

Bachelor of Technology (Electrical Engineering) w.e.f. Session 2018-19

Scheme of Studies/ Examination

VII semester

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs)
			L	T	P	Hrs/Week	Theory	Sessional	Practical	Total	
1	EE-401N*	Utilization of Electrical Energy	3	1		4	75	25		100	3
2	EE-403N	Transducers & Their Applications	3	1		4	75	25		100	3
3	EE-405N	High Voltage Engineering	4	1		5	75	25		100	3
4	**	Elective-I	4	1		5	75	25		100	3
5	***	Elective-II	4	1		5	75	25		100	3
7	EE-415N	Transducers Applications Lab			3	3		40	60	100	3
8	**	Elective-I Lab			3	3		40	60	100	3
9	EE-423N	Minor Project			3	3		75	75	150	3
10	EE-425N	Industrial Training- II			1	1		100		100	
		Total	18	5	10	33	375	380	195	950	

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 (EE-425N) through submission of certified computerized report to the H.O.D. followed by conduct of viva-voce & seminar/presentation.

Elective-I with corresponding lab:

**	Elective-I		Elective-I Lab	
Set-I	EE-407N	Programmable Logic Controllers & Applications	EE-417N	Programmable Logic Controllers Lab
Set-II	EE-409N	Advanced Programming	EE-419N	Advanced Programming Lab

***	Elective-II
-----	--------------------

EE-411N	Electrical Estimation and Costing
EE-413N	Power System Operation and Control
EE-421N	Operations Research

Bachelor of Technology (Electrical Engineering) w.e.f. Session 2018-19

Scheme of Studies/ Examination

VIII semester

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam(hrs)
			L	T	P	Hrs/Week	Theory	Sessional	Practical	Total	
1	EE-402N	Computer Methods in Power System	4	1		5	75	25		100	3
2	EE-404N	HVDC Transmission	4	1		5	75	25		100	3
3	EE-406N*	Special Electrical Machines	3	1		4	75	25		100	3
4	**	Elective-III	4	1		5	75	25		100	3
5	***	Elective-IV	3	1		4	75	25		100	3
6	EE-416N	Power System Lab			2	2		40	60	100	3
7	EE-418N	Computer methods in Power System Lab			3	3		40	60	100	3
8	EE-420N	Major Project			6	6		75	75	150	3
9	EE-422N****	General Fitness & Professional Aptitude							100	100	3
		Total	18	5	11	34	375	280	295	950	

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

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.

**Elective-III	EE-408N	Electrical Energy Conservation and Auditing
	EE-410N	Fuzzy logic and Neural Network
***Elective-IV	EE-412N	Embedded system
	EE-414N	Power Management

INTERNATIONAL INSTITUTE OF ENGINEERING & TECHNOLOGY

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

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT I

Illumination: Term used in illumination, Law's of illumination, sources of Light, arc lamp incandescent lamp, discharge lamp, sodium vapour, mercury vapour lamp, fluorescent 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.

Suggested Books:

1. Dr.S.L.Uppal, Electrical Power ,Khanna Publishers, New Delhi,1980.
2. M.L.Soni,P.V.Gupta,U.S.Bhatnagar,A.Chakrabarti,A Text Book On Power System Engineering, DhanpatRai&Co,New Delhi1997-98
3. H.Pratap, Art and Science of Utilization of Electric Energy, DhanpatRai& Sons, New Delhi,1980.
4. G.C.Garg, Utilization of Electric Power and Electric Traction, Khanna publishers, New Delhi,1995.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-403N	Transducers & Their Applications	3	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

UNIT - I

INTRODUCTION: Definition of transducer. Advantages of an electrical signal as out-put. Basic requirements of transducers, Primary and Secondary Transducer; Analog or digital types of transducers. Resistive, inductive, capacitive, piezoelectric, photoelectric and Hall effect transducers.

UNIT-II

CHARACTERISTICS OF A TRANSDUCER: Static characteristics - Accuracy, Precision, Sensitivity, Linearity, Hysteresis, Threshold, Resolution, Dead time, Dead zone, Scale range, Scale span.

Dynamic characteristics - Speed of response, Measuring lag, Fidelity, Dynamic error mathematical model of transducer - Zero, I&II order transducer-Response to step, ramp & impulse inputs.

UNIT - III

RESISTANCE TRANSDUCERS: Principle of operation, construction, characteristics and applications of potentiometer, loading effects, Strain gauge - theory, types, temperature compensation, applications.

INDUCTIVE AND CAPACITIVE TRANSDUCERS: Self-inductance, Mutual inductance transducer, Induction potentiometer, Variable reluctance transducers, LVDT, RVD, Capacitive transducers - Variable air gap type - Variable area type - Variable permittivity type

Capacitor displacement transducer, Capacitor microphone and its applications.

UNIT - IV

ANALOG AND DIGITAL TRANSDUCERS Thermo electric transducer, Photovoltaic cell-Hall effect, Sound sensor, Seismic transducer, Piezo electric, Magnetostrictive, Fibre optic, Digital displacement transducer, Shaft angle encoder, Digital speed transducer, Introduction to MEMS and NANO sensors.

- y, "Instrumentation Measurement and Analysis," . Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. Thomas G. Beckwith etc. all, "Mechanical Measurements (International Student Edition), Addison-Wesley Longman, Inc. England.
 3. A.K. Sawhney, " A Course in Electrical and Electronic Measurements and Instrumentation," DhanpatRai&Sons, Delhi-6.

INTERNATIONAL INSTITUTE OF ENGINEERING & TECHNOLOGY

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-405N	High Voltage Engineering	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT I

Conduction & Breakdown in Gases, Liquid & Solid Dielectrics: Gases - Ionization process, Townsend's current growth equation. 1st & 2nd ionization coefficients. Townsend's criterion for breakdown. Streamer theory of breakdown. Paschen's law of gases. Gases used in practice.

Liquid Dielectrics - Conduction & breakdown in pure & commercial liquids, suspended particle theory, stressed oil volume theory, liquid dielectrics used in practice.

Solid Dielectrics - Intrinsic, electromechanical, & thermal breakdown, composite dielectric, solid dielectrics used in practice.

UNIT II

Insulating materials: Insulating materials in power transformers, rotating machines, circuit breakers, cables & power capacitors.

Generation of high D.C., A.C. impulse voltage & impulse currents. Tripping & control of impulse generators.

Measurement of high D.C., A.C. (Power frequency & high frequency) voltages, various types of potential dividers, generating voltmeter, peak reading A.C. voltmeter, Digital peak voltmeter, electrostatic voltmeter, Sphere gap method, factors influencing the spark voltage of sphere gaps.

UNIT III

High Voltage Testing of Electrical Apparatus: Testing of insulators, bushings, circuit breakers power capacitors & power transformers. Over voltage Phenomenon & Insulation Co-ordination:

Theory of physics of lightning flashes & strokes. Insulation co-ordination, volt time and circuit time characteristics. Horn gap single diverters, ground wires, surge absorbers.

UNIT IV

EHV Transmission & Corona Loss: Need for E.H.V. transmission, use of bundled conductors, corona characteristics of smooth bundled conductors with different configurations, corona loss, factors, affecting the corona. Shunt & Series compensation of E.H.V. lines. Tuned power lines. & H.V.D.C. Transmission:

Advantages, disadvantages & economics of H.V.D.C. transmission system. Types of D.C. links, converter station equipment, their characteristics.

Suggested Books:

1. Kamaraju & Naidu, "HV Engg."
2. RS Jha, "HV Engg."
3. Bagmudre "EHV AC Transmission Engg."
4. Kuffel & Abdullah, "HV Engg."

5. Kimbark, "HVDC Transmission

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-409- N	Advanced Programming	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT I

Review: Review of C language, standard library, basics of C environment, pre-processors directives, illustrative simple C programs, header files.

Review of elementary data structures arrays, stacks, queues, link list with respect to storage representation and access methods.

UNIT II

Searching Method: Sequential, binary, indexes searches.

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

UNIT III

Introduction to C++, C++ environment: objects, classes & their associations, object modeling techniques, namespaces, basics of OOP concepts: data encapsulation, abstraction, inheritance, reusability, polymorphism (compile time & run time). Illustrative C++ programs on the above topics.

UNIT IV

Topic in C++: Access specifiers: public, private & protected, Constructor: constructor with default arguments, parameterized constructors, copy constructors, destructors, function overloading, operator overloading, friend function & classes, types of inheritance, virtual functions. Illustrative C++ programs on the above topics.

Suggested Books:

1. Trembley and Sorenson, "An Introduction of data structures with application" MGH
2. Goodman, S.E. and Hetedniemi, S.T. "Introduction to the design and Analysis" MGH
3. Herbert Schildt, "C++ complete reference" TMH

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-407N	Programmable Logic Controllers & Applications	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT-I

Introduction: Programmable Logic Controller; Block diagram of PLC, advantages of PLCs Over Relay System; input output Section – Fixed input output, Modular input output, Discrete input output Modules, Analog input output Modules. Applications of PLC.

UNIT-II

Ladder Diagram & PLC Programming: Ladder Diagram Rules; Writing Diagram; Ladder Diagram; Basic Stop / START Circuit; Digital Logic gates; Sequenced Motor Starting; Relay Type Instruction; Programming a PLC; PLC Peripherals.

UNIT-III

PLC Instructions: Bit logic instructions, Logical instructions, mathematic instruction, move instruction, sequential and shift register instruction
Program Control Instructions: Master Control Relay Instructions; Latching Relay instruction; immediate input output instruction; Jump and Label Instruction.

UNIT-IV

Programming Timer & Counters: Cascading Timers, On delay timer, Off delay timer, retentive timer, example of timer application, Allen Bradley PLCs Counters; Up counter, down counter, cascading counter, Combining Timer & Counters, examples of counter industrial applications.

SUGGESTED Books

1. Hackworth, John R. and Hackworth, Jr. Frederick D., "Programmable Logic Controllers: Programming Methods and Applications", Pearson Education, 2004.
2. Webb, John W., & Reis, Ronal A., "Programmable Logic Controllers: Principles & Applications", Pearson Education / Prentice Hall, 2008.
3. Dunning, Gary, "Introduction to Programmable Logic Controllers", Delmar Thomson Learning, 2004.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-413N	Power System Operation and Control	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT I

Automatic Generation Control: Load frequency control (single area case); load frequency control and economic dispatch; optimal load frequency control; load management.

UNIT II

Economic Load Despatch: Introduction; Optimal Operation of Generators of Bus bar; Unit Commitment; Reliability Considerations; Optimal Generation Schedule Hydro thermal optimal scheduling.

UNIT III

Power System Stability: Steady state; transient and dynamic stabilities; equal area criteria; effect of fault clearing time on transient stability; dynamics of synchronous machine; factors affecting transient stability.

UNIT IV

Automatic Voltage Control & Excitation Systems: AVR's; role of AVR on transient stability of system; type 0 and 1 excitations system; power system stabilizers. Voltage Stability: Basic concept; Voltage collapse; modelling and prevention.

Suggested Books:

1. E.W. Kimbark, "Power System Stability", John Wiley & Sons, 2001
2. P.Kundur, "Power System Control and Stability", Tata McGraw Hill, 2006
3. B.R.Gupta, "Power System Analysis & Design", S. Chand & Sons, 2008
4. S.Rao "EHV-AC/DC Transmission System" ;KhannaPublishers, 1999.
5. William D. Stevenson, Jr., "Elements of Power System Analysis", Mc-Graw Hill International, Fourth Edition, 1982
6. Nagrath .I.J. and Kothari. D.P. "Power System Engineering", Tata Mcgraw Hill,. 2006

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-411N	Electrical Estimation and Costing	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT I

Design Considerations of Electrical Installations: General requirements of electrical installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations.

UNIT II

Electrical Installation for Different Types of Buildings and Small Industries: Electrical installations for residential buildings — estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.

UNIT III

Overhead and Underground Transmission and Distribution Lines: Introduction, Supports for transmission lines, Distribution lines — Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.

UNIT-IV

Substations: Introduction, Types of substations, Outdoor substation — Pole mounted type, Indoor substations — Floor mounted type.

Suggested Books:

- Electrical Design Estimating and Costing, K. B. Raina, S. K. BhattAcharya, New Age International Publisher.
- Design of Electrical Installations, Er. V. K. Jam, Er. Amitabh Bajaj, University Science Press.
- Electricity Pricing Engineering Principles and Methodologies, Lawrence J. Vogt, P. E., CRC Press.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-421N	Operation Research	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT-I

Development of operation research, characteristics and scope of operation research, operation research in Management, model in operation research, model formation, types of mathematical models, limitation of operation research. L.P. models, simplex method, the algebra of simplex method, (Minimization problems), the big M method, post optimality analysis, essence of duality theory, Application of sensitivity analysis.

UNIT-II

Introduction to model, matrix terminology, formulation and solution of Transportation model (least cost method, Voxel's Approximation method), least time transportation problem, Assignment problems. Introduction to net work logic, Numbering of events (Fulkerson Rule), PERT calculation Forward Path, back-ward path, Slack, probability, comparison with PERT, Critical path, Floats, Project cost, crashing the net work, updating (PERT and CPM)

UNIT-III

Introduction, applications of simulation, advantages and limitations of simulation techniques, generation of random numbers, Time-flow mechanism, simulation languages.

Steps in decision theory approach, Decision Machinery environment, Decision machining under certainly and uncertainly, Decision machining under condition of risk, Decision trees, minimum enchaind criteria, advantage and limitations of decision tree solutions, post optimality, Definition of arguments models, comparison with transport model, Mathematical representation of assignment model, Formulation and solution of argument models, variation of the argument model, Alternate optimal solutions.

UNIT-IV

Introduction, Applications of queuing theory, waiting time and idle time costs, single channel queuing theory and multi channel queuing theory with Poisson, arrivals, and exponential services, Numerical on single channel and multi channel queuing theory.

Theory of games, competitive games, Rules and terminology in game theory, Rules for game theory- saddle point, dominance, mixed strategy(2x2games), mixed strategy (2x n games or m x 2 games), mixed strategy (3x 3 games), two person zero sum games, n-person zero sum games.

Suggested books:

1. Introduction to operation research- by Hillier and Lieberman, McGraw Hill.
2. Operations Research – by P.K. Gupta and D.S Hira.
3. Linear Programming by N.P. Loomba.

Code	Nomenclature of Subject		P	Int.	Ext.	Total	Time
EE-415N	Transducers Application Lab		3	40	60	100	3 Hr

List of Experiment

1. To Measure Temperature using RTD.
2. To Measure Displacement using L.V.D.T.
3. To Measure Load using Load Cell.
4. Pressure Measurement using Cantilever.
5. Light Measurement using LDR &Photo Cell.
6. To Measure Angular Displacement using Capacitive Transducer.
7. To Measure the Variation in Water Level using Capacitive Transducer.
8. To Measure Speed of DC Motor using Reluctance Method.
9. To Measure Strain using Strain gauge.
10. To Measure Speed using Photo Interrupter Method.

NOTE: At least 9 experiments are to be performed.

Code	Nomenclature of Subject		P	Int.	Ext.	Total	Time
EE-417N	Programmable Logic Controller Lab		3	40	60	100	3 Hr

List of Experiment

1. To study hardware and software used in PLC.
2. To implement Logic Gates.
3. To realize a Direct-on-line (DOL) starter.
4. To implement an On-delay timer.
5. To implement an Off-delay timer
6. To realize an Up-down counter.
7. To conceptualize the arithmetic instructions used in PLC.
8. To design the operation of PID controller.
9. To design the operation for Star-delta Starter

NOTE: At least 7 experiments are to be performed.

Code	Nomenclature of Subject		P	Int.	Ext.	Total	Time
EE-419N	Advanced Programming LAB		3	40	60	100	3 Hr

List of Experiment

1. Write a programme to implement stack.
2. Write a programme to implement queue.
3. Write a programme to perform following operation on linked list a) insertion of a node b) deletion of a node.
4. Write a programme to find addition and multiplication of two matrix using classes.
5. Write a programme to implement searching techniques.
6. Write a program to implement following sorting methods a) insertion sort b) quick sort c) bubble sort.
7. Create two classes' dm and db which store the value of distance, dm stores distance in metres and centimetres and db in feet and inches.
8. Write a program to read a value for the class object and add one object of dm with another object of db.
9. Write a programme shows the use of copy constructor and destructor.
10. Implement a programme using compile time polymorphism (function overloading and operator overloading).
11. Write a programme which shows the use of inheritance (multiple and multilevel).

NOTE: At least 8 experiments are to be performed.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-402N	Computer Methods In Power System	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT-I

General: Impact of computers, orientation of engineering problems to computers, review of matrices and matrix operations.

Incidence and Network Matrices: Network graph, various incidence matrices, generalized element representation, primitive network and primitive network matrices, formation of various network matrices by singular transformations, inter- relations between various incidence matrices and network.

UNIT-II

Bus Impedance and admittance matrices: Building algorithms for bus impedance matrix, modification of bus impedance matrix for change of reference bus and for network changes, formation of bus admittance matrix and modification of three-phase network elements, treatment under balanced and unbalanced excitation, transformation matrices, and unbalanced elements.

UNIT-III

Short-Circuit Studies: Introduction, network short circuit studies using Z bus, short circuit calculations using symmetrical components for various types of faults.

Load-Flow Studies: Introduction, importance of load flow studies, classification of buses, load flow equations, iterative methods, computer algorithms and load flow solutions using Gauss Seidel and Newton Raphson methods, decoupled and fast decoupled load flow solutions, representation of regulating and off nominal ration transformers, comparison of load flow solution methods.

UNIT-IV

Sparsity: Introduction, optimally ordered triangular factorization, schemes of optimal ordering Stability Studies: Algorithms flow chart and transient stability solution using modified Euler method.

Power System Security: introduction, contingency analysis using Z bus and various distribution factors.

Suggested books:

1. Glenn W. Stagg and Ahmed EI-Abiad, "Computer Methods in Power System Analysis", McGraw Hill.
2. George L. Kusic, "computer-Aided Power Systems Analysis", PHI.
3. John J Grainger and William D. Stevenson, " Power System Analysis", Jr. McGraw Hill.
4. IJ Nagrath and D.P. Kothari, "Power System Engg.", Tata McGraw Hill

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-404N	HVDC Transmission	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT-I

DC Power Transmission Technology: Introduction; comparison of AC and DC transmission; application of DC transmission; description of DC transmission system; planning for HVDC transmission; modern trends in DC transmission.

UNIT-II

Thyristor Valve & Analysis of HVDC Converters: Introduction; thyristor device; thyristor valve; valve tests; recent trends; pulse number; choice of converter configuration; simplified analysis of Graetz circuit; converter bridge characteristics; characteristics of twelve pulse converter; detailed analysis of converters.

UNIT-III

Converter and HvdC System Control: General; principles of DC link control; converter control characteristics; system control hierarchy; firing angle control; current and extinction angle control; starting and stopping of dc link; power control; higher level controllers; telecommunication requirements.

UNIT-IV

Reactive Power Control, Harmonic and Filters: Introduction; reactive power requirement in steady state; sources of reactive power; static var systems; reactive power control during transients; introduction of harmonic and filters; generation of harmonics; design of AC filters; DC filters; carrier frequency and RI noise

Suggested Books:

1. Padiyar, K.R., "HVDC Power Transmissions Systems", New Age International, 2001
2. Rao, S., "EHV-AC, HVDC Transmission & Distribution Engineering", Khanna Publishers, 1999
3. Tagare, D.M., "Reactive Power Management", Tata McGraw Hill, 1996
4. Dubey, G.K., "Power Semi-conductor Controlled Drives", Prentice Hall, 1999.
5. Arrillaga, J., "High Voltage D.C. Transmission", Peter Peregrinus Ltd, 1996

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

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

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.

Suggested Books:

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.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-408N	Electrical Energy Conservation and Auditing	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT-I

Introduction: Energy Scenario, Energy Analysis of Fuels, Energy Needs of Growing Economy, Long Term Energy Scenario, Energy Pricing, Energy Sector Reforms, Energy and Environment: Air Pollution, Climate Change, Energy Security, Energy Conservation and its Importance, Energy Strategy for the Future, Energy Conservation Act-2001 and its Features.

UNIT-II

Basics of energy and its various forms: (a) thermal (b) Electricity (c) Non-Conventional Sources Thermal: Different Fuels & its Energy Contents, Temperature & Pressure, Heat Capacity. Steam and Moist Air.

Electricity: AC & DC, Load Management, Maximum Demand Control, Aggregated Technical & Commercial Losses (ATC), Electricity Tariffs.

UNIT-III

Energy Management: Need for Energy Management, Various Approaches, Cost Effectiveness, Benchmarking, Optimization of Energy Requirements and Maximization of System Efficiencies. Fuel and Energy Substitution..A Few Case Studies of Real Systems.

UNIT-IV

Energy Audit: Definition, Requirements for Energy Audit, Different Approaches viz, Preliminary and Detailed Energy Audit, Case Studies for Real Systems.

Suggested Books:

1. Albert : Plant Engineers & Managers Guide to Energy Conservation.
2. Wayne C. Turner Energy management handbook, John Wiley and Sons.
3. Guide to Energy Management, Cape Hart, Turner and Kennedy
4. Cleaner Production – Energy Efficiency Manual for GERIAP, UNEP, Bangkok prepared by National Productivity Council
5. M.K.Lahiri : Saving of Electricity by System Management. M.K. Lahiri Publication

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-414N	Power Management	3	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT-I

Introduction: Power scenario; power development; planning; power resources; environment-power matters plan; pre-feasibility and feasibility studies; state relations for power etc; electricity industry structure and safety regulations bill - state and central power boards / power corporations.

UNIT-II

Resources: Resources; geophysical study; Seismic considerations; environmental restraints; resettlement and rehabilitation.

Procurement: Contracting and procurement; consulting services; types of contracts; project management; organization and economy management; organizational planning and time scheduling; project cost control.

UNIT-III

Engineering: Engineering and general layout of equipments; generator; transformer and switch gear and control equipment; construction methods; operation and maintenance principle; maintenance organization and planning; availability; life cycle cost and future development; visits to sites.

UNIT-IV

Power Sector: Power sector structure in different states; regulatory regime in those states; power utilities in Haryana; grid management; power financing; visit to sites.

Power Station: Management of fuel; water resource electricity deviating scenario; storage and handling; pricing; contract etc.; human resource management; visit to sites..

Suggested Books:

1. Subramanyam, B. "Power Plant Engineering", Dhanpat Rai Pub., 1995
2. Sharma P.C., "Power Plant Engineering", Dhanpat Rai Pub., 1997
3. Decenzo, David A., Robbins, Stephen P. , "Human Resource Management", Prentice Hill of India, 2004.
4. Nag, P.K., "Power Plant Engg". Tata McGraw Hill, 2003.
5. Gill, A.B., "Power Plant Performance Management", British Electricity Authority, 1984.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-412N	Embedded Systems	3	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

UNIT-I

Introduction: Different types of microcontrollers: Embedded microcontrollers; External memory microcontrollers; Processor Architectures: Harvard V/S Princeton; CISC V/S RISC; microcontrollers memory types; Introduction to Real Time Operating System.

UNIT-II

8051 Microcontroller Architecture: Architecture; memory considerations; Addressing modes; clocking; i/o pins; interrupts; timers; peripherals; serial communication; Instruction set; simple operations.

UNIT-III

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

UNIT-IV

Interrupts and I/O Ports: Interrupt logic; Timer2 scalar initialization; 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.

Suggested Books:

1. Mazidi, "8051 Microcontroller", 2nd Edition, Prentice Hall, 2005
2. Predko, "Programming and Customizing the 8051 Microcontroller", 2nd Edition, McGraw Hill, 2002.
3. Catsoulis John, "Designing Embedded Hardware", 2nd Edition, O'Media, 2005.
4. Barr Michael, "Programming Embedded Systems in C and C++", Shroff Pub. and Distr., 3rd Edition, 2003.
5. Ayala A. J., "The 8051 Microcontroller: Architecture, Programming, and Applications", Pap/Dsk edition, West Publishing Company, 1991
6. Udai Shankar; "8051 Microcontrollers", CSVTU Research Journal, Chhattisgarh Swami Vivekanand Technical University, 2010.

Code	Nomenclature of Subject	L	T	Int.	Ext.	Total	Time
EE-410N	Fuzzy Logic & Neutral Networks	4	1	25	75	100	3 Hr

Paper Setter Note: 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections

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

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

Suggested Books:

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 ", TAT A 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

Code	Nomenclature of Subject	L	P	Int.	Ext.	Total	Time
EE-416N	Power System Lab		2	40	60	100	3 Hr

List of Experiment

1. To find out the dielectric strength of transformer oil.
2. To find zero sequence component of three phase line.
3. To draw the characteristics of thermal overload relay.
4. To study an IDMT over current relay to obtain and plot its characteristic curves i.e. the graph between current and time.
5. To measure the ABCD parameters of a given transmission line.
6. To plot the power angle characteristics of given transmission lines.
7. To find the string efficiency of a string insulator with/without guard rings.
8. To study the characteristics of transmission line for π -network & pie-network.
9. To study and testing of a current transformer.
10. To study various types of distance relay

NOTE: At least 8 experiments are to be performed.

Code	Nomenclature of Subject	L	P	Int.	Ext.	Total	Time
EE-418N	Computer Methods In Power System Lab		3	40	60	100	3 Hr

List of Experiments:

1. Develop a program to do the following mathematical operations:
 - i) Transpose of a matrix
 - ii) Multiplication of two matrices
 - iii) Addition & subtraction of two matrices.
2. The demand estimate is the starting point for planning the further electric power Supply. Mathematical curves of the trend. One of the simplest curve is $P = P_0 \exp \{a(t-t_0)\}$, where a is the average per unit growth rate

P is the demand in year 't' in GW

P_0 is the given demand at year T_0 in GW.

Develop a table to compute the system demand from 1984 to 2005 on yearly basis.

Calculate also the average yearly demand over this period.

3. Write a program to formulate Y-Bus by non-singular transformation $Y_{Bus} = [A]^{-1}T^{-1}y$ [A].
4. Develop a program to solve a set of 4 simultaneous linear equations using Gaussian Elimination method.
5. Develop a program to calculate Z bus of a given network using building algorithm. Assume that no mutual coupling is involved in between the different elements.
6. The Gauss Seidel method to find the solution of following equations

$$X_1 + X_1X_2 + X_3 = 10$$

$$X_1 + X_2 + X_3 = 6$$

$$X_1 X_2 - X_3 = 2$$
7. You have given with a 6 bus system. Apply load flow technique using Gauss Seidel method to solve up to two iterations.
8. Develop a program to find Eigen Values for given Matrix.
9. Develop a program to determine the bus impedance matrices for the given power system network.
10. Develop a program to determine the admittance matrices for the given power system network.

NOTE: At least 8 experiments are to be performed