam width, Gain, Directivity, Effective height, Effective aperture, Bandwidth and Antenna Temperature.

**UNIT – II**

Radiating Wire Structures And Antenna Arrays**:** Folded dipole , Monopole, Biconical Antenna, Loop Antenna, Helical Antenna. Principle of pattern multiplication, Broadside arrays, End fire arrays, Array pattern synthesis, Uniform Array, Binomial Array, Chebyshev Array, Antennas for receiving and transmitting TV Signals.

**UNIT – III**

Aperture Type Antennas**:** Radiation from rectangular aperture, E-plane Horns, H-plane Horns, Pyramidal Horn, Lens Antenna, Reflector Antennas

Broadband and Frequency IndependentAntennas**:** Broadband Antennas. The frequency independent concept: Rumsey’s principle, Frequency independent planar log spiral antenna, Frequency independent conical spiral antenna.

**UNIT – IV**

Propagation of Radio Waves**:** Different modes of propagation, Ground waves, Space waves, Surface waves and Troposphere waves, Ionosphere, Wave propagation in the ionosphere, critical frequency, Maximum Usable Frequency (MUF), Skip distance, Virtual height.

Text Books:

1. Robert E.Collin, Antenna & Wave Propagation, McGraw Hill

 Reference Books:

1. John D. Kraus, Antennas, McGraw Hill.

2. E.C.Jordan and K.G.Balmain, Electromagnetic Waves and Radiating Systems, PHI

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 5th Semester Electronics Engineering**](#RANGE!SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam (Hrs.)** |
| **L**  | **T**  | **P**  |  **Theory** | **Sessional** | **Total**  |
| **EL-309N** |  Digital System Design | 3 | 1 | - | 75 | 25 | 100 | 3 |
| ***Purpose***  | To familiarize the students with the synchronous and asynchronous sequential circuits and their designing, state finite machine, iterative networks etc. |
| **Course Outcomes (CO)**  |
| **CO-1** | To understand various types of converters, designing of two level NAND and NOR gates |
| **CO-2** | To understand the designing of synchronous and asynchronous sequential circuits. |
| **CO-3** | To understand the concept of finite state machine. |
| **CO-4** | To understand the designing of pattern detector, state machine design with SM Chart etc. |

**UNIT-I**

Combination Circuit Design**:** Adders, Subtractors, BCD Adder code converters, 7-segment display, designing using multiplexer, demultiplexer, decoder, encoder. Design of two level NAND only and NOR only networks, Design of multilevel NAND only NOR gate networks.

**UNIT-II**

Synchronous Sequential ckt Design**:** Flip-flop, FSM. Sequence detector, party checker & Detector and different application of sequential circuits, state table state diagram. Moose & mealy sequential ckt with state diagram reduction of state table using merger graph method & moose method, computing M/C, limitation & capabilities of sequential Circuit

**UNIT-III**

Asynchronous Sequential ckt. **:** FSM, Racer, state table & flow table diagram, compatibility chart state assignment in Asynchronous circuit.

**UNIT-IV**

Iterative networks: iterative networks, design of parity checker, comparator, design of pattern detector, state machine design with SM charts, state machine charts, derivation of SM charts, memories: read only memory, ROM applications, Read write memories, static RAM, Dyanmic RAM, Structure and Timings.

Text Books:

1. Z.Kohavi by Switching & System (McGraw Hill)
2. W.Fletcher :- An Engineering Approach to Electronic Design(PHI)

Reference Books:

1. Floyd: - Digital Fundamentals (UBS)

2. Morris Mano:- Digital Logic &Computer Design(PHI).

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 5th Semester Electronics Engineering**](#RANGE!SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam (Hrs.)** |
| **L**  | **T**  | **P**  | **Sessional**  | **Practical** | **Total**  |
| **EL-311N**  | Linear Integrated Circuits Lab | 0 | 0 | 3 | 40 | 60 | 100 | 3 |
| ***Purpose***  | To familiarize the students with different configurations of Operational Amplifiers. This is to make student aware of different filters and special ICs using OP Amp. |
| **Course Outcomes (CO)**  |
| **CO-1** | To study different configurations of OP AMP for different applications practically. |
| **CO-2** | To study different configurations of filters using OP AMP for different applications practically. This also includes practical implementation of special IC 555. |

**LIST OF EXPERIMENTS**

1. To study the OPAMP as inverting and non-inverting
2. To study the OPAMP as differentiator
3. To study the OPAMP as integrator
4. To demonstrate the operation of low pass filter and design the second order low pass filter.
5. To demonstrate the operation of high pass active filter
6. To study the frequency response of band pass filter
7. To study the notch filter
8. To construct the astable multivibrator using IC 555
9. To study the operation of the Schmitt trigger using the IC 741.
10. To study the phase shift wein bridge oscillator

**Note :** *At least 8 experiments are to be performed with 6 from above list, the remaining may either be performed or designed & set by concerned institution as per the scope.*

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| [**B. Tech. 5th Semester Electronics Engineering**](#RANGE!SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam (Hrs.)** |
| **L**  | **T**  | **P**  | **Sessional**  | **Practical** | **Total**  |
| EL-313 N  | Control System Engineering Lab | 0 | 0 | 3 | 40 | 60 | 100 | 3 |
| ***Purpose***  | To study control system engineering and its design to the practical level. |
| **Course Outcomes (CO)**  |
| **CO-1** | To encourage students to work as a team (group) and learn to communicate effectively. |
| **CO-2** | The practical and wide applications of control systems in this course might lead some students to choose it as a research topic of interest, for either graduate or undergraduate |
| **CO-3** | To study & design different control systems. |

**LIST OF EXPERIMENTS**

1. To study D.C. Position control system.

2. To study linear system simulator.

3. To study light intensity control using P & PI controller with provision for disturbance and transient speed control.

4. To study D.C motor speed control.

5. To study the stepper motor characteristics and its control through microprocessor kit.

6. To study Temperature control system.

7. To study Compensation design

8. To study Digital control system.

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| [**B. Tech. 5th Semester Electronics Engineering**](#RANGE!SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam (Hrs.)** |
| **L**  | **T**  | **P**  | **Sessional** | **Practical**  | **Total**  |
| EL-315 N  | Digital System Design Lab | 0 | 0 | 2 | 40 | 60 | 100 | 3 |
| ***Purpose***  | To familiarize the students with the basics of design of conventional electronic circuits, the features of VHDL, design circuits using gate level modeling. |
| **Course Outcomes (CO)**  |
| **CO-1** | To describe, design, simulate, and synthesize circuits using the Very hardware description language. |
| **CO-2** | To design and modeling of combinational and sequential digital systems. |
| **CO-3** | To develop program codes for synthesis-friendly combinational and sequential logic circuits. |
| **CO-4** | To understand the advanced features of VHDL and be able to write optimized codes for complex systems. |

**LIST OF EXPERIMENTS:**

**ANY FIVE EXPERIMENTS: VHDL**

1. Design all gates using VHDL.

2. Write VHDL programs for the following circuits, check the wave forms and the hardware generated

a. half adder

b. full adder

3. Write VHDL programs for the following circuits, check the wave forms and the hardware generated

a. multiplexer

b. demultiplexer

4. Write VHDL programs for the following circuits, check the wave forms and the hardware generated

a. decoder

b. encoder

5. Write a VHDL program for a comparator and check the wave forms and the hardware generated

6. Write a VHDL program for a code converter and check the wave forms and the hardware generated

7. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated

8. Write a VHDL program for a counter and check the wave forms and the hardware generated

**ANY FIVE EXPERIMENTS USING: using FPGA (Spartan 3) & CPLD**

1. Design of Half-Adder, Full Adder, Half Subtractor, Full Subtractor

2. Design a parity generator

3. Design a 4 Bit comparator

4. Design a RS & JK Flip flop

5. Design a 4: 1 Multiplexer

6. Design a 4 Bit Up / Down Counter with Loadable Count

7. Design a 3: 8 decoder

8. Design a 8 bit shift register

9. Design a arithmetic unit

10. Implement ADC & DAC interface with FPGA

11. Implement a serial communication interface with FPGA

12. Implement a Telephone keypad interface with FPGA

13. Implement a VGA interface with FPGA

14. Implement a PS2 keypad interface with FPGA

15. Implement a 4 digit seven segment display

**Note :** *At least 9 experiments are to be performed with 8 from above list, the remaining may either be performed or designed & set by concerned institution as per the scope.*

**Semester-VI**

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| [**B. Tech. 6th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-302N** | DIGITAL SIGNAL PROCESSING | 4  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To make students aware about the digital signal processing in FIR & IIR filter |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This section provides the detail about the analysis of LTI system in Z transform |
| **CO-2**  | This section describe how we implement discrete time system in FIR & IIR systems |
| **CO-3**  | This section describe how we design FIR filters by frequency sampling method |
| **CO-4**  | This section describe how we design IIR filters using various method |

**UNIT-I**

 Z – Transform Analysis of LTI System**:-** Transform its properties, System Function of a linear Time- Invariant system. Inversion of the Z Transform, the one-sided Z-transform, Solution of difference equations. Analysis of LTI system in Z- domain, transient and steady- state response. Causality and stability. Pole- Zero Cancellations. Shur- Cohn Stability test. Jury Test Shur-Cohn stability criterion.

DFT and FFT**:** DFT and its properties, Circular Convolution and fast linear convolution, Linear filtering using DFT. Direct Computation of DFT, FFT algorithms, Radix-2 and Radix-4 algorithms.

**UNIT-II**

Implementation of Discrete-Time Systems**:** Structure for the Realization of Discrete-Time Systems, Structure for FIR Systems: Direct-Form Structure, Cascade-Form Structures, Frequency-Sampling Structures; Structure for IIR Systems: Direct-Form Structures, Signal Flow Graphs and Transposed Structures, Cascade-Form Structures, Parallel-Form Structures, Lattice and Lattice-Ladder Structures for IIR Systems.

**UNIT-III**

Design of FIR Filters**:** Characteristics of practical frequency selective filters. Filters design specifications peak and pass band ripple, minimum stop band attenuation. Design of FIR filters using windows functions( Kaiser window, rectangular, Hamming and Blackman window) method comparison of design methods for FIR filters, Gibbs phenomenon, design of FIR filters by frequency sampling method.

**UNIT-IV**

Design of IIR Filters: Design of IIR filters from analog filters, Design by approximation of derivatives, Impulse invariance method, bilinear transformation method, characteristics of Butterworth, Chebyshev, and Elliptical analog filters and design of IIR filters.

Text Books:

1. Digital Signal Processing by J.G. Proakis and D.G. Manalakis-PHI

2. Digital Signal Processing by: A.V. Oppenheim and R.W. Schafer-PHI

References Books:

1. Element of Digital Signal Processing by N. Sarkar Khanna Publishers.

2. Digital Signal Processing by S. K. Mitra –TMH.

3. Digital Signal Processing by Rabinar, Gold-PHI

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 6th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-304N** | Microprocessor & Interfacing | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  |  To make students aware about the basic of Microprocessor systems & its advance technique |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This section describe the basic 8085 & 8086 microprocessor architecture |
| **CO-2**  | This section provide the detailed description of 8086 |
| **CO-3**  | This section describe 8086 Interrupt & how we interface 8086 to another device |
| **CO-4**  | This section deal with the advance microprocessor 80286 & 80386 |

. **UNIT I**

8085 Microprocessor**:** Introduction to microprocessor, 8085 microprocessor Architecture, Pin diagram, timing diagram, instruction set

8086 Microprocessor Architecture**:** architecture, details of sub blocks such as EU, BIU, pin diagram of 8086

**UNIT II**

8086 Processor**:** memory segmentation and physical address computations, program relocation, addressing modes, instruction formats, pin diagram and description of various signals, types of buses, and timing diagrams in minimum and maximum modes.

Instruction Set of 8086**:** Instruction execution timing, assembler instruction format, data transfer, arithmetic, branch, looping, NOP and HLT, flag manipulation, logical, shift and rotate instructions, assembler directives and operators

**UNIT III**

8086 Interrupts: 8086 Interrupts and Interrupt responses, hardware interrupt application.

Reset and Clock generation using 8284 and Wait State generation, Memory Devices, Address Decoding Techniques

Interfacing Device**:** 8255 Programmable peripheral interface, interfacing keyboard and seven segment display, 8254 (8253) programmable interval timer

**UNIT IV**

Interfacing:8259A programmable interrupt controller, Direct Memory Access and 8237 DMA controller

Introduction to Advanced Processors**:** Real and virtual mode of execution, Introduction to 80286 and 80386

Text books:

1. Microprocessor Architecture, Programming & Applications with 8085: Ramesh S Gaonkar; Wiley Eastern Ltd.
2. Microprocessors and interfacing : Hall; TMH, Bhurchandi

Reference books:

1. The Intel Microprocessors 8086- Pentium processor : Brey; PHI
2. Advanced Microprocessors and Interfacing : Badri Ram; TMH

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 6th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-306N** | Digital CMOS Design | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  |  To make the students aware of Digital Vlsi system and its related new technique |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This section provide the detail about the basic principle of MOS transistor & introduction of large and small MOS models |
| **CO-2**  | This section describes symbolic & physical layout system of MOS layers. |
| **CO-3**  | This section provides the detail of Combinational and Sequential logic structure used in CMOS logic family & discuss about the Flip-Flops.  |
| **CO-4**  | This section describe how we design ALU subsystem using CMOS logic family |

. **UNIT-I**

Introduction: Basic principle of MOS transistor, Introduction to large signal and small signal MOS models for digital design, MOS Switches, Threshold Voltage, Pull-up to Pull down ratio Calculation The MOS Inverter: Inverter principle, Depletion and enhancement load inverters, the basic CMOS inverter, BiCMOS Inverter, transfer characteristics, logic threshold, Noise margins, Latch-up, Propagation Delay and Power Consumption.

**UNIT-II**

Symbolic and Physical Layout Systems: MOS Layers Stick/Layout Diagrams, Layout Design Rules, Transistor layout, Inverter layout, CMOS digital circuit layout Issues of Scaling, Scaling factor for device parameters. Performance Estimation: Resistance Estimation, Capacitance Estimation, Inductance Estimation, Switching characteristics, CMOS-gate transistor Sizing.

**UNIT-III**

Combinational and Sequential Logic Structures: CMOS Logic Families - static, dynamic and differential logic families, CMOS Complimentary logic, Pseudo NMOS logic, Dynamic Logic Circuits: Basic principle, non ideal effects, domino CMOS Logic, high performance dynamic CMOS Circuits, Clocking Issues, Two phase clocking, pass Transistor logic, transmission gates logic circuits, complimentary switch logic, Registers, CMOS Schmitt trigger.

**UNIT- IV**

Subsystem Design: Design of ALU Subsystem: design 4-bit simple and carry look ahead adder, multiplier design: serial-parallel multiplier, Braun Array, Wallace tree Multiplier, Design of 4-bit Shifter. CMOS Memory Design: Semiconductor memories, memory chip organization, RAM Cells, dynamic memory cell, Programmable logic arrays

Text Books:

1. J. M. Rabaey, A. P. Chandrakasan and B. Nikolic, “Digital Integrated Circuits” Second Edition, PH/Pearson, 2003.

2. D. A. Pucknell and K. Eshraghian, “Basic VLSI Design”, Third Edition, PHI, 1994.

Reference Books:

 1. S. M. Kang and Y. Leblebici, “CMOS Digital Integrated Circuits: Analysis and Design”, Third Edition, MH, 2002.

2. W. Wolf, Modern VLSI Design: System on Chip, Third Edition, PH/Pearson, 2002.

3. N. Weste, K. Eshraghian and M. J. S. Smith, Principles of CMOS VLSI Design” Pearson, 2001.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit*.

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| [**B. Tech. 6th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-308N** | Microwave and Radar Engineering | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  |  The objective of this course is to make the students aware of Microwave & Radar Engg.Technique |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This section describe introduction of Microwave & its related some decive |
| **CO-2**  | This section provides the details how we design microwave & problem based on smith chart |
| **CO-3**  | This section tell us about the device used in Microwave & discussion about the waveguide |
| **CO-4**  | This section describe about the Radar Engg. & its related parameter |

**UNIT I**

Introduction to Microwave and tubes, Advantages of microwaves, Microwave devices: Multicavity klystron and magnetron, Tunnel diodes, GUNN Diodes, Parametric amplifiers, TWT, IMPATT, TRAPTT, Microwave solid state devices.

**UNIT-II**

Challenge in microwave design, Use of Smith chart to find unknown impedance, impedance matching design network, Equivalent voltage and current concept at microwave frequency. Problems based on Smith Chart, Scattering parameters, properties of scattering parameters, network analyzer, network analyzer, Relationship between S-parameters and Transmission parameters.

**UNIT-III**

Microwave Circuits: Passive microwave devices (E-plane, H-Plane Tee, Magic Tee, Circulator, Attenuator, Isolators, Directional Coupler, TE, TM and TEM modes in rectangular waveguides and circular waveguides, Resonators and phase shifter

**UNIT-IV**

Radar Engg.: Introduction, Radar range equation, parameters affecting the range, Doppler

effect, CW and pulse Doppler Radar, MTI delay lines and canceller, range gate pulse, MTI & Doppler radar, non coherent MTI. Noise and clutter, Radar displays, applications of radar

Text Books:

1. Liao S.Y. : Microwave Circuit & Devices, PHI
2. M. Kulkarni : Microwave & Radar Engineering, Umesh Publication

Reference Books:

1. Skolonik M. K. : Introduction to Radar system, McGraw Hill.

2. Siegman A.E. : An introduction to lasers & Masers, McGraw Hill.

3. Gautam A. K. : Microwave Engineering , S.K. Kataria & Sons.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [B. Tech. 6th Semester Electronics Engineering](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-310N** | Biomedical Instrumentation | 3  | 1  | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  |  The objective of this course is to make the students aware of Biomedical Instrument in which used in hospital & in daily routine life,  |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This section describe the basic instrument of biomedical & its detail discussion .  |
| **CO-2**  |  This section provide the details about the X-ray production and interaction, Ultrasound imaging systems and its interaction |
| **CO-3**  | This section tell us about the biomedical telemetery and telemedicine |
| **CO-4**  |  This section provide the detail about the external pacemakers, Implantable pacemakers, Programmable Pacemakers |

**UNIT-I**

Introduction to Biomedical Instrumentation**:** Basic Anatomy and Physiology: Circulatory system, Nervous system and Respiratory system, Review of development of biomedical instrumentation and Biometrics, Review of transducers, Sensors and electrodes.

Biomedical Devices and Measurements**:** Cardiovascular Measurement: The heart out cardio vascular system, Electrocardiography, Photocardiography,Respiratory system measurement: Respiratory mechanism, measurement of gas volume, flow rate, measurement of gas concentration in inhaled aided respiratory controller. Measurement of electrical activities in muscles and brain: Electromyography, Electroencephalograph and their interpretation.

**UNIT-II**

Modern Imaging System**:** Introduction to Ionising and Non-ionising radiation, principles of X-ray production and interaction, special techniques, CAT, mammography, Ultrasound Imaging Systems and its interaction, Magnetic Resonance Imaging System, Basic NMR components different imaging methods, image processing, filters, enhancements and restoration and image segmentation

**UNIT-III**

Biomedical Telemetry and Telemedicine**:** Introduction to Biotelemetry, Physiological parameters, Wireless telemetry, Single channel telemetry systems, Multichannel wireless telemetry system, Multipatient telemetry, Implantable telemetry systems, transmission of analog physiological signals over telephone, Telemedicine, Application of Telemetry in Patient care

**UNIT-IV**

Cardiac Pacemakers and Defibrillators**:** Cardiac pacemakers: External pacemakers, Implantable pacemakers, Programmable Pacemakers, Performance aspects of Implantable pacemakers, Power sources, Pacing system analyzers Cardiac Defibrillators: Dc defibrillator, Defibrillator electrodes, Performance aspects, Implantable Defibrillator analyzer.

 Text Books :

1. Handbook of Biomedical Instrumentation, Khandpur
2. Medical Instrumentation: Application and Design, J.G.Webster, Houghton Mifin.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 6th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **practical**  | **Total**  |
| EL-312N | Digital Signal Processing Lab | 0  | 0  | 3  | 40  | 60  | 100  | 3  |
| ***Purpose***  |  To make students aware about the designing of digital systems using MATLAB |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This lab will explain the coding of MATLAB system tool |
| **CO-2**  | Student will be able to understand the basic communication technique on MATLAB and to read the result on the screen |

**Perform the Experiments using MATLAB**

1. To develop a program for computing Z- transform in factored form, Plot its poles and zeros , and then determine its ROCs.

2. To develop a program for computing Inverse Z-transform of a rational transfer function.

3. To develop a program for linear convolution and circular convolution .

4. To develop a Program for computing discrete Fourier transform .

5. To develop a Program for computing the convolution by overlap-add method and overlap save-method.

6. To develop Program for realization of IIR Digital filters (Direct, Cascade, Parallel).

7. To develop a program for sampling theorem .

8. To design FIR filters using windows technique.

9. To design analog filter (Low pass, High pass).

10. To design analog filter (Band pass, Band stop)

11. To design IIR filters using (Impulse Invariant method ).

12. To design IIR filters using (bilinear transformation).

**Note: Any 8 experiments from the above list and 2 more from others (developed by institute) are required to be performed by students in the laboratory.**

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| [**B. Tech. 6th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **practical**  | **Total**  |
| EL-314N | Microprocessor and Interfacing Lab | 0  | 0  | 3  | 40 | 60 | 100  | 3  |
| ***Purpose***  |  To make students aware about the Microprocessor systems & how we implement it in practically. |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | Student will be able to understand execution of various experiments on Microprocessor kits. |

**Objective:** Write the efficient Assembly Language Program for different problem statements and implement different system interfacing.

**Write an Assembly Language Program to**

1. Add / Sub two 16 bit numbers.
2. Find sum of series of numbers.
3. Multiply two 16 bit unsigned/ signed numbers.
4. Divide two unsigned/ signed numbers (32/16 , 16/8, 16/16, 8/8 )
5. Add / Sub / multiply / Divide two BCD numbers.
6. Find smallest/ largest number from array of n numbers.
7. Arrange numbers in array in ascending/ descending order.
8. Perform block transfer data using string instructions / without using string instructions.
9. Compare two strings using string instructions / without using string instructions.
10. Display string in reverse order, string length, Concatenation of two strings.
11. Convert Hex to Decimal, Decimal to Hex.
12. To find 1’s and 2’s complement of a number.

**Note: Any 8 experiments from the above list and 2 more from others (developed by institute) are required to be performed by students in the laboratory.**

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| [**B. Tech. 6th Semester Electronics Engineering**](#SEM3) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **practical**  | **Total**  |
| **EL-316N** | Microwave Lab | 0  | 0  | 3  | 40 | 60  | 100  | 3  |
| ***Purpose***  | To give the students an idea about the study and analysis of components used in Microwave Engg. |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | Students will learn the steps to analyze microwave components. |
| **CO-2** | Students will be able to find the characteristics of microwave components. |
| **CO-3** | Students will learn the steps to analyze various antennas. |
| **CO-4** | Students will be able to find the characteristics of various antennas. |

**LIST OF EXPERIMENTS:**

 1. To study microwave components.

 2. To study the characteristics of the reflex Klystron tube and to determine its

 electronic tuning range.

 3. To determine the frequency and wavelength in a rectangular waveguide

 working in TE 10 mode.

 4. To determine the standing wave ratio and reflection coefficient.

 5. To study the I-V characteristics of gunn diode.

 6. To study the magic Tee.

 7. To study the isolator and attenuator.

 8. To measure the coupling coefficient and directivity of a waveguide directional coupler.

 9. To measure the polar pattern and the gain of a waveguide horn antenna.

 10. To measure the insertion loss and attenuation.

**Semester-VII**

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| [**B. Tech. 7th Semester Electronics Engineering**](#SEM6) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration** **of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-401N** | Fuzzy Logics And Neural Networks | 4 | 1 | 0  | 75  | 25  | 100  | 3  |
| **Purpose** | The objective of this course is to make the students aware about Neural & Fuzzy Logics and its application. |
| **Course Outcomes** |
| **CO 1** | Understanding of different Fuzzy Arithmetic, Algebraic operations and Fuzzy sets. |
| **CO 2** | Introduction to Fuzzy control and its applications |
| **CO 3** | Identify and understand of Neural Networks, Artificial Neuron model and neural controller |
| **CO 4** | Application of Neural Network |

**UNIT I**

Neurals Networks: Fundamental of neural network, overview of biological Neuro-system, Mathematical Models of Neurons, ANN architecture, Learning Methods, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Radial Basis functions, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

**UNIT II**

Fuzzy Sets: Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Extension principle and fuzzy relations Fuzzy Logic: Fuzzification and defuzzification, Membership Function, Linguistic Variables, Linguistic hedges, Fuzzy rules and reasoning, lamda cut-sets. Arithmetic operations on Fuzzy numbers.

 **UNIT III**

Fuzzy Inference System: Fuzzy Modeling, Mamdani Fuzzy model, TSK Fuzzy model, Fuzzy Controller, Industrial Applications.

 Introduction to Neural FuzzyNetworks: Architecture of Neuro Fuzzy Networks, Hybrid learning algorithms, Neuro-fuzzy Control.

**UNIT IV**

Introduction to Evolutionary Techniques: Genetic Algorithm, Basic Concepts, Flow Chart of GA, Genetic representations (Encoding), Initialization and Selection, Genetic Operators, Mutation, Generational Cycle, Convergence of GA and Applications.

Text Books:

1. J.M Zurada , " Introduction to Artificial Neural Network" , Jaico Publishers
2. H.J. Zimmermann" Fuzzy set theory & its Applications ", Allied Publishers Ltd.

Reference Books:

1. James A. Anderson" Introduction to Neural Networks", Prentice Hall India.
2. Nil Junbong " Fuzzy Neural Control Principles & Algorithm", PHI.
3. N.K. Bose" Neural Network Fundamental with Graphics ", TAT A McGraw Hill.
4. Klir George J. " Fuzzy sets and Fuzzy Logic Theory and Applications", PHI.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 7th Semester Electronics Engineering**](#SEM6) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration** **of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-403 N**  | Embedded System Design | 4 | 1 | 0  | 75  | 25  | 100  | 3  |
| **Purpose** | The objective of this course is to make the students aware about embedded systems design including different type of microcontroller and their designing. |
| **Course Outcomes** |
| **CO 1** | Implement combinatorial logic and sequential systems in terms of basic digital building blocks using simulation software. You will be able to perform some optimizations. |
| **CO 2** | Design, test and critically evaluate embedded solutions to real world situations using digital components (sequential and combinational). |
| **CO 3** | Develop software systems for embedded devices using assembler code. |
| **CO 4** | Design, test and critically evaluate embedded solutions to real world situations using (embedded) computer systems interfaced to digital hardware. |

**UNIT I**

Types of Microcontrollers**:** Embedded microcontrollers, External memorymicrocontrollers; Processor Architectures: Harvard V/S Princeton , CISC V/S RISC; microcontrollers memory types; microcontrollers features : clocking, i/o pins, interrupts, timers, peripherals.

**UNIT II**

Microcontroller architecture: Introduction to PIC microcontrollers, Architecture and pipelining, program memory considerations, Addressing modes, CPU registers, Instruction set, simple operations.

**UNIT III**

Interrupts And I/O Ports: Interrupt logic, Timer2 scalar initialization, IntService Interrupt service routine, loop time subroutine, External interrupts and timers, Synchronous serial port module, Serial peripheral device, O/p port Expansion, I/p port expansion, UART.

**UNIT IV**

Programming with microcontrollers**:** Arithmetic operations, Bit addressing, Loop control, Stack operation, Subroutines, RAM direct addressing, state machines, Oscillators, Timer Interrupts, Memory mapped I/O.

Designing using microcontrollers**:** Music box, Mouse wheel turning, PWM motor control, Aircraft Demonstration, ultra sonic distance measuring, Temperature Sensor, Pressure Sensor.

Text Books**:**

1. Design with PIC Microcontrollers by John B. Peatman , Pearson.

Reference Books **:**

1. Programming and Customizing the 8051 Microcontroller : Predko ; TMH.

2. Designing Embedded Hardware : John Catsoulis ;SHROFF PUB. & DISTR. ND.

3. Programming Embedded Systems in C and C++: Michael Barr; SHROFF PUB. & DISTR.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 7th Semester Electronics Engineering**](#SEM6) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration** **of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-421 N**  | Robotics | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| **Course Outcomes** |
| **CO 1** | The basic concepts related to robot, Parts of robots, End effectors and to make the student familiar with the various drive systems for robot. |
| **CO 2** | Various sensors and machine vision and their applications in robots. |
| **CO 3** | About various control system, robot programming, Artificial intelligence and safety standards of robots |
| **CO 4** | Industrial and Non-industrial Applications of robots. |

**UNIT-I**

Fundamentals of Robot: Definition, History and Development in robot technology. Robot Technology: Characteristics, Basic Components, Robot Anatomy, Robot Generations, Robot selection, Present and Future Applications. Robot Drive Systems and End Effectors: Robot Classification: Arm geometry, Degrees of freedom, Power sources, Types of motion, Path Control. Robot End Effectors: Mechanical grippers, Vacuum, Magnetic, Adhesive. Special purpose grippers, Process tooling, Compliance, Robot Drive systems: Hydraulic, Pneumatic and Electric system.

**UNIT-II**

Sensor : Requirements of a sensor, Sensor classification, Principles and Applications of the following types of sensors : Position of sensors (Potentiometer, Encoder, LVDT, Resolvers, LMDT, Hall – effect sensors),Velocity sensors(Encoder, Tachometer, Differentiation of position signal),Acceleration sensors, Force and Pressure Sensors(Piezoelectric, Force sensing resistor, Strain Gauge, Antistatic foam), Torque Sensors, Micro switches, Visible light and Infrared Sensors, Touch and Tactile sensors, Proximity Sensors(Magnetic, optical, Ultrasonic, Inductive, Capacitive, Eddy Current), Range Finder (Ultrasonic, Light-based, GPS), Sniff Sensors, Taste Sensors, Vision Sensors, Voice recognition devices, Voice synthesizers, RCC. Machine Vision : Visual sensing, Architecture of robotics vision system, Machine vision: Image acquisition (Vidicon tube, CCD), Digitization, Image processing, Image Analysis, Image interpretation. Machine vision application, other optical methods.

**UNIT-III**

Control System, Programming and Artificial Intelligence: Control Systems: PLC, PID, CNC, MPU, URC. Robot programming: Programming methods, Languages, levels of robot programming, Program statements. Elements of Artificial Intelligence, System architecture, Application of fuzzy logic in robotics, Robot Safety, safety standards.

**UNIT-IV**

Robot Applications: Industrial applications, Automation in manufacturing, Robot applications, Material handling, Processing application, Assembly application, Inspection application, evaluating the potential of a robot application, future applications, challenge for the future, Innovations, Nonindustrial application.

Text Books:

1. James G. Keramas, “ Robot technology fundamentals”, Delmar Publishers.

2. Saeed B. Niku, “Introduction to robotics analysis,control and applications”, 2nd ed., Wiley India.

3. R. K. Mittal,I.J.Nagrath, “Robotics and Control”, TMH Education Pvt. Lmt. IndustrialRobotics- By M.P Grover Tata McGraw Hill

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [B. Tech. 7th Semester Electronics Engineering](#SEM6) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration** **of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-423 N**  |  Microcontrollers | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| **Purpose** |  |
| **Course Outcomes** |
| **CO 1** | This section will provide basic concepts of various types of microcontrollers. |
| **CO 2** | This section will provide details description and instruction set of 8051 microcontroller. |
| **CO 3** | This section will provide interfacing part of 8051 with peripheral devices. |
| **CO 4** | This section will provide basic concept and architecture of PIC microcontroller. |

**UNIT-I**

Introduction: Comparing Microprocessors and Microcontrollers. survey of microcontrollers- 4 bit, 8 bit, 16 bit, 32 bit microcontrollers. Applications of microcontrollers.

8051 Architecture: Block diagram, pin diagram of 8051. Functional descriptions of internal units, registers, PSW, internal RAM ROM, Stack, Oscillator and Clock. UO Pins, Ports and Circuits connecting external memory. Counters and timers. Serial data interrupt Serial data transmission Reception and transmission modes. Timer flag interrupt. External interrupt, software generated interrupts. External memory and memory space decoding, expanding I/Os, memory mapped I/O Reset & CLK Circuits.

**UNIT-II**

8051 Instruction set and programming: 8051 Instruction syntax, addressing modes, Data transfer instructions, logical instructions, arithmetic instructions, Jump and Call instructions. Interrupts and interrupt handler subroutines. Writing assembly Language programs. Time delays and its types.Lookup tables. Serial data transmission using time delays and polling. Interrupt driven serial transmission and reception.

**UNIT-III**

8051 applications: Interfacing Keyboards Programs for small keyboards and matrix keyboards. Interfacing multiplexed displays, numeric displays and LCD displays. Measuring frequency and pulse width. Interfacing ADCs & DACs. Hardware circuits for handling multiple interrupts. 8051 Serial data communication modes- Mode 0, Mode I, Mode 2 and Mode 3.

**UNIT-IV**

PIC Microcontroller:Introduction toPIC microcontrollers, PIC architecture, comparison of PIC with other CISC and RISC based systems and microprocessors, memory mapping and assembly language programming, addressing modes, instruction set.

I/O Programming: PIC I/O ports, I/O bit manipulation programming, timers/counters, programming to generate delay and waveform generation, Peripherals devices interfacing.

Text books:

1. KJ.Ayala, The 8051 Microcontroller - 2'd cd. Penram International.

2. Intel's manual on " Embedded Microcontrollers"

3. PICmicrocontroller-programming in basic by Milan Verle

Reference Books:

 1. Programming PIC microcontrollers with PIC basic by Chuck Helebuyck.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 7th Semester Electronics Engineering**](#SEM6) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration** **of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-425 N** | Renewable Energy Resources | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| **Course Outcomes** |
| **CO 1** | This section will provide basic concept of energy conversion system. |
| **CO 2** | This section will provide description of solar systems and electric/thermal power generation systems.  |
| **CO 3** | This section will provide description of hydro power systems. |
| **CO 4** | This section will provide description of wind energy, tidal energy etc. |

**UNIT-I**

Introduction:Direct energy conversion, description, working principle, magneto hydrodynamic systems (MHD), thermoelectric generators, thermionic generator, fuel cells, solar cells, EMF generated, power output, losses and efficiency, applications, hydrogen conversion and storage systems.

**UNIT-II**

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| Extraterrestrial solar radiation, components of radiation, geometry of earth and sun, geometry of collector arid the solar beam, effects of earth's atmosphere, measurements of solar radiation, calculation of heat balance for a solar collector, type of water heaters, selective surfaces, crop heaters, space heating, space cooling, water desalination, solar ponds, solar concentrators, electric power system, problems. |

Silicon p-n junction, photon absorption, solar radiation input, photovoltaic circuit properties

And loads, limit to cell efficiency, solar cell construction type and adaptations of photovoltaic, other types of photoelectric, and thermo electric generation and problems

**UNIT-III**

Principles of hydro power, assessing the resource for small installations, an impulse turbine, reaction turbines, hydro electric systems, the hydraulic rain pump, wind turbine types and terms, linear momentum and basic theory, dynamic matching, steam tube theory, characteristics of the wind, power extraction by a turbine, electricity generation, mechanical power, problems.

Introduction, tropic level photosynthesis, photosynthesis at the plant level, thermodynamic considerations, photosynthesis, molecular level photosynthesis, synthetic photosynthesis, bio fuel classification, bio-mass production for energy farming, direct combustion for heat, pyrolysis (destructive distillation), alcoholic fermentation, anaerobic digestion for bio-gas, agrochemical fuel extractions, problems

**UNIT-IV**

 Introduction, wave motion, wave energy and power,wave patterns, devices, the causes of tides,

 enhancement of tides flow power, tidal range power, world range power sites, problems.

Principles of Ocean Thermal Energy Conversion (OTEC), heatexchangers, pumping requirements, other practical considerations, introduction to geothermal energy, geophysics, dry rock and hot aquifer analysis, harnessing geothermal resources, problems.

Text/References Books:

 1. Renewable Energy Rsources by John W. Twidell and Anthony D. Weir, published by E.&

 F. N. Spon Ltd. London.

 2. Non-Conventional energy sources by Rai G D, Khanna Publishers, New Delhi

***Note:-*** *The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit.*

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| [**B. Tech. 7th Semester Electronics Engineering**](#SEM6) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration** **of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-431 N** | MEMS | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| **Course Outcomes** |
| **CO 1** | Students will be using knowledge of mathematics, science, and engineering to understand various MEMS devices. |
| **CO 2** | Students be able to understand various processes used such as oxidation, metallization, fabrication and packaging of MEMS devices. |
| **CO 3** | Understanding basic principles of bulk micromachining and clean rooms practices |
| **CO 4** | Understand materials and MEMS packaging techniques. |

**UNIT-I**

Introduction to Microsystems: Overview of microelectronics manufacture and Microsystems technology. Definition - MEMS materials. Laws of scaling. The multi disciplinary nature of MEMS. Survey of materials central to micro engineering. Applications of MEMS in various industries.

**UNIT-II**

Micro Sensors and Actuators: Working principle of Microsystems - micro actuation techniques, micro sensors – types, Microactuators and types,micropump, micromotors, micro – valves, microgrippers – micro- accelerometers.

**UNIT-III**

Fabrication Process Substrates - single crystal silicon wafer formation, Clean room practices, Photolithography, Ion implantation, Diffusion, Oxidation, CVD - Physical vapor deposition, epitaxy - etching process.

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**UNIT-IV**

Micro System Manufacturing Bulk Micro manufacturing - surface micro machining – LIGA Micro system packaging materials - die level - device level - system level - packaging techniques – die preparation – surface bonding wire bonding - sealing. Introduction to assembly, Introduction to Micro-system design.

Text Books:

1. MEMS and Microsystems Design and Manufacture” by Tai-Ran Hsu. Tata McGraw-Hill Publishing Company Ltd.

2. Foundation of MEMS” by Chang Liu. Pearson Education.

3. MEMS Handbook”, Mohamed Gad – el – Hak, CRC Press, 2002.

4. Rai - Choudhury P. MEMS and MOEMS Technology and Applications”, PHI Learning Private Limited, 2009.

Reference Books:

1. Francis E.H. Tay and Choong .W.O, “Micro fluidics and Bio mems application”, IEEE Press New York, 1997.

2. Trimmer William S., Ed., “Micromechanics and MEMS”, IEEE Press New York, 1997.

3. Maluf, Nadim, “An introduction to Micro electro mechanical Systems Engineering”, AR Tech house, Boston 2000.

4. Julian W.Gardner, Vijay K.Varadan, Osama O. Awadel Karim, “Micro sensors MEMS and Smart Devices”, John Wiby & sons Ltd., 2001.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 7th Semester Electronics Engineering**](#SEM6) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration** **of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-433 N**  | Nanoelectronics | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| **Course Outcomes** |
| **CO 1** | Students will be using physics, mathematics, and material science engineering to understand the latest development in the area of Microelectronics leading to Nanoelectronics |
| **CO 2** | Students be able to understand the fundamentals of classical CMOS technology and issues in scaling MOSFET in the sub-100nm regime |
| **CO 3** | Understanding basic principles of non classical transistors with new device structure and nano materials. |
| **CO 4** | Understand the issues in realizing Germanium and compound semiconductor MOSFET. |

**UNIT 1**

Overview: Nano devices, Nano materials, Definition of Technology node, Basic CMOS Process flow, MOS Scaling theory, Issues in scaling, Short channel effects, Description of a typical 65 nm CMOS technology, Requirements for Non classical MOS transistor, MOS capacitor, Role of interface quality and related process techniques, Gate oxide thickness scaling trend, SiO2 vs High-k gate dielectrics. Integration issues of high-k , Interface states, bulk charge, band offset, stability, etc.

**UNIT II**

Metal Gate Transistor : Motivation, requirements, Integration Issues, Transport in Nano MOSFET, velocity saturation, ballistic transport, injection velocity, velocity overshoot, SOI - PDSOI and FDSOI., Ultrathin body SOI - double gate transistors, Vertical transistors - FinFET and Surround gate FET, Metal source/drain junctions - Properties of schotky junctions on Silicon, Germanium and compound semiconductors –Work function pinning, Germanium Nano MOSFETs : strain , quantization , Advantages of Germanium over Silicon.

**UNIT III**

PMOS versus NMOS, Compound semiconductors - material properties, MOSFETs Compound semicocnductors MOSFETs in the context of channel quantization and strain , Hetero structure MOSFETs exploiting novel materials, strain, quantization. Synthesis of Nanomaterials : CVD, Nucleation and Growth, ALD, Epitaxy, MBE. Compound semiconductor hetero-structure growth, emerging nano materials: Nanotubes, nanorods and other nano structures, LB technique, Soft lithography etc. Microwave assisted synthesis, Self assembly etc.

**UNIT IV**

Characterization : Quantum wells and Thickness measurement techniques: Contact - step height, Optical - reflectance and ellipsometry, AFM, Nanomaterials Characterization techniques: FTIR, XRD, AFM, SEM, TEM, EDAX and interpretation of results.

Reference Books **:** 1.Fundamentals of Modern VLSI Devices, Y. Taur and T. Ning, Cambridge University Press. Silicon VLSI Technology, Plummer, Pearson Education India.

2.Encyclopedia of Materials Characterization, Edited by: Brundle, C.Richard; Evans, Charles A. Jr.; Wilson, Shaun ; Elsevier

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 7th Semester Electronics Engineering**](#SEM6) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration** **of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-435 N**   | Electronic Waste Management | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| **Purpose** | The objective of this course is to make the students aware about Materials Used In Manufacturing Electrical and Electronic Products and Electronic Waste Management |
| **Course Outcomes** |
| **CO 1** | Describe the major categories of waste, sources of pollution in coastal environments |
| **CO 2** | Students will be able to learn about effects of ocean pollutants and environmental effects of electronic waste. |
| **CO 3** | Students will be able to learn about chemical and physical properties of Solid waste. |
| **CO 4** | Study of Disposal techniques, ways in which battery recycling rates can be improved. |

**UNIT-I**

Introduction:

Introduction to E-waste, classification of E-waste, legislative influences on electronic recycling, WEEE and ROHS directive, treatment options for WEEE, material composition of WEEE, health and safety implication

**UNIT-II**

Materials used inmanufacturing electrical and electronics products:

Overview, ROHS directive and prescribed materials – lead, brominated flame retardants, soldering and move to lead free assembly, printed circuit board materials, encapsulant of electronic components, indium tin oxide and LCD screens, polymeric materials in enclosures, casing and panels, material composition of mobile phones, computers, televisions, washing machines and other electronic components, useful components and hazardous components in electronic waste.

**UNIT-III**

Dumping,Burning and Landfill:

Introduction, landfills, pollutions from landfill, landfill site construction, burning, incineration, thermal processing, current practices in India, case studies and projects.

Integrated approach to electronic waste recycling:

Separation and sorting, treatment, emerging technologies like separation, thermal treatment, sensing technologies, plastics to liquid fuels, sorting, crushing, automated disassembly, design for recycling and inverse manufacturing. Design methodology and resource efficiency, environmentally sound treatment technology for E-waste, eco-design guidelines for manufacturing, case studies and project.

**UNIT-IV**

Electronic waste management:

Methods for electronic waste management, national and international efforts, corporate social responsibility, extended producer responsibility(EPR), current practices in India, case studies and project.

Text Books:

1. E-waste implications, regulations and management in India and current global best practices by rakeshJohri (2008), TERI publishing.
2. E-Waste: Managing the digital dump yard by Vishaka Munshi, ICFAI.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 7th Semester Electronics Engineering**](#SEM5) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Sessional**  | **Practical**  | **Total**  |
| **EL-407 N** | Neural Networks Lab | 0  | 0  | 3  | 40 | 60 | 100  | 3  |
| **Purpose** | To make students understand about the applications of refrigeration and Air-conditioning. |
|  | **Course Outcomes:** |
| **CO1** | Understanding of different Fuzzy Arithmetic, Algebraic operations and Fuzzy sets. |
| **CO2** | Introduction to Fuzzy control and its applications |
| **CO3** | Identify and understand of Neural Networks, Artificial Neuron model and neural controller |
| **CO4** | Application of Neural Network |

**List of Experiments:**

1. NN for AND, OR gate using perceptron.

2. Perceptron to classify odd and even numbers.

3. NN for alphabet recognition using backpropagation.

4. Hopfield network for recognizing patterns such as ‘+’ and ‘-‘.

5. NN for EXOR classification using Back propagation.

6. CPN for image classification.

7. Name and Telephone number recognition system

**Semester-VIII**

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| [**B. Tech. 8th Semester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-402 N** | Computer Communication Network | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This Section basically aware the students about types of networks and network topologies. |
| **CO-2**  | This section provides the concept of functioning of Data Link Layer. |
| **CO-3**  | This section provides the details of functioning of network layer. |
| **CO-4**  | The students will be able to understand the functioning of presentation layer.  |

**UNIT-I**

Introduction: Uses of Computer Networks, Network Hardware, Network Software, Reference models, Examples of Networks & Data communication Services, Network Standardization. THE Physical Layer: Theoretical basis for Data communication, Transmission media, Wireless Communication, The Telephone System, Narrowband ISDN, Broadband ISDN and ATM, Cellular Radio, Communication Satellites.

**UNIT-II**

 Data Link Layer: Data Link Layer Design issues, Error Detection & correction, Elementary Data Link protocols, Sliding Window Protocols, Protocol Specification & Verification, Example of Data Link Protocols. THE MEDIUM ACCESS SUBLAYER: Aloha Protocols, LAN Protocols, IEEE Standards, Fiber optic Networks, Satellite Networks, Packet switching, radio Networks.

**UNIT-III**

Network Layer: Design issues, routing algorithms, congestion control Algorithms, internetworking. TRANSPORT & SESSION LAYER: Protocol design issues, connection Management, remote procedure calls.

**UNIT-IV**

Presentation Layer: Design issues, abstract Syntax notation, data compression technique, cryptograph. APPLICATION LAYER: Design issues, file transfer, access and management, electronic mail, virtual terminals, applications and examples.

Text/References Books:

1. Tanenbaum A.S, Computer Networks, PHI.

2. Forouzan B.A, Data Communications and Networking, Tata-Mc-Graw Hill.

3. Stallings W, Data and Computer Communications, PHI.

4. Ahuja V, Design and Analysis of Computer Communication, McGraw Hill.

5. Bee K.C.S, Local Area Networks, NCC Publication

 **Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 8thSemester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-404N** | Optical Communication | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To make the students conversant with the basics concept of Optical Fiber Communication, Optical sources and detectors. |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This Section will aware the students about the basics of fibers, principals and the types of fibers. |
| **CO-2**  | This Section describes the modes in the fibers, attenuations and the other effects in the fibers. |
| **CO-3**  | This section is all about the optical sources, their structures and their characteristics.  |
| **CO-4**  | This section is all about the optical detectors, their structures and their characteristics.  |

**UNIT-I**

Overview of Optical Fiber Communication: Advantages of optical fiber communication. Optical Fiber waveguides: Introduction, Ray theory transmission Total internal reflection, acceptance angle, numerical aperture, skew rays. Electromagnetic mode theory for optical propagation: Electromagnetic waves, modes in a planar guide, phase and group velocity, phase shift with total internal reflection

**UNIT-II**

Cylindrical Fiber modes, mode coupling, step index fibers Graded index fibers, Single mode Fiber: Cut-off wavelength, Mode field diameter and spot size, effective refractive index, Group delay and mode delay factor

Signal Distortion in Optical Fibers - Attenuation, Material Absorption, losses in silica glass fibers; Intrinsic absorption, Extrinsic absorption. Linear scattering losses; Ray light scattering, Mie scattering. Non linear Scattering losses: fiber bending losses; Dispersion, Chromatic dispersion: material dispersion, waveguide dispersion. Intermodal dispersion: Multimode step index fiber, Multimode graded index fiber. Overall fiber dispersion Multimode fiber, Dispersion modified single mode fibers, Dispersion–shifted fiber, dispersion flatted fibers, nonzero-dispersion shifted fibers (MZ-DSF), Polarization

**UNIT-III**

Optical Sources - Light Emitting Diodes (LEDs): Structures, light source materials, Quantum Efficiency on LED Power Modulation of a LED, Laser Diodes- models and threshold conditions, laser diode rate equations, External quantum efficiency, resonant frequency, laser diode structures and radiation patterns, single mode lasers modulation of laser diodes, laser lines.

**UNIT-IV**

Source to fiber power launching, Source Output patterns, Power coupling calculation, Power launching versus wavelength, Photo detectors: PIN photo detector, Avalanche photodiodes. Photo detector Noise: Noise sources, signal to noise ratio. Detector Response time: response time structure of in GaAs APDs, Temperature effect on Avalanche gain, comparison of photo detectors

Text Books**:**

1. John M. Senior, “Optical Fiber Communications”, PEARSON, 3rd Edition, 2010.

2. Gerd Keiser, “Optical Fiber Communications”, TMH, 4th Edition, 2008.

Reference Books:

1. Govind P. Agrawal, “Fiber Optic Communication Systems”, John Wiley, 3rd Edition, 2004.

2. Joseph C. Plais, “Fiber Optic Communication”, Pearson Education, 4th Ed, 2004.

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 8thSemester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-406N** | Optical Communication and Networking Lab | 0 | 0 | 2  | 40 | 60  | 100  | 3  |
| ***Purpose***  | To make the students understand various kind of commands ,servers and file transfer protocols |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | Understand and connect various components for networking lab |
| **CO-2**  | To have a look at various kind of connectors and how to use  |
| **CO-3**  | To know about the software used for networking and communication |
| **CO-4**  | To know about how to develop a file server |

**Part - A**

1. Familiarisation of different types of cables and different commands.

a) Identify Cat5 cable , RJ 45 Connector , Crimping Tool , Wire Stripper

b) Use Wire Stripper for Cutting wire shield and Understanding of Internal Structure of Cat 5 Cable

c) Finding Pin No-1 on RJ 45 Connector and Inserting Wires in connector

d) Crimping of RJ45 connector using Crimping tool

e) Preparation of Straight cable (used for Dissimilar devices such as PC to Switch , PC to router ) and Cross cables (used for similar devices such as PC to PC , Router to Router , Switch to Switch)

f) Understand different commands like ping, treacert, ifconfig, dig etc..

2. Making a subnet and configuring router

a) Understand the working of a router & method to access the router via console or using telnet, different types of cables used for connectivity.

b) Different types of show commands & their purpose.

c) Assignment of IP address and enabling layer 3 connectivity. d) Implement sub netting

3. Configuring web and DHCP servers

a) Understand Internet Information Services tool and its installation.

b) To configure web services using IIS tool.

c) Configure DHCP

 4. Configuring VLAN

a) Understand the configuration of Vlan in a switch

b) How to make the port of a switch as an access port & a trunk port, purpose of the Vlan in a network

c) Different types of show commands & their purpose.

5. To implement a simple file transfer protocol (FTP) using connection oriented and connectionless sockets.

6. To develop a concurrent file server that spawns several threads, one for each client requesting a specific file.

7. To develop a simple chatting application using

 (i) Connection oriented and

(ii) Connectionless sockets

**Part – B (Any 4 Experiments)**

1. To setting up fiber optic analog link.

2. Study and measurement of losses in optical fiber.

3. Study and measurement of numerical aperture of optical fiber.

4. Study and perform time division multiplexing (digital).

5. Study of framing in time division multiplexing.

6. Study of Manchester coding and decoding.

7. Study of voice coding and codec chip.

8. Study and measure characteristics of fiber optic LED’s and photo detector.

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| [**B. Tech. 8thSemester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-422N** | Operation Research | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To introduce the students about Different types of operation research models.  |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | To introduce the students about Linear Programming problem-Formulation and graphical solution. |
| **CO-2**  | To introduce the students about Dual simplex method. Sensitivity analysis.  |
| **CO-3**  | To introduce the students about Network minimization, shortest route problem, Maximum flow problem and project of scheduling by PERT,CEM.  |
| **CO-4**  | To introduce the students about Critical path calculations.  |

**UNIT-I**

Different types of o.r. models, their construction and general methods of solution. Linear Programming problem-Formulation and graphical solution. The standard form of the L.P.model. The simplex method, The dual of L.P.P, Primal-dual relationship, Dual simplex method, Sensitivity analysis, Transportation problem, its solution and applications, The assignment model, Travelling salesman problem.

**UNIT-II**

Network minimization, Shortest route problem, Maximum flow problem, Project of scheduling by PERT, CPM.

**UNIT-III**

Critical path calculations, Construction of the time chart and resource leveling, Integer programming-examples, method of and algorithms, cutting plane algorithm only.

**UNIT-IV**

Dynamic Programming, Examples of D.P.models, Bellman‘s Principle of optimality and method of recursive optimization, simple problems only involving up to one constraint.

Text Books: -

1. Taha H.A Operations Research-An Introduction, PHI

2. Wanger H.M, Principles of Operation Research, PHI

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 8th Semester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-424N** | Artificial Intelligence and Expert system | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | To make the students familiar with Expert system and their features.  |
| **CO-2**  | To introduce the Problem areas addressed by Expert system.  |
| **CO-3**  | To introduce the organization of Expert Systems.  |
| **CO-4**  | To introduce the design and architectures of Expert system.  |

**UNIT – I**

Introduction to Expert System: What are Expert Systems, Features of Expert System, features of good Expert System, Types of applications of Expert Systems; relationship of Expert Systems to Artificial Intelligence and to Knowledge-Based Systems. Problem areas addressed by ES, ES success factors. Role of human in Expert System, Expert System organization.

**UNIT – II**

Expert system development life: cycle Difference between expert system and conventional program, Basic activities of expert system and the areas in which they solve problems. Expert system development life cycle: Problem selection, Prototype construction, Formalization, Implementation, Evaluation.

**UNIT – III**

Expert System Tools: Knowledge representation in expert systems-using rules semantic nets, frames, Types of tools available for expert system building and how they are used, Stages in the development of expert system tools, Examples of knowledge engineering.

Building an Expert Systems: Necessary requirements for expert systems development, Task in building expert systems, Stages of expert system development, Examples of the expert system building process, Examples of expert system used in different areas, Architecture of Rule based Expert system, Non Rule based Expert system.

**UNIT – IV**

Types of Expert System : An analysis of some classic expert systems, Limitations of first generation expert systems, Deep expert systems, Co-operating expert system, Neural Expert System, Fuzzy Expert System, Real Time Expert Systems, Applications of Expert System.

Text/Reference Books:

1. David W. Rolston: Principles of Artificial Intelligence and Expert System Development, McGraw Hill Book Company.

2. Peter Jackson: Introduction To Expert Systems, Addison WesleyElaine Rich and Kevin Knight: Artificial Intelligence and Expert Systems, McGraw Hill Book Company.

3. Elias M. Awad : Building Expert Systems, principles, procedures, and applications, west publishing co.1996.

4. Dan W. Patterson: Introduction to Artificial Intelligence and Expert Systems, Prentice Hall (April 1, 1990).

**Note:** *Examiner will set eight questions by selecting two from each unit. Students will be required to attempt five questions selecting at least one question from each unit.*

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| [**B. Tech. 8th Semester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-426N** | Analog Filter Design | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To make the students to aware about the different types of filter to design and their applications |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This section is designed to have the knowledge of fundamentals of filters & op-Amp  |
| **CO-2**  | This section is designed to have the knowledge of realizing first order , second order filters with different parameters |
| **CO-3**  | This section is designed to have the knowledge of designing second order filters with arbitrary transmission zeros.  |
| **CO-4** | This section is designed to have the knowledge of realizing the Low pass Chebeshev filters.  |

**UNIT-I**

Introduction: Fundamentals, Types of filters and descriptive terminology, why we use Analog Filters, Circuit elements and scaling, Circuit simulation and modeling. Operational amplifiers: Opamp models, Opamp slew rate, Operational amplifiers with resistive feedback: Non inverting and Inverting, Analyzing Opamp circuits, Block diagrams and feedback, The Voltage follower, Addition and subtraction, Application of Opamp resistor circuits.

**UNIT-II**

 First Order Filter: Bilinear transfer functions and frequency response – Bilinear transfer function and its parts, realization of passive elements, Bode plots, Active realization, The effect of A(s), cascade design. Second order low pass and band pass filters: Design parameters, Second order circuit, frequency response of low pass and band pass circuits.

**UNIT-III**

Second order filters with arbitrary transmissionzeros: By using summing, By voltage feed forward, cascade design revisited. Low pass filters with maximally flat magnitude: the ideal low pass filter, Butterworth response, Butterworth pole locations, low pass filter specifications, arbitrary transmission zeros.

**UNIT-IV**

Low pass filter with equal ripple (Chebyshev) magnitude response: The chebyshev polynomial ,The chebyshev magnitude response, Location of chebyshev poles, Comparison of maximally flat & equal–ripple responses, Chebyshev filter design Inverse chebyshev and cauer filters: Inverse chebyshev response, From specifications to pole and zero locations, Cauer magnitude response, Chebyshev rational functions, Cauer filter design.

Text Books:

1. Rolf. Schaumann, Haiqiao Xiao, Mac. E. Van Valkenburg, “Analog Filter Design”, 2nd Indian Edition, Oxford University Press.

Reference Books:

1. J. Michael Jacob ,”Applications and Design with Analog Integrated Circuits”, Second edition, Pearson.

2. T. Deliyannis, Yichuang Sun, J.K. Fidler, “Continuous-Time Active Filter Design”, CRC Press.

***Note: -*** *The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit.*

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| [**B. Tech. 8thSemester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-432N** | Electronics System Design | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To make the students to aware about the design of the various logic circuits. |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | Students will be aware of basics of the digital iterative networks. |
| **CO-2**  | This Section describes the designing of the sequential machines. |
| **CO-3**  | This Section describes the designing of multi input systems controller design with FPGA , CPLD |
| **CO-4** | This Section describes the designing of the sequential state machines. |

**UNIT-I**

MSI and LSI Circuits And Their Applications:Arithmetic Circuits, Comparators, Multiplexers, Code Converters, XOR And AND-OR Inverter Gates, Wired Logic, Bus Oriented Structures, Tri-State Bus System, Propagation Delay.

**UNIT-II**

Sequential Machines:The Concept Of Memory, The Binary Cell, The Cell And The Bouncing Switch, Set / Reset, D, Clocked T, Clocked JK Flip Flop, Design Of Clock F/F, Conversion, Clocking Aspects, Clock Skew, State Diagram Synchronous Analysis Process, Design Steps For Traditional Synchronous Sequential Circuits, State Reduction, Design Steps For Next State Decoders, Design Of Out Put Decoders, Counters, Shift Registers and Memory.

**UNIT-III**

Multi Input System Controller Design**:** System Controllers, Design Phases And System Documentation, Defining The System, Timing And Frequency Considerations, Functional,MDS Diagram, Generation, Synchronizing Two System And Choosing Controller, Architecture, Next State Decoders And Its Maps, Output Decoders, Clock And Power Supply Requirements, MSI Decoders, Multiplexers in System Controllers, Programmable System Controllers, ROM, PLA And PAL Based Design. Introduction to the CPLD & FPGA.

**UNIT-IV**

Asynchronous Finite State Machines**:** Scope, Asynchronous Analysis, Design Of Asynchronous Machines, Cycle And Races, Plotting And Reading The Excitation Map, Hazards, Essential Hazards Map Entered Variable, MEV Approaches To Asynchronous Design, Hazards In Circuit Developed By MEV Method.

Text Books**:**

1. Fletcher, “An Engineering Approach to Digital Design” PHI 1990

2. Z. Kohavi, “Switching and Finite Automata Theory”, TMH

Reference Books**:**

1. Markovitz, “Introduction to Logic Design”, TMH

2. Morris Mano, “ Digital Design”, PHI

***Note:-*** *The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit.*

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| [**B. Tech. 8thSemester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-434N** | Electronics Switching Theory | 3 | 1 | 0  | 75  | 25  | 100  | 3  |
| ***Purpose***  | To make the students to learn about different switching circuits and control of switching. |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This section aware the students about the history & evolution of the switching systems. |
| **CO-2**  | This Section describes the different parameters of digital switching at different timings.. |
| **CO-3**  | This Section describes the control of the switching systems & signaling |
| **CO-4** | This Section describes the packet switching, ATM, Memory switch. |

**UNIT-I**

Evolution of switching systems: Introduction, Message switching, Circuits switching, Functions of a switching system, Register transistor-senders, Distribution frames, Crossbar switch, A general trucking, Electronic switching, Reed- electronic system, Digital switching systems.

**UNIT-II**

 Digital Switching: Switching functions, Space Division Switching, Time Division Switching, Two-Dimensional Switching, Digital Cross-Connect Systems, Digital Switching in an Analog Environment. Telecom Engineering: Network Traffic Load and Parameters, Grade of Service and Blocking Probability, Modeling Switching Systems, Incoming Traffic and Service Time Characterization, Blocking models and Loss Estimates, Delay Systems

**UNIT-III**

Control of switching systems: Introduction, Call-processing functions, Common control, Reliability, availability and security; Stored-program control. Signaling: Introduction, Customer line signaling, Audio-frequency junctions and trunk circuits, FDM carrier systems, PCM signaling, Inter register signaling, Common-channel signaling principles, CCITT signaling system no. 6 and 7, Digital customer line signaling.

**UNIT-IV**

Packet Switching: Packet Switching, Statistical Multiplexing, Routing Control (dynamic routing, virtual circuit routing and fixed-path routing), Flow Control, X.25, Frame Relay, TCP/IP ATM Cells, ATM Service Categories, ATM Switching (ATM Memory Switch, Space-Memory Switch, Memory-Space Switch, Memory-Space Memory switch, Banyan Network Switch).

Text Books:

1. Thiagarajan Viswanathan & Manav Bhatnagar, “Telecommunication Switching Systems and Networks”, PHI.
2. J.E. Flood, “Telecommunication Switching, Traffic and Networks”, Pearson Education.

3. John C. Bellamy, “Digital Telephony”, John Wiley, 3rd Ed.

*Note: The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit.*

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| [**B. Tech. 8th Semester Electronics Engineering**](#SEM4) |
| **Course No.**  | **Course Title**  | **Teaching Schedule**  | **Allotment of Marks**  | **Duration of Exam** **(Hrs.)**  |
| **L**  | **T**  | **P**  | **Theory**  | **Sessional**  | **Total**  |
| **EL-436N** | Quality and Reliability of Electronics system | 3 | 1 | 0  | 75 | 25 | 100 | 3  |
|  | **Course Outcomes (CO)**  |
| **CO-1**  | This section of the subject makes the student aware about various probability distribution functions. |
| **CO-2**  | This section explains about reliability data analysis. |
| **CO-3**  | This section describes the reliability of electronics system design. |
| **CO-4** | This section describes the basics of quality management system. |

**UNIT-I**

Introduction:-Definition of reliability, quality, availability, maintainability, types of failures, various parameters of system effectiveness, concept of failure modes, difference between MTTR and MTTF. Reliability mathematics: Classical set theory, Boolean algebra, sample space, definition of probability, basic properties of probability, conditional probability, and random variables. Probability distribution: Exponential distribution, gamma distribution, binomial distribution, normal distribution and Weibull distribution.

**UNIT-II**

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| Reliability Data Analysis: - The reliability function, bathtub curve, data collection, storage & recovery of data, component reliability from test data, linear hazard model & exponential hazard model. System Reliability: Systems with components in series, systems with components in parallel, series –parallel systems, Fault tree techniques, K-out of m systems.  |

**UNIT-III**

Electronics System Reliability:- Reliability of electronic components, component types and failure mechanics, circuit and system aspects, reliability of electronic system design, parameter variation and tolerance.

**UNIT-IV**

 Quality Management System & TQC: - Quality policy, cost & quality, concept of TQM,

 management of reliability & quality, elements of quality systems, essential steps in

 implementing quality system for ISO:9000.

Text Books:

1. 1. Practical Reliability Engineering/ Patrick D.T., O’Connor/ John Wiley & Sons 4th

edition).

 2. Reliability Engineering/ E. Balagurusamy/ Tata McGraw- Hill.

 Reference Books:

 1. Quality control & Total quality Management / P.L.Jain/ Tata McGraw- Hill.

 2. Reliability and Maintainability Engineering / Charles E. Ebeling / TMH .

***Note:-*** *The Examiners will set eight questions, taking two from each unit. The students are required to attempt five questions in all selecting at least one from each unit.*