ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

SYLLABUS

8th Semester, B.Tech

Electrical Engineering

COURSE STRUCTURE

Sl No	Sub-Code	Subject	Hrs			Credits
			L	T	P	C
		Theory				
1	EE131801	Computer Aided Power System Analysis	3	0	0	3
2	EE131802	Project Management on Power Transmission and Distribution	3	0	0	3
3	EE1318E03	Elective III(Departmental)	3	0	0	3
4	EE1318E04	Elective IV(Departmental)	3	0	0	3
5	**1318E05	Elective -V (This elective may be from other Dept. also)	3	0	0	3
		Practical				
6	EE131811	Computer Aided Power System Analysis Lab	0	0	2	1
7	EE131812	Project	0	0	10	5
8	EE131821	Comprehensive Viva	0	0	0	4
		Total	15	0	12	25
Total Contact Hours = 27						
Total Credits = 25						

Elective III (Departmental)

i. EE1318E03(i) High Voltage Engineering
ii. Any other subject offered from time to time with the approval of the University.

Elective IV (Departmental)

i. EE1318E04(i) Digital System Design
ii. EE1318E04(ii) Expert Systems
iii. Any other subject offered from time to time with the approval of the University.

Elective (Open)

i. **1318E05(i) Engineering System Analysis and Design
ii. **1318E05(ii) Engineering System Modeling and Simulation
iii. Any other subject offered from time to time with the approval of the University.

COMPUTER AIDED POWER SYSTEM ANALYSIS

SUBJECT	**COMPUTER AIDED POWER SYSTEM ANALYSIS**
CODE	**EE131801**
L-T-P-C	**3-0-0-3**
CLASS HOUR	**3 HRS/WEEK**
TOTAL NO OF CLASSES	**36 (APPROX)**
EXPECTED NO OF WEEKS	**12 (APPROX)**

MODULE	CHAPTER	COURSE CONTENT	HOUR
1	Network matrix	Primitive network, bus incidence matrix, formation of Y-bus by singular transformation , networks with mutually coupled elements ,formation of Z-bus by matrix inversion , formation of Z-bus using the building algorithm – addition of a tree branch p to reference bus , addition of a link between buses p and q , addition of a link between bus p and reference bus .	8
2	Symmetrical components and unsymmetrical fault calculations	Fortesque's theorem. Symmetrical components of an unbalanced 3- phase system: average power in terms of symmetrical components, sequence impedances, fault calculations, graphical method of determining swquence components, network equations. LG, LL, LLG faults. Effect of fault impedance on fault current. Sequence networks	7
3	Fault and Contingency calculation	Fault calculation using Z-bus and Ybus. Contingency analysis using Z-bus in superposition method, alternative method using Z-bus, use of Y-bus Table Factors for contingencies.	7
4	Load flow analysis	Introduction , classification of buses , representation of transformers , Gauss Seidel iterative method using Ybus , N-R iterative method using Y-bus , approximation to the Jacobian in the NR method, Fast Decoupled L-F method, solution using Z-bus in the bus frame of reference. Calculation of power.	7
5	Power system stability	Introduction. Dynamics of synchronous machine, swing equation. Power- angle curve. Steady- state and transient Stabilities. Equal area criterion. Calculation of power – angle curves for fault and post –fault conditions for various types of Fault; effect of reclosing. Numerical solution of swing equation. Dynamic stability, automatic regulation, effect of excitation systems. Factors affecting stability.	7
	TOTAL		**36 Hrs**

References

1) Computer Methods in Power System Analysis : Stagg,Glenn W, Ahmed H. El-Abiad---TMH
2) Computer Techniques and Models in Power Systems: Rao, K.U.----I.K. International Pvt.Ltd
3) Power System Analysis: Ramana, N.V.------- Pearson
4) Power System Analysis: Gupta, J.B.------- S.K. Kataria and Sons

PROJECT MANAGEMENT ON POWER TRANSMISSION AND DISTRIBUTION

SUBJECT	Project Management on Power Transmission and Distribution
CODE	EE 131802
L-T-P-C	3-0-0-3
CLASS HOUR	3hrs/week
TOTAL NO OF CLASS	36 (APPROX)
EXPECTED NO OF WEEKS	12 (APPROX)

MODULE	CHAPTER	CONTENTS	HOURS
1	HVDC Transmission	a) Brief history, Basic requirements, economics, advantages of a.c transmission, b) 1-phase and 2-phase half wave bridge rectifier, relative performances, operation, current and voltage wave forms, delay timing, conversion efficiency, waveform commutation margin, c) reactive KVAR requirement, constant current control, constant excitation angle control of inverter, combined characteristics of converter and inverter, tap changing control, d) Brief description of equipments at d.c terminal station, gain in transient stability limits.	14
2	Thyristor converter circuit	Analysis with overlap in converters, basic means of control-power reversal-desired features of control-actual control characteristics	8
3	Inverters	Power control-commutation failure-D.C reactors-voltage and current oscillators-circuit breakers and overvoltage protection	6
4	Harmonics	Characteristic and uncharacteristic harmonics-troubles due to harmonics-harmonic filters-converter charts of direct current and voltage.	8
		TOTAL	36

Reference Books

1) Power System Enginering: Planning, Design and Operation of Power System and Equipment- Juergen Schlabbach, Karl Heinz Rofalski, Wiley

ELECTIVE-III (DEPARTMENTAL)

SUBJECT CODE L-T-P-C CLASS HOUR TOTAL NO OF CLASS EXPECTED NO OF WEEKS	High Voltage Engineering – Elective III EE 1318E03(i) 3-0-0-3 3hr/week 36 12

MODULE	CHAPTER	CONTENTS	HOURS
1	Breakdown of gases, liquid, solid Dielectrics	a) Desirable properties of gas and insulating medium, Townsond's current growth equations, Townsond's criterion for breakdown, Electronegative gases and their breakdown, Streamer theory, paschen' s law. Vacuum insulation. b) and commercial liquids, origin and purification, conduction and breakdown in pure and commercial liquids. c) Breakdown mechanisms in solid dielectrics, partial discharge	12
2	High-voltage Generation:	Methods of generation of high direct current voltages, Voltage multipliers and cascade circuits using rectifiers, electrostatic machines. Generation of high alternating voltages, transformers in cascade, single units, high frequency transformers. Impulse generator, analysis of the basic circuits, standard impulse wave-shape, multi-stage circuits, wave shape control, triggering, general construction, synchronization with oscilloscope.	7
3	Measurement of high voltage	Measurement of high direct, alternating (rms and peak) and impulse voltage and currents. Uniform field electrodes, measurement of dielectric constant and loss factor, Schering bridge, Wagner earth discharge and measurement	6
4	High-voltage Testing	Testing of overhead line insulators, cables and transformer oil. Testing of power transformer, Testing of bushing and surge arresters.	4
5	Lighting Over-voltage	Lighting phenomenon Measuring instruments, Magnetic surge crest ammeter, Kyldonograph, Fulchronograph, Oscillograph, Protective devices, surge absorbers, ground and counterpoise wires, lighting arresters, switching over voltages- origin, wave shape and magnitudes, protective devices	4
6	High-voltage Laboratory	Planning, testing and other facilities, test equipment, clearance and layout safety measures, grounding, High-voltage connections.	3
		Total	36

References:

1. Kuffel E. and Abdulla , M., 'High Voltage Engineering', Paragon Press, London.
2. Naidu, M. S., and Karmaju, V., 'High Voltage Engineering', Tata Mc Grow Hill.
3. Chourasia, M. P., 'High Voltage Engineering', Khanna publishers.
4. Alsten, 'High Voltage Engineering'.
5. C.L. Wadhva ,High Votage Engineerig, new age International publishers.
6. Rind , D. 'High Voltage Laboratory Technics, PHI.

ELECTIVE-IV (DEPARTMENTAL)

SUBJECT	**DIGITAL SYSTEM DESIGN**
CODE	**EE 1318E04(i)**
L-T-P-C	**3-0-0-3**
CLASS HOUR	**3 HRS/WEEK**
TOTAL NO OF CLASSES	**36 (APPROX)**
EXPECTED NO OF WEEKS	**12 (APPROX)**

MODULE	CHAPTER	CONTENTS	HOURS
1	Review	High speed addition, Modular design using IC chips, Hazard and hazard-free realization, design of decoder circuit FPGA, CPLD, PLA, PLD, RAM, ROM	6
2	Synchronous sequential circuit design	Design and analysis of sequential circuit, State machine and timing diagram of Mealy and Moore machines, design of sequential circuit from state table and state diagram, sequence generator and sequence detector	6
3	VHDL	Introduction to VHDL, Basic language elements, Behavioral modeling, dataflow modeling, structural modeling, Design of combinational circuit using VHDL(half adder, full adder, half subtractor and full subtractor, parallel adder, ripple carry adder, 4-bit adder, parity checker, parity generator, encoder, decoder, multiplexer, demultiplexer, comparator, tristate buffer), Design of sequential circuit using VHDL(flip-flop, counter, register, shift register)	6
4	Design Convention	Register transfer, electronic realization of hardwired control unit, conditional transfer	6
5	AHPL	Introduction to AHPL, AHPL operators, operand convention of AHPL, AHPL conventions for combinational logic and memory arrays	6
6	High-voltage Laboratory	Planning, testing and other facilities, test equipment, clearance and layout safety measures, grounding, High-voltage connections.	6
			36 Hrs

REFERENCES

1 J. Frederic and G.R. Peterson- Digital Systems: Hardware Organization and Design, John Wiley and Sons

2 F.J. Hill and G.R. Peterson- Switching theory and logical Design: John Wiley and Sons

3 VHDL Primer- J. Bhasker

4 Circuit design with VHDL-V.Pedroni

ELECTIVE-IV (DEPARTMENTAL)

SUBJECT CODE L-T-P-C CLASS HOUR TOTAL NO OF CLASSES EXPECTED NO OF WEEKS	:EXPERT SYSTEMS :EE 1318E04(ii) :3-0-0-3 :3hr/week :36 :12

MODULE	CHAPTER	CONTENTS	HOURS
1	Fuzzy Logic	Basic concepts, fuzzy set theory and operations, properties of fuzzy sets, membership functions, fuzzy if-then rules, fuzzy implications and fuzzy algorithms, fuzzifications and de-fuzzifications, fuzzy controller, applications.	8
2	Genetic Algorithm	Introduction, Basic concepts and working principle, procedures of GA, flowchart of GA, genetic representations, initialization and selection, genetic operator, generational cycles, applications	7
3	Artificial Neural Network	Introduction and architecture (neuron , nerve structure and synapse), artificial neuron and its model, activation function, neural network architecture, single layer and multi-layer feed-forward network, auto associative and hetro-associative memory, back propagation network, training, applications	7
4	Design Convention	Register transfer, electronic realization of hardwired control unit, conditional transfer	7
5	Particle Swarm Optimization	Introduction, computational implementation of PSO, improvement to PSO method, solution of the constrained optimization method.	7
		TOTAL	36Hrs

References :

1) S. Rajsekaran & G.A. Vijayalakshmi Pai, “Neural Networks,Fuzzy Logic and Genetic Algorithm:Synthesis and Applications” Prentice Hall of India.

2) S.S.Rao “Engineering Optimization”,Theory and Practice, John Wiley & Sons, Inc.

3) Kumar Satish, “Neural Networks” Tata Mc Graw Hill.

ELECTIVE-V (OPEN)

SUBJECT:	**:Engineering System Analysis and Design**
CODE:	:EE1318E05(i)
L-T-P-C:	:3-0-0-3
CLASS HOUR	:3hrs/week
TOTAL NO OF CLASSES:	:36
EXPECTED NO OF WEEKS:	:12

Module	Topics	Course content	Hours
1	Introduction	Systems, Elements of a system, Types of systems, Subsystems, Super systems, Need for system analysis and design, CASE tools for analysis and its limitations	9
2	System Analysis	Methods of system analysis, system development life cycle, structured approach, development tools, data base and networking techniques	9
3	System design	Design technologies, Design principles, Design tools and methodologies, feasibility survey, conversion and testing tools, design management and maintenance tools	9
4	Object oriented analysis and design	Introduction, Object modeling, Dynamic modeling, functional modeling, UML diagrams and tools	9
		TOTAL	36

Text Books:

1. Perry Edwards, "System analysis and design", McGraw Hill international edition, 1993.
2. Len Fertuck, "System analysis and design with CASE tools", Wm C. Brown Publishers, 1992.

Reference Books:

1. Er. V.K. Jain, "System analysis and design ", Dreamtech Press.
2. Kenneth E.Kendall and Julie E.Kendall, "System analysis and design", Prentice Hall, India, 2007.

ELECTIVE-V (OPEN)

SUBJECT:	**:Engineering System Modelling and Simulation**
CODE:	:EE1318E05(ii)
L-T-P-C:	:3-0-0-3
CLASS HOUR	:3hrs/week
TOTAL NO OF CLASSES:	:36
EXPECTED NO OF WEEKS:	:12

Module	**Topics**	**Course content**	**Hours**
1	Introduction	Systems, System types, System Modelling, Types of system modelling, Classification and comparison of simulation models, attributes of modelling, Comparison of physical and computer experiments, Application areas and Examples	9
2	Models	Mathematical and Statistical Models- Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers	9
3	System simulation	Continuous & discrete event simulation languages_GPSS, GIMULA, CSMP, DYNAMO. Birth – Death process, parameter estimation & input-output validation,	9
4	Case study	Developing simulation model for information centres, inventory systems and analysis of maintenance systems.	9
		TOTAL	36

Text and Reference Books:

1) Payer, T.A. : Introduction to Simulation, McgrawHill.
2) Gordon, G : System Simulation, PHI.
3) Law, A.M & W.D. Kelton : Simulation Modelling & Analysis, McgrawHill.

COMPUTER AIDED POWER SYSTEM ANALYSIS LABORATORY

SUBJECT	**COMPUTER AIDED POWER SYSTEM ANALYSIS LABORATORY**
CODE	**EE131811**
L-T-P-C	**0-0-2-1**
EXPECTED NO OF WEEKS	**12 (APPROX)**

EXPERIMENT NO	AIM OF THE EXPERIMENTS	HOUR
1	Formation of Y bus matrix by inspection / analytical method using MATLAB Software	3
2	Formation of Z bus matrix using building algorithm using MATLAB Software	3
3	Load flow analysis using MATLAB Software	9
4	Symmetrical Fault analysis using MATLAB Software	3
5	Transient Stability Analysis using MATLAB	3

Project(EE131812)

L-T-P= 0-0-10
Credit=5
Expected Weeks=12

Guidelines will be issued by the University from time to time.

Comprehensive Viva (EE131821)

L-T-P= 0-0-0
Credit=4
Expected Weeks=12

Guidelines will be issued by the University from time to time.