**6KURUKSHETRA UNIVERSITY KURUKSHETRA**

**SCHEME OF STUDIES/EXAMINATIONS**

**Bachelor of Technology (Electrical & Electronics Engineering)**

**VII SEMESTER (w.e.f. 2018-2019)**

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| **S.**  **No.** | **Course**  **No.** | **Course Title** | **Teaching**  **Schedule** | | | | **Allotment of Marks** | | | |  | **Duration**  **of Exam** |
|  |
| **L** | **T** | **P** | **Hr/**  **Wk** | **Theory** | | **Sessional** | **Practical** | **Total** | **(Hrs)** |
| 1 | **EE-401N\*** | **Utilization of Electrical Energy** | 3 | 1 |  | 4 | 75 |  | 25 |  | 100 | 3 |
| 2 | EEN-403N | Electronic Instruments and Measurements | 3 | 1 |  | 4 | 75 |  | 25 |  | 100 | 3 |
| 3 | EEN-405N | Advance Programming | 3 | 1 |  | 4 | 75 |  | 25 |  | 100 | 3 |
| 4 | \*\* | Elective - I | 3 | 1 |  | 4 | 75 |  | 25 |  | 100 | 3 |
| 5 | \*\* | Elective - II | 3 | 1 |  | 4 | 75 |  | 25 |  | 100 | 3 |
| 6 | EEN-407N | Electronic Instruments and Measurements Lab |  |  | 2 | 2 |  |  | 40 | 60 | 100 | 3 |
| 7 | EEN-409N | Advanced Programming Lab |  |  | 2 | 2 |  |  | 40 | 60 | 100 | 3 |
| 8 | EEN-411N | Minor Project |  |  | 3 | 3 |  |  | 75 | 75 | 150 | 3 |
| 9 | EEN-413N | Industrial Training-II |  |  | 2 | 2 |  |  | 100 |  | 100 | 3 |
|  |  | Grand Total | 17 | 5 | 9 | 29 | 375 |  | 380 | 195 | 950 |  |

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| **Elective - I** | | **Elective - II** | |
| EEN-415N | HVDC Transmission | EEN-421N | Non-Conventional Energy Sources |
| EEN-417N | Microwave and Radar | EEN-423N | Operating System |
| EEN-419N | Antenna & Wave Propagation | EEN-425N | Power System Planning |

**Note**: 1. \* Subject Common with VII Semester. B.Tech. [Electrical Engg.] Scheme, K.U.K.

2. The Minor Project should be initiated by the student in the VII th semester beginning and will be evaluated in the end of the semester on the basis of a presentation and report submitted to the department.

3. **Industrial Training-II** undergone by the students after VI sem is to be evaluated during VII sem as **(EEN-413N)** through submission of certified computerized report to the H.O.D. followed by conduct of viva-voce & seminar/presentation.

**VIII SEMESTER (w.e.f. 2018-2019)**

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| **S. No.** | **Course** | **Course Title** | **Teaching** | | | | **Allotment of Marks** | | | **Total** | **Dur.** |
| **No.** |  | **Schedule** | | | |  |  |  |  | **of** |
|  |  | **L** | **T** | **P** | **Hr/** | **Theory** | **Sessional** | **Pract.** |  | **Exam** |
|  |  |  |  |  | **Wk** |  |  |  |  | **(Hr)** |
| 1 | EEN-402N | Modern Trends in Communication | 3 | 1 |  | 4 | 75 | 25 |  | 100 | 3 |
| 2 | EEN-404N | Modeling and Simulation | 3 | 1 |  | 4 | 75 | 25 |  | 100 | 3 |
| 3 | **EE-406N\*** | **Special Electrical Machines** | 3 | 1 |  | 4 | 75 | 25 |  | 100 | 3 |
| 4 |  | Elective - III\*\* | 3 | 1 |  | 4 | 75 | 25 |  | 100 | 3 |
| 5 |  | Elective - IV\*\* | 3 | 1 |  | 4 | 75 | 25 |  | 100 | 3 |
| 6 | EEN-408N\*\*\* | Major Project |  |  | 3 | 3 |  | 75 | 75 | 150 | 3 |
| 7 | EEN-410N | Simulation Lab |  |  | 2 | 2 |  | 40 | 60 | 100 | 3 |
| 8 | EEN-412N | Electronic Design Lab |  |  | 2 | 2 |  | 40 | 60 | 100 | 3 |
| 9 | EEN-414N\*\*\*\* | General Fitness & Professional Aptitude |  |  |  |  |  |  | 100 | 100 |  |
|  |  | TOTAL | 15 | 5 | 7 | 27 | 375 | 280 | 295 | 950 |  |

**Note:** 1. \* Subjects Common with VIII Semester. B.Tech. [Electrical Engg.] Scheme, K.U.K.

1. *\*\** The students should opt two departmental electives subjects from the list of core elective subjects.
2. \*\*\*The Major project should be initiated by the student in continuation of the VII semester and will be evaluated in the end of the semester on the basis of a presentation and Report.
3. \*\*\*\* A viva of the students will be taken by external examiner (Principal/Director/Professor/or any senior Person with Experience more than 10 years) at the end of the semester.

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| **Elective - III** | | **Elective - IV** | |
| EEN-420N | Computer Architecture and Organization | EEN-426N | Digital Image Processing |
| EEN-422N | Radio & TV Engineering | EEN-428N | Software Engineering |
| EEN-424N | Advanced Microprocessor and Interfacing | EEN-430N | Fuzzy logic & Neural Networks |

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EE-401N** | **Utilization of Electrical Energy** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Illumination: Term used in illumination, Law’s of illumination, sources of light, arc lamp incandescent lamp, discharge lamp, sodium vapor, mercury vapor lamp, florescent tubes, lightening schemes, method of lightning calculation.

**UNIT II**

Electrical Heating:Advantages of Electrical Heating, various types of Electrical heating, Power frequency and High frequency heating, Degree of heating element, Equivalent circuit of arc furnace, Resistance heating, Arc heating, Induction heating, dielectric heating etc.

Electric Welding:All types of electrical welding, resistance welding, arc welding, electrical winding equipment, Comparison between AC & DC welding, types of electrodes, advantages of coated electrodes.

**UNIT III**

Electroplating:Basic principle, faraday’s law of electrostatics, terms used, Application of electrolysis, factors governing electro deposition, power supply.

Refrigeration & Air Conditioning:Basic principle, various compression cycle & system its application, electric circuit of refrigerator, air conditioner.

**UNIT IV**

Traction Motors:Different system of electric traction, comparison between AC & DC system, block diagram of traction system ,Starting-Speed control and braking- Speed control and braking –Speed time curves,-Mechanics of Train movement-Tractive effort for acceleration – Power and energy output from driving axles-Specific energy output and consumption-Train resistance.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. Dr.S.L.Uppal, Electrical Power, Khanna Publishers, New Delhi
2. M.L.Soni,P.V.Gupta,U.S.Bhatnagar,A.Chakrabarti,”A TextBook On Power System Engineering”, Dhanpat Rai & Co,New Delhi
3. H.Pratap, Art and Science of Utilization of Electric Energy, Dhanpat Rai & Sons, New Delhi
4. G.C.Garg, Utilization of Electric Power and Electric Traction, Khanna publishers, New Delhi

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-403N** | **Electronic Instruments and Measurements** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

C.R.O.: Introduction, Cathode Ray Tube (CRT), Electron Gun, Electrostatic Focusing, Electrostatic Deflection, Post Deflection Acceleration of Electron Beam, Effect of Beam Transit Time, Frequency limitation. Deflection plates, Screens of CRT’s Graticule Aquadog, Applications, Storage C.R.O. Digital CRO. Design of delay lines for CRO.

Amplifier Measurement: Amplifier Measurements, Transient response of Amplifiers, Measurements of Noise figure of Amplifier, Harmonic Distortions analyzer, Distortion Meter, Measurement of op- amp parameters.

**UNIT II**

Digital Instruments: Digital Indicating instruments, comparison with analog type digital display methods, theory and applications of digital voltmeters. Transistor, FET and other type of voltmeters. Electronic Galvanometers, Q-meter.

Frequency Measurements: - Measurements of frequency use cavity wave-meter. Heterodyne frequency meter, comparison of frequency using interpolation method. Digital frequency meter. Frequency measurements using digital means.

**UNIT III**

Signal Conditioning & Acquisition System: Signal conditioning, A/D converter, D/A Converter, Use of op-amp in signal conditioning, Components of analog data acquisition System. Components of digital data acquisition system, signal conditioning, multiplex special Encoders, Principles of Telemetry, Wire link channels, Ratio channels, and Microwaves Channels.

**UNIT IV**

Instruments For Signals Generation: Pulse and square wave circuits, Laboratory square wave and pulse generators, Function generators, Random noise generators, Frequency Synthesizer.

Bio-Medical Instruments:- ECG, EEG, EMG & Measurement of BP.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit..

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**References:**

1. A course in Electrical & Electronics Measurement & Instrumentation: By A.K. Sawhney.
2. Electronics Instruments & Measurements techniques: By Helffrick & Cooper (PHI)
3. Instrumentation devices & Systems: By C.S. Rangan, G.R. Sharma & V.S. Mani.
4. Bio- medical Instrumentation & measurements: By Leslie Cromwell, Fred. J. Weibell, Erich A. Pfeitter (PHI).

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-405N** | **Advance Programming** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Review of Elementary Data Structures: arrays, stacks, queues, link list with respect to storage representation and access methods.

**UNIT II**

Searching Methods: Sequential, binary, Indexes searches**.**

**UNIT III**

Sorting: internal and external sorting, Methods: bubble, insertion, selection, merge, heap, radix and quick sort. Comparison with respect to their efficiency.

**UNIT IV**

C++ Programming Language: Concept of object oriented programming, Abstract Data type C classes, Data encapsulation, inheritance, polymorphism, virtual function templates implementation using C++.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. Trembley and Sorenson, “An Introduction of data structures with application” McGraw Hill.
2. Goodman, S.E., and Hetedniemi, S.T, “Introduction to the design and Analysis” , McGraw Hill.
3. Herbert Schildt, “C++ Computer reference”, TMH.
4. Herowitz E and Sahni S. “Fundamentals of Data Structures”.

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| Code | Nomenclature of Subject | P | Int | Ext. | Total | Time |
| **EEN-407N** | **Electronic Instruments and Measurements Lab** | **2** | **40** | **60** | **100** | **3Hr** |

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

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| Code | Nomenclature of Subject | P | Int | Ext. | Total | Time |
| **EEN-409N** | **Advance programming lab** | **2** | **40** | **60** | **100** | **3Hr** |

**List of Experiments:**

Write a program to perform following operations on linked list.

1. Insertion of a node
2. Deletion of node.
3. WAP to implement stack.
4. WAP to implement queues.
5. WAP to sort a list using following.
6. Insertion sort and. Quick sort
7. Bubble sort and Merge sort
8. Selection Sort and Radix sort
9. WAP to find roots of quadratic equation using polymorphism.
10. WAP to find addition & multiplication of two matrices using classes.
11. WAP which shows the use of inheritance.
12. WAP to implement the concept of copy constructor & destructor.

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

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-402N** | **Modern Trends in Communication** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Digital Communication: Introduction to sampling theorem for band limited & band pass signals, bit rate, detection levels, Digital filtering, Pulse code modulation, Adaptive data modulation, coding, Coding efficiency, introduction to used codes. Error detection & corrections codes, ASK,FSK, PSK,DPSK,QPSK.

**UNIT II**

Satellite Communication:Introduction, Satellite orbits, frequency used, station keeping, orientation of satellite, transmission paths & its losses & noise consideration. Satellite systems flux density, effective isotropic radiated power, link budget calculations, multiple accessing techniques.

**UNIT III**

Fiber Optic Communication: Introduction, advantages & disadvantages, principle of light transmission in a fiber, types of optical fibers, effect of index profile on propagation, modes of propagation. Number of modes via fiber, single mode propagation, Rayleigh scattering losses, absorption losses, mode coupling losses, bending losses, combined losses, effect of dispersion on pulse transmission, inter model dispersion, material dispersion, wave guide dispersion, total dispersion.

**UNIT IV**

Optical Communication: LEDs, semiconductor laser diode, the PN photodiode, PIN diode. The avalanche photo diode, fiber optic communication system block diagram & loss budget, connectors & Splices.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. Dennis Roddy & John Collen: Electronics Communication.(PHI)
2. John Gowar: Optical communication system (PHI)
3. D. C. Aggarwal : Satellite Communication

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-404N** | **Modelling and Simulation** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT 1**

Introduction: Systems, Models and simulation, concept of model, model classification and mathematical representation, Identification, continuous and discrete, static and dynamic, deterministic and stochastic systems.

**UNIT 2**

Discrete event systems: Introduction, statistical model in simulation, random number generation, method of generating random variables, discrete random variates, generating correlated random numbers.

Queuing models: Characteristics, queuing notation, single server and multiple server systems.

**UNIT 3**

Simulation: State space simulation techniques, Digital simulation languages, Analog simulation of linear systems, magnitude scaling, time scaling, simulation equations, transfer function simulator, hybrid simulation. Load flow, short circuit and steady state stability studies. Transmission parameters.

**UNIT 4**

Matlab: Matlab environment, programming, modeling, with matrices, simulation in Matlab, introduction to dynamic system simulation using SIMULINK, applications of simulink.

Note: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. Banks J. Carson J.S and Nelson B: Discrete Event system simulation, PHI.
2. Celler F.E. Continuous system simulation, Springer verilag.
3. Athanasios Papoulis: Probability Random variables and Statistics Processes, Mc-Graw Hill.
4. Reference manual & user’s guide on Matlab.
5. Analog computation & simulation (V Raja Raman)
6. System simulation with digital computer ( D E O )
7. System simulation (Jorden).
8. System modeling & Computer Simulation by Nain A. Kheir. Marcel Dekker Inc.
9. Discrete Event System Simulation, PHI Banks J. Carson J. S. and Nelson B.
10. Advanced Computer methods for power system Analysis- Stagg and Elabiad.
11. Advanced power System L.P.Singh( New Age Publication.

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EE-406N\*** | **Special Electrical Machines** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Different types of FHP motors and uses in domestic & industrial applications, Single phase Induction motor, Qualitative examination starting and running performance of I-Phase Induction Motors.

**UNIT II**

Linear Induction Motors and Actuators and its principle of operation, Linear Levitated machine & applications, Permanent magnet motors, High performance energy efficient machines, Effect of E.M.F injected into secondary circuits , quantitative study, discharge motor.

**UNIT III**

Special Induction generations, Special motors and generators associated with Wind, Solar, Tidal, Biogas and other unconventional energy forms and their applications.

**UNIT IV**

Synchronous motors, Series universal motors, Stepper motor, Permanent magnet D.C. motor, Permanent magnet AC motors, Switch reluctance motors. Servo motor, shaded pole motor, brush less D.C motor, Typical applications in Computers, Electronics, Communications and Information Technologies.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. Generalized Electrical Machines by P. S. Bhimbra

2. Generations of Electrical Energy by A. E. Fitzgerald/Charles, Kingsley J. R.

3. The Performance &design of A.C Commutator Motor by O.E .Taylor

4. Performance & Design of A.C machines by M.G. Say.

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| Code | Nomenclature of Subject | P | Int | Ext. | Total | Time |
| **EEN-410N** | **Simulation Lab** | **2** | **40** | **60** | **100** | **3Hr** |

**Perform the experiments using C/C++/Matlab Language**

**List of Experiments:**

To develop a Program for Matrix n\*n.

1. Add two Matrixes.
2. Multiplication of two Matrixes.
3. Find Inverse of Matrix.
4. Check stability by Routh Hurwitz Criteria.
5. Check stability by Jury Test.
6. Draw a circle for given radius use graphics.
7. Draw a straight-line use graphics.
8. Find Eigen value for given Matrix.
9. To develop a program for Cramer’s Rule
10. To develop a program for Tower of Hanoi.

**NOTE:** At least 7 experiments are to be performed with 6 from above list, remaining may either be performed or designed & set by concerned institution as per the scope.

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| Code | Nomenclature of Subject | P | Int | Ext. | Total | Time |
| **EEN-412N** | **Electronic Design Lab** | **2** | **40** | **60** | **100** | **3Hr** |

**List of Experiments:**

1. Design a single stage R C Coupled amplifier and plot its gain frequency response.
2. Design a two stage R C Coupled amplifier and plot its gain frequency response.
3. Design a R C Phase shift oscillator using IC 741.
4. Design a Wein bridge oscillator.
5. Design a square wave generator using IC 555.
6. Design a 4: 1 multiplexer and 1: 4 Demultiplexer using logic gates.
7. Design a parallel parity bit generator using ICs.
8. Design a digital to analog converter using ICs.
9. Design a digital frequency meter (0-999HZ) using IC 555 for Monoshot, IC-

7404,7408,7490,7447.

1. Design a controller such that LEDs glow in pairs sequentially using IC 7490 and LEDs.

**NOTE:** At least 10 experiments are to be performed with at least 7 from above list, remaining 3 may either be performed from the above list or designed & set by concerned institution as per the scope of the syllabus.

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-415N** | **HVDC Transmission** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Merits and Demerits of HVDC over EHVAC, type of HVDC links, Analysis Of 3- phase bridge converter with grid control for U  60 and U  60, derivation of equivalent circuit of HVDC link.

**UNIT II**

Basic means of control of HVDC link, C.C.A., C.C. and C.E.A, Control Characteristics of a converter, Harmonics in HVDC Operation, types of filters used for harmonic elimination, characteristics harmonics, characteristic AC current harmonics, Non characteristics AC harmonics, harmful effects.

**UNIT III**

Protection aspects of a HVDC link, types of faults, over current protection, over voltage protection, ground and short circuit fault & their protection.

**UNIT IV**

Parallel operation of A.C. and D.C. Systems. Corona & R.I characteristics of HVDC link.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. K.P. Padyar, “HVDC Power Transmission Systems”, Wiley Eastern Ltd.
2. E.W. Kimbark, “Direct Current Transmission”, Vol.I, Wiley Intersect
3. J. Arrillage, “High Voltage Direct Current Transmission”, Peter Peregrines
4. S. Rao,” EHV-AC and HVDC transmission Engineering Practice”, Khanna publishers

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-417N** | **Microwave and Radar** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Introduction to microwaves and tubes, Microwave Devices: Advantage of Microwaves, limitation of conventional tubes, Light house tube, Multicavity & Reflex klystron, Magnetron

**UNIT II**

Tunnel diode, Gunn diode, Parametric amplifier, Masers, TWT, IMPATT, TRAPTT, Microwave solid state devices.

**UNIT III**

Microwave Circuits: Scattering matrix, impedance transformation & Matching, passive Microwave devices (E-plane &H-plane Tee, Magic Tee, Circulator, Attenuator, isolators, directional coupler, TE, TM & TEM modes in Rectangular wave guides, resonators, 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, Radar signal processing, applications of radar, radio aids to navigation.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. Liao S.Y.: Microwave Circuit & Devices, PHI.
2. Skolnik M. K.: Introduction to Radar system, McGraw Hill.
3. Siegman A.E. : An introduction to lasers & Masers, McGraw Hill.
4. M. Kulkarni: Microwave & Radar Engineering, Umesh Publication.
5. Gautam A. K. : Microwave Engineering , S.K. Kataria & Sons.

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-419N** | **Antenna & Wave Propagation** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Basic Principle: Scalar & vector potential for electric & magnetic components, Retardation, retarded vector potential relation between scalar & vector potential current element.

Basic Antennas: Half wave dipole, quarter wave mono pole, short dipole, calculation of radiation resistance, effective length & pointing vector. Current distribution: Linear current & sinusoidal distribution.

**UNIT II**

Antenna Parameter: Solid angle, radiation intensity, directive gain directivity, power gain, beam width: HPBW, FNBW, band width, Q factor resonance in antenna, antenna as a transmission line, antenna as active component, antenna temp. Radiation pattern, Eplane H plane, efficiency. Effective aperture, scattering aperture, loss aperture, directivity, polarization. Transmission between two Antenna, Reciprocity theorem application of Reciprocity theorem.

Low Freq Antennas: Monopole, folded, loop antenna, biconical antenna, yagi-uda antenna: different antenna used for A.M & FM transmission. VHF & LHF antennas, Resonant Antennas & non-resonant antenna, design parameter of different Antenna.

**UNIT III**

Microwave Antenna: Parabolic Antenna, Lens Antenna, horn Antenna, Antenna used for tracking & antenna used for satellite communication. E-plane horn, H-Plane horn circulars Horn, pyramidal Horn.

Radio Wave Propagation: Different technique for radio wave propagation: Ground wave propagation, space wave, sky wave, duct propagation, troposcatter.

**UNIT IV**

Ionosphere propagation: Skip distance, LUF, MUF, Critical freq, Variation of refractive index with height, effect of earth magnetize field on ionospheres propagation, calculation of refractive index dielectric constant & Conductivity for ionospheres. Ionospheres abnormalities.

Antenna Array: Multiplication of Pattern, Significance of Antenna Array, Broadside, and End fired, Uniform, and Parasitic feed in Antenna Array, Calculation of Directivity & B.W for Antenna array. Increased directed directive end fired array. Tapering of Array: Binomial Array, chebyshev array

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. Jordan Balmian:- Electromagnetic Field Theory (PHI)
2. Kraus Antenna & Wave propagation (Mc Graw Hill)
3. Antenna & Wave propagation by K.D.Prasad (Satya Prakashan)
4. Collin R.E :- Antenna & Wave Propagation (TMH).

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-421N** | **Non-Conventional Energy Sources** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**Unit I**

Introduction: Energy demand of world and country and gap analysis, Fossil fuel based systems, Impact of fossil fuel based systems, Non conventional energy – seasonal variations and availability, Renewable energy – sources and features, Hybrid energy systems. Distributed energy systems and dispersed generation (DG).

**Unit II**

Solar thermal systems: Solar radiation spectrum, Radiation measurement, Technologies, Applications, Heating, Cooling, Drying, Distillation, Power generation; Costing: Life cycle costing (LCC), Solar thermal system.

Solar Photovoltaic systems ,Operating principle, Photovoltaic cell concepts ,Cell, module, array, Series and parallel connections, Maximum power point tracking, Applications ,Battery charging, Pumping , Lighting,Peltier cooling , Costing: Life cycle costing ,Solar PV system

**Unit III**

Microhydel: Operating principle, Components of a microhydel power plant, Types and characteristics of turbines, Selection and modification, Load balancing, Costing: Life cycle costing -Microhydel

Wind; Wind patterns and wind data, Site selection, Types of wind mills, Characteristics of wind generators, Load matching, Life cycle costing - Wind system LCC

**Unit IV**

Biomass: Learning objectives, Operating principle, Combustion and fermentation, Anaerobic digester, Wood gassifier, Pyrolysis, Applications, Bio gas, Wood stoves, Bio diesel, Combustion engine, Life cycle costing - Biomass system LCC

Hybrid Systems, Need for Hybrid Systems, Range and type of Hybrid systems, Case studies of Diesel-PV, Wind-PV, Microhydel-PV, Biomass-Diesel systems, electric and hybrid electric vehicles

**References:**

1. Ashok V Desai, Non-Conventional Energy, Wiley Eastern Ltd, New Delhi
2. Mittal K M, Non-Conventional Energy Systems, Wheeler Publishing Co. Ltd, New Delhi
3. Ramesh R & Kumar K U, Renewable Energy Technologies, Narosa Publishing House, New Delhi
4. Wakil MM, Power Plant Technology, Mc Graw Hill Book Co, New Delhi

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-423N** | **Operating System** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Introduction: Operating System Services-types.

File Systems: File concept, File support, Access methods, Allocation methods, Directory Systems, File protection.

CPU Scheduling: Review of multiprogramming concepts, scheduling concepts, Scheduling algorithms, Algorithm evaluation, multiple processor scheduling.

**UNIT II**

Memory Management:Bare machine concept, Resident monitor, Swapping-Multiple partitions, Paging, Segmentation, Combined systems, Virtual memory, Demand paging, Page replacement algorithms, Thrashing, Cache memory.

**UNIT III**

*I/O Management* And Disk Scheduling: Organization of I/O function, Logical structure and I/O buffering, Memory physical characteristics, First come first served scheduling,

Protection: Goals of protection, Mechanisms and policies, Domain of protection, Access matrix, Dynamic protection structure, Language based protection, Protection problems, Security. Round robin, Shortest seek time first scheduling, SCAN, CSCAN, LOOK, CLOOK, Selecting a disk scheduling algorithm, Sector queuing.

**UNIT IV**

Concurrency: Principle of concurrency, Mutual exclusion, Software support, Dekker’s algorithm, Hardware support, Operating system support, Semaphore Implementation, Messages, Deadlock presentation , Deadlock detection, Deadlock avoidance, recovery.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. James L. Peterson and Abraham Silbersachatz, Operating System Concepts, Addison Wesley, World Students Series Edition, Second edition
2. Harvey M. Deitel, An Introduction to Operating Systems, Addison Wesley Publishing Company, Revised First edition
3. John J. Donovan, Systems Programming, McGraw Hill Book Co., International Student Edition

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-425N** | **Power System Planning** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Load Forecasting: Introduction, Classification of loads, methods of load forecasting.

Scope of power system planning and design significance:Computer programming for planning, generation, transmission, Investment growth, generation cost.

**UNIT II**

Reliability of Transmission and Distribution System: Definition of reliability, bath tub Curve, Two state model, failure and repair rate, Probability density function, probabilities of survival and failure, mean time to failure, Mean down time, continuous Markov’s process, reliability of series and parallel system, Approximate method, reliability planning, and perception of reliability models.

**UNIT III**

Reliability Schemes in Power System: Introduction, Marine power plant, Nuclear , Power plant, General Complex systems, Failure modes and effect analysis, Fault free Analysis of power systems.

**UNIT IV**

Operation and Control of Interconnected Power systems(AGC and SCADA): Main tasks planning , operation , accounting , Tasks of national control center, Regional control center, Generating station control room, Tasks of major substations, AGC- SCADA, Normal state - Restoration, system security, factors affecting security, load flow, state estimation.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. Switch gear protection and power system by SUNIL S. RAO.
2. Power System Analysis and stability by S.S. Vadhera.
3. Power System Design and Analysis by B.R. Gupta
4. System Engg. & Reliability by L. S. Srinath

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-420N** | **Computer Architecture and Organization** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Evolution of computers: Generation of computer system, different types of computers, characteristics of Von Neumann architecture, Limitation of computer systems, Parallel computer structures.

Instruction formats, addressing modes and instruction types: Principles of linear pipelining, Classifications of pipeline processor, Interleaved memory organizations, Instructions and arithmetic pipelines, Design examples, vector processing requirements, characteristics of vector processing.

**UNIT II**

Multiprocessor: Architecture, Functional structure, Loosely coupled multiprocessors, Tightly coupled multi processor, Processor characteristics for multiprocessing, Inter- connection networks, Time shared, crossbar switch and multiport memories and multistage networks for multiprocessors, classification of multiprocessor operating system.

**UNIT III**

AL Unit: Construction, Integer representation, Binary half adder, full adder, Parallel Binary adder, Addition and subtraction in a parallel arithmetic element, Full adder design, BCD adder, Positive and negative BCD number, Shift operations, Basic operations, Logic operations, Multiplexer, High Speed arithmetic.

Control Unit: Construction of an instruction work, Instruction cycle and execution cycle, organization of control registers, Instruction formats, Controlling arithmetic operations, Typical Sequence of operations, Instruction set, Register transfer language, Microprogramming- Micro instruction format, Simple micro program, Microprogramming applications.

**UNIT IV**

Memory: Basic concepts, memory device characteristics, semiconductor memories, static and dynamic memories. Random access and serial access memories. Memory hierarchies- cache, virtual, interleaved and associative memories.

**I**/O Devices: Input media, Keyboards, Mouse, Pointing Devices, character recognition (MICR & OCR), Output devices, CRT, Flat panel display, Printers, Tele printer (TTY).

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit.

**References:**

1. Hay, “ Computer Architecture And Organizations” TMH
2. Stalling , “Computer Organization” PHI
3. Tannanbaum, “Structured Computer Organization” TMH

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-422N** | **Radio & TV Engineering** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Radio Transmitter: Modulation, AM Transmitter, FM Transmitter; AFC,Sensitivity selectivity, VODAS, Radio Transmitter, Telephone transmitter Privacy device, Radio telegraph transmitter.

**UNIT II**

Radio receiver: TRF, super-heterodyne, communication receiver, double conversion receiver, SSB Rx, freq synthesis, image freq, selectivity. IF freq tracking AFC & AGC n Rx, FM demodulator, neutralization, freq drift & scintillation, Diversity reception, fading, Armstrong FM Rx.

**UNIT III**

Monochrome T.V: Introduction, composite video signal picture tube, camera tube image orthicon, vidicon, plumbicon TV Tx & Rx, modulation technique, TV Application CATV, CCTV, Video games Theater T.V., VTR, AGC, Various AGC system

**UNIT IV**

Color T.V.: Compatibility, three color theory different color picture tube, color signal transmission, NTSC, Color TV, PAL, SECAM

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all selecting at least one question from each unit.

**References:**

1. Monochrome & color T.V. by R.R.Gulati (Wiley Eastern Ltd.)
2. Radio Engineering by G.K. Mithal (Khanna Publications)
3. A.M Dhaka, “ Monochrome & color T.V” (TMH)
4. Skolnik.M.I,” Introduction to Radar System” (TMH)

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-424N** | **Advanced Microprocessor and Interfacing** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

8086 Microprocessor: 8086 Internal Architecture timing diagram, interfacing 8086 to memory.

**UNIT II**

8086 Assembly Language Programs: 8086 instruction set, Assembler directive, program development method, writing simple 8086 programs for use with an assembler.

**UNIT III**

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

Interfacing: Digital interfacing, Programming parallel port and handshake I/O, Interfacing a Microprocessor to keyboards & displays, Analog interfacing, introducing to A/D and D/A Converter & applications.

**UNIT IV**

Introduction to 80286, 80386, 80486 microprocessor and Single chip microcontrollers.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. V. Hall “ Microprocessor & Interfacing Programming & Hardware-IInd Edition”, TATA Mc Graw Hill.
2. A.P. Mathur “, Introduction Microprocessor–IIIrd Edition”, (TMH)
3. Tabak. D,” Advanced Microprocessor- Duglas 2nd edition,” (TMH)

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-426N** | **Digital Image Processing** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Digital Image Fundamentals: Introduction, image model, sampling and Quantization, relationship between pixels, imaging geometry, photographic film, discrete, Fourier transform, properties of two dimensional Fourier transform, fast Fourier transform.

**UNIT II**

Image Enhancement and Compression: Enhancement by point processing, spatial filtering and enhancement in the frequency domain, pseudo color image processing, image compression models, error free compression, image compression standards.

**UNIT III**

Image Restorations: Degradation, models, diagonalizations of matrices, inverse filtering, interactive restorations, geometric transformations.

Image Segmentation: Detection of discontinuities, edge linking and boundary detection, thresholding, region orienting segmentation.

**UNIT IV**

Representations and Recognition: Representations schemes, boundary descriptors, regional descriptors, morphology, recognition and interpretation, basics.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References**

1. Rafael c. Gonzalez and Richard E. Woods, digital image processing, Addison Wesley publishing company
2. William K. Pratt, digital image processing, John Wiley and sons
3. Jain, Fundamentals of digital image processing, PHI
4. Barrie W. Jervis , “digital signal processing (Pearson education India)
5. Prokis, “ digital signal processing” (PHI)

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-428N** | **Software Engineering** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT- I**

Introduction: Programs vs. Software products, Emergence of Software Engineering, Notable Changes in Software Development Practices, Software Life Cycle Models.

Software Project Management: Project Planning, Project Size Estimation Matrices, Project Estimation Techniques, Empirical Estimation Techniques, COCOMO- A heuristic Estimation Technique, Halstead’s software Science- An Analytical Technique, Staffing Level Estimation, Scheduling, Organization and Team structures, Staffing, Risk Management, Software Configuration Management.

**UNIT- II**

Requirements Analysis and Specification: Requirements Analysis, Software Requirements Specification (SRS), Formal System Development Techniques, Algebraic Specifications, Software Design: Good Software Design/Practices, Cohesion and Coupling, Neat Hierarchy, Software Design Approaches.

Function-Oriented Software Design: Overview of the SA/DK Methodology, Structured Analysis, Data Flow Diagrams (DFDs), Extending the DFD Technique to Real Time Systems, Structured Design.

**UNIT- III**

Object Oriented Software Design: Overview of Object-Oriented Concepts, Object- Oriented vs. Function –Oriented Design, Graphical Representation of Object- Oriented Design, Object-Oriented Design Methodology.

User Interface Design: Characteristics of a Good User Interface Design, Basic Concepts, Command Language –Based Interface, Menu-Based Interface, Director Manipulation Interfaces, Windowing Systems, Types of Widgets, An overview of X Window/MOTIF, Visual C++.

**UNIT-IV**

Software Reliability and Quality Assurance: Software Reliability, Software Quality, Software, Software Quality Management, ISO 9000, SEI Capability Maturity Model. Computer Aided Software Engineering: CASE and its Scope, CASE Support in Software Architecture of a CASE Environment.

**NOTE:** The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. Rajib Mall, “ Fundamentals of Software Engineering”, PHI
2. RogerS.Pressman ,“Software Engineering A Practitioner’s Approach, McGraw-Hill.
3. Ali Behforooz and Frederich J. Hudson, “ Software Engineering Fundamentals”, Oxford University Press.

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| Code | Nomenclature of Subject | L | T | Int. | Ext. | Total | Time |
| **EEN-430N** | **Fuzzy Logic & Neural Networks** | **3** | **1** | **25** | **75** | **100** | **3 Hr** |

**UNIT I**

Introduction to Fuzzy sets, Crisp sets, Basic concepts of Fuzzy sets, L-fuzzy sets, level 2-fuzzy sets, type 2-fuzzy sets. Fuzzy sets Vs. Crisp sets. Fuzzy Arithmetic, Algebraic operations, set-theoretic operations, fuzzy relation on sets & fuzzy set compositions of Fuzzy relations, properties of the minimum-maximum composition.

**UNIT II**

Introduction to Fuzzy control, Fuzzy logic controller components, Construction of Fuzzy sets(Direct methods, Indirect method), Introduction to Expert system, Case study on fuzzy logic controller, Application of Fuzzy control.

**UNIT III**

Introduction to Neural Networks, Artificial Neuron model, Neural Network controller, Multilayer Network, Back propagation Algorithm (Forward, Backward), learning control Architecture (Indirect learning, General, Forward Inverse), Simplex matrix operation.

**UNIT IV**

Network Application of Neural: The traveling salesman problem, Time series prediction.

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all, selecting at least one question from each unit.

**References:**

1. James A. Anderson “Introduction to Neural Networks”, Prentice Hall India.
2. H.J. Zimmermann “Fuzzy set theory & its Applications “, Allied Publishers Ltd.
3. Nil Junbong “Fuzzy Neural Control Principles & Algorithm”, PHI.
4. N.K. Bose “Neural Network Fundamental with Graphics “, TATA McGraw Hill.
5. Klir George J. “Fuzzy sets and Fuzzy Logic Theory and Applications”, PHI.
6. J.M Zurada , “ Introduction to Artificial Neural Network” , Jaico Publishers