



# ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

## Course Structure and Syllabus

### ELECTRICAL ENGINEERING (EE)

### Semester VIII/ EE/ B.TECH

Sl. No.	Sub-Code	Subject	Hrs/week			Credits C
			L	T	P	
<b>Theory</b>						
1	EE131801	Computer Aided Power System Analysis	3	0	0	3
2	EE131802	Power Plant Engineering	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 (Open)	3	0	0	3
<b>Practical</b>						
6	EE131811	Computer Aided Power System Analysis Lab	0	0	2	1
7	EE131816	Project	0	0	10	5
8	EE131821	Comprehensive Viva	0	0	0	4
Total			15	0	12	<b>25</b>
Total Contact Hours = 27						
<b>Total Credits = 25</b>						

<b>Elective-III Subjects</b>		
<b>Sl. No.</b>	<b>Subject Code</b>	<b>Subject</b>
1	EE1318E031	High Voltage Engineering
2	EE1318E032	Flexible AC Transmission System (FACTS)
3	EE1318E033	HVDC Transmission System
4	EE1318E034	Any other subject offered from time to time with the approval of the university

<b>Elective-IV Subjects</b>		
<b>Sl. No.</b>	<b>Subject Code</b>	<b>Subject</b>
1	EE1318E041	Expert System
2	EE1318E042	Digital System Design
3	EE1318E043	Utilization and Conservation of Electrical Energy
4	EE1318E044	Any other subject offered from time to time with the approval of the university

<b>Elective-V Subjects</b>		
<b>Sl. No.</b>	<b>Subject Code</b>	<b>Subject</b>
1	EE1318E051	Engineering System Analysis and Design
2	ME1318E052	Planning for Sustainable Development
3	HS1318E053	Disaster Management
4	EE1318E054	Engineering System Modeling and Simulation
5	**1318E055	Any other subject offered from time to time with the approval of the university

**Course Title : COMPUTER AIDED POWER SYSTEM ANALYSIS**

**Course Code: EE131801**

**L-T-P-C: 3-0-0-3**

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

MODULE	TOPIC	COURSE CONTENT	HOURL
1	<b>NETWORK MATRIX</b>	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	<b>SYMMETRICAL COMPONENTS AND UNSYMMETRICAL FAULT CALCULATIONS</b>	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	<b>FAULT AND CONTINGENCY CALCULATION</b>	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	<b>LOAD FLOW ANALYSIS</b>	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	<b>POWER SYSTEM STABILITY</b>	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
<b>TOTAL</b>			<b>36</b>

**REFERENCE BOOKS:**

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.

**Course Title : POWER PLANT ENGINEERING****Course Code: EE131802****L-T-P-C: 3-0-0-3**

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

<b>MODULE</b>	<b>TOPIC</b>	<b>COURSE CONTENT</b>	<b>HOUR</b>
<b>1</b>	<b>INTRODUCTION TO POWER PLANT ENGINEERING</b>	Power sources, choice of generation, effect of variable load on power-plant operation and design, choice of number and size of generating units.	<b>4</b>
<b>2</b>	<b>COAL FIRED STEAM POWER PLANT</b>	Operation of a steam power plant, schematic line diagram, operation of equipments like economiser air preheater, superheater, condenser, precipitator etc. Rankine cycle and efficiency, the reheat and regeneration cycles, steam prime movers type and suitability, impulses and reaction turbines, governing of turbines. Steam plant auxiliaries, methods of auxiliary drives, Principles of steam-plant design, selection of site, layout and foundation.	<b>9</b>
<b>3</b>	<b>DIESEL PLANT</b>	Fields of use and advantages, elements of diesel plant, air standard cycle, operation and control, engine cooling, heat balance and efficiency, starting, loading and stopping, building and layout.	<b>4</b>
<b>4</b>	<b>HYDRO-ELECTRIC PLANT</b>	Introduction to and classification of hydro-electric plants, elements of a simple h.e. plant and their working, capacity calculation of hydro-power plant, types of water turbines, turbine governors, auxiliaries and auxiliary drives, characteristics and selection of turbines, layout and internal design of power house building, underground, automatic and remote-controlled hydro stations. Preventive maintenance, pumped storage plants, reversible pump turbine for pump storage schemes.	<b>9</b>
<b>5</b>	<b>GAS-TURBINE PLANTS</b>	Fields of use and advantages, the components of a simple gas-turbine plant, open and closed cycle gas turbines, compressor, turbine efficiency, plant layout, installation and maintenance.	<b>5</b>
<b>6</b>	<b>MODERN TRENDS IN POWER PLANT OPERATION</b>	Use of computers in power stations, on-line computer control of power systems (SCADA), load dispatching and load forecasting.	<b>5</b>
<b>TOTAL</b>			<b>36</b>

## **REFERENCE BOOKS:**

1. Gupta, B. R; Generation of Electrical Energy; Eurasia Publishing House; 2001.
2. Nag, P.K.; Power Plant Engineering; Steam and Nuclear; Tata McGraw Hill; N Delhi 1998.
3. Chakrabarti, A., Soni, M.L., Gupta, P.V., Bhatnagar, U.S.; A text book on Power system Engineering.
4. Power Plant Engineering, Drbal L.F. , Boston P.G., Westra K.L. , Erickson R.B., CBS publishers.
5. Power Plant Performance – Gill A.B.
6. Power Plant Engineering, R.K Rajput

Course Title : ELECTIVE-III (Departmental)

Course Code: EE1318E031

L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

### HIGH VOLTAGE ENGINEERING

MODULE	TOPIC	COURSE CONTENT	HOUR
1	<b>Breakdown of Gases, Liquid, Solid Dielectrics</b>	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	<b>High-Voltage Generation</b>	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	<b>Measurement of High Voltage</b>	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	<b>High-Voltage Testing</b>	Testing of overhead line insulators, cables and transformer oil. Testing of power transformer, Testing of bushing and surge arresters.	4
5	<b>Lighting Over-Voltage</b>	Lighting phenomenon Measuring instruments, Magnetic surge crest ammeter, Kydonograph, Fulchronograph, Oscillograph, Protective devices, surge absorbers, ground and counterpoise wires, lighting arresters, switching over voltages- origin, wave shape and magnitudes, protective devices.	4
6	<b>High-Voltage Laboratory</b>	Planning, testing and other facilities, test equipment, clearance and layout safety measures, grounding, High-voltage connections.	3
<b>TOTAL</b>			<b>36</b>

### REFERENCE BOOKS:

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.

**Course Title : ELECTIVE-III (Departmental)**

**Course Code: EE1318E032**

**L-T-P-C: 3-0-0-3**

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

**FLEXIBLE AC TRANSMISSION SYSTEM (FACTS)**

<b>MODULE</b>	<b>TOPIC</b>	<b>CONTENTS</b>	<b>HOURS</b>
1	<b>Power Flow Control</b>	Power flow in AC Systems , Power Flow Control , Reactive power control in electric power transmission lines, compensated and uncompensated transmission lines, series and shunt compensation, Phase angle control.	<b>7</b>
2	<b>FACTS concepts</b>	Definition of FACTS, Concept and opportunities for FACTS, basic types of FACTS controllers, benefits from FACTS controllers, Requirements and Characteristics of High Power devices – Voltage and Current rating and losses, Basic concept of voltage source converter (VSC) and Current source converter (CSC).	<b>8</b>
3	<b>Static Shunt Compensation</b>	SVC and STATCOM. Operation and Control of TSC, TRC and STATCOM. Compensator Control. Comparison between SVC and STATCOM.	<b>6</b>
4	<b>Static Series Compensation</b>	TSSC, SSSC, Static voltage and phase angle regulators TCVR and TCPAR. Operation and Control Applications.	<b>7</b>
5	<b>Unified Power Flow Controller</b>	Circuit Arrangement, Operation and Control of UPFC, Basic Principle of P and Q Control, independent real and reactive power flow control, Applications, Introduction to interline power flow.	<b>8</b>
<b>TOTAL</b>			<b>36</b>

**REFERENCE BOOKS:**

1. “Understanding FACTS ” N.G. Hingorani and L. Gyugi, IEEE Press, Indian Edition is available:-- Standard Publications, 2001.
2. “Flexible a c transmission system (FACTS)” Edited by YONG HUE SONG and ALLAN T JOHNS, Institution of Electrical Engineers, London

Course Title : ELECTIVE-III (Departmental)

Course Code: EE1318E033

L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

### HVDC TRANSMISSION SYSTEM

MODULE	TOPIC	CONTENTS	HOURS
1	<b>HVDC Transmission</b>	(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.	<b>14</b>
2	<b>Thyristor converter circuit</b>	Analysis with overlap in converters, basic means of control-power reversal-desired features of control actual control characteristics.	<b>8</b>
3	<b>Inverters</b>	Power control-commutation failure-D.C reactors voltage and current oscillators-circuit breakers and overvoltage protection.	<b>6</b>
4	<b>Harmonics</b>	Characteristic and uncharacteristic harmonic troubles due to harmonics-harmonic filters-converter charts of direct current and voltage.	<b>8</b>
<b>TOTAL</b>			<b>36</b>

#### REFERENCE BOOKS:

1. HVDC Power Transmission Systems, K.R. Padiyar
2. HVDC Transmission: Power Conversion Applications in power Systems, Chan- Ki – Kim, Vijay K. Sood, Gil- Soo Jang.
3. Power System Engineering: Planning, Design and Operation of Power System and Equipment- Juergen Schlabbach, Karl Heinz Rofalski, Wiley

**Course Title : ELECTIVE-IV (Departmental)**

**Course Code: EE1318E041**

**L-T-P-C: 3-0-0-3**

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

**EXPERT SYSTEM**

<b>MODULE</b>	<b>TOPIC</b>	<b>CONTENTS</b>	<b>HOURS</b>
1	<b>Fuzzy Logic</b>	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.	<b>8</b>
2	<b>Genetic Algorithm</b>	Introduction, Basic concepts and working principle, procedures of GA, flowchart of GA, genetic representations, initialization and selection, genetic operator, generational cycles, applications.	<b>7</b>
3	<b>Artificial Neural Network</b>	Introduction and architecture (neuron, nerve structure and synapse), artificial neuron and its model, activation function, neural network architecture, single layer and 7 multi-layer feed-forward network, auto associative and hetro-associative memory, back propagation network, training, applications.	<b>7</b>
4	<b>Design Convention</b>	Register transfer, electronic realization of hardwired control unit, conditional transfer.	<b>7</b>
5	<b>Particle Swarm Optimization</b>	Introduction, computational implementation of PSO, improvement to PSO method, solution of the constrained optimization method.	<b>7</b>
<b>TOTAL</b>			<b>36</b>

**REFERENCE BOOKS:**

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.

**Course Title : ELECTIVE-IV (Departmental)**  
**Course Code: EE1318E042**  
**L-T-P-C: 3-0-0-3**

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

### DIGITAL SYSTEM DESIGN

MODULE	TOPIC	CONTENTS	HOURS
1	<b>Introduction</b>	High speed addition, Modular design using IC chips, Hazard and hazard-free realization, design of decoder circuit FPGA, CPLD, PLA, PLD, RAM, ROM.	<b>6</b>
2	<b>Synchronous Sequential Circuit Design</b>	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.	<b>7</b>
3	<b>VHDL</b>	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)	<b>9</b>
4	<b>Design Convention</b>	Register transfer, electronic realization of hardwired control unit, conditional transfer.	<b>7</b>
5	<b>AHPL</b>	Introduction to AHPL, AHPL operators, operand convention of AHPL, AHPL conventions for combinational logic and memory arrays.	<b>7</b>
<b>TOTAL</b>			<b>36</b>

### REFERENCE BOOKS:

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

Course Title : ELECTIVE-IV (Departmental)

Course Code: EE1318E043

L-T-P-C: 3-0-0-3

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

### UTILIZATION AND CONSERVATION OF ELECTRICAL ENERGY

MODULE	TOPICS	COURSE CONTENT	HOURS
1	<b>Electric Heating</b>	Advantages, Classification, Resistance Heating, Furnaces, Requirements and Design of heating elements, Temperature control, Electric arc furnaces, Direct & Indirect, Construction & Operation, Electrodes & Power Supply, High Frequency Heating, Induction Heating, Working principle, Power & High frequency Heating, Choice of Frequency, Core type & Coreless Furnaces, Skin Effect & Pinch effect, High Frequency Supply, Advantages & Disadvantages, Dielectric Heating, Working principle, Choice of Voltage and Frequency, Advantages & Applications.	8
2	<b>Electric Welding</b>	Classifications, Resistance Welding:: Spot, Butt, Seam. Arc welding:: types, electrode used, power sources and control circuits. Atomic hydrogen welding. Modern development.	5
3	<b>Electric Traction</b>	Advantages. Systems of electric traction. Choice of system voltage and frequency. The Indian scenario. Types of train services. Train movements and energy consumption. speed-time, distance-time and energy consumption curves. Tractive effort, Adhesion, Train resistance. Power supply arrangements. Substation equipment. D.C AND A.C. traction motors, their disposition and operation on tram cars, motor coaches and locomotives. Control systems; Rheostatic, field control and series-parallel using shunt and bridge transition methods. Multiple unit control. Metadyne control. Controllers for dc & ac traction motors. Tram Cars, Motor coaches, & Trolley Buses. Auxiliary Electrical Equipments for Tram cars, Motor Coaches & Locomotives. Braking:: mechanical, vacuum & electrical.	8
4	<b>Energy Storage</b>	Size & Duration of storage. Modes of energy storage::mechanical, electrical, magnetic, thermal & chemical. Comparison of the different systems.	5
5	<b>Electrical Losses &amp; Energy Conversion</b>	Electrical transmission, distribution & utilization losses. Classification. Reduction of losses. Benefits of electrical energy conservation. Energy conservation in lighting, electric furnaces, electric drive, traction systems. Use of energy –efficient equipment.	5

<b>6</b>	<b>Electrical Energy Audit</b>	Introduction, benefits, procedure for energy audit. Instruments for energy audit. Methodology. Case study.	<b>5</b>
<b>TOTAL</b>			<b>36</b>

**REFERENCE BOOKS:**

- 1) Tripathy S.C ; Electrical Energy Utilization & Conservation, TMG
- 2) Suryanarayan, N.V. ; Utilization of Electric power ; Wiley Eastern Ltd.
- 3) Partab, H.; Utilization of Electrical Energy; Dhanpat Rai & Sons.
- 4) Rajput R.K. ; Utilization of electrical Power, Laxmi Publication (P) Ltd.
- 5) Gupta J.B. ; Utilization of Electric Power & Electric Traction, Kaston Books.

**Course Title : ELECTIVE-V (Open)**

**Course Code: EE1318E051**

**L-T-P-C: 3-0-0-3**

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

**ENGINEERING SYSTEM ANALYSIS AND DESIGN**

MODULE	TOPIC	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 modelling, UML diagrams and tools.	9
<b>TOTAL</b>			<b>36</b>

***Text Books:***

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

***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

**Course Title : ELECTIVE-V (Open)**

**Course Code: ME1318E052**

**L-T-P-C: 3-0-0-3**

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

**PLANNING FOR SUSTAINABLE DEVELOPMENT**

<b>MODULE</b>	<b>TOPIC</b>	<b>COURSE CONTENT</b>	<b>HOURS</b>
1	<b>SUSTAINABLE DEVELOPMENT</b>	Explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability, strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.	12
2	<b>INNOVATION FOR SUSTAINABLE DEVELOPMENT</b>	Environmental management and innovation strategies.	6
3	<b>SOCIETAL TRANSFORMATIONS</b>	Institutional theory.	6
4	<b>GOVERNANCE FOR SUSTAINABLE DEVELOPMENT</b>	Policy responses to environmental degradation.	6
5	<b>CAPACITY DEVELOPMENT FOR INNOVATION</b>	Research methods	6
<b>TOTAL</b>			<b>36</b>

***Text/Reference Books:***

1. Harris, J.M. (2004) Basic Principles for Sustainable Development, Global Development and Environment Institute, working paper 00-04. Available at: [http://ase.tufts.edu/gdae/publications/Working\\_Papers/Sustainable%20Development.PDF](http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF)
2. Robinson, J. (2004) Squaring the circle? Some thoughts on the idea of sustainable development Ecological Economics 48(4): 369-384.
3. Hjorth, P. and A. Bagheri Navigating towards Sustainable Development: A System Dynamics Approach, Futures 38: 74-92.
4. Mog, J.M. „Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs“, World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68 kb)
5. Arundel, A., R. Kemp, and S. Parto Indicators for Environmental Innovation: What and How to Measure, forthcoming in International Handbook on Environment and Technology Management (ETM), edited by D. Annandale, J. Phillimore and D. Marinova, Cheltenham, Edward Elgar.

6. Douthwaite, B. Enabling Innovation. A practical guide to understanding and fostering innovation,  
London, Zed Books.

*Additional References:*

<http://www.sustainability.com/developing-value/definitions.asp>

**Course Title : ELECTIVE-V (Open)**  
**Course Code: HS1318E053**  
**L-T-P-C: 3-0-0-3**

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

### DISASTER MANAGEMENT

MODULE	TOPIC	COURSE CONTENT	HOURS
1.	<b>INTRODUCTION</b>	Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation).	4
2.	<b>DISASTERS</b>	Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.	10
3.	<b>DISASTER IMPACTS</b>	Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.	6
4.	<b>DISASTER RISK REDUCTION (DRR)</b>	Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and non structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.	12
5.	<b>DISASTERS, ENVIRONMENT AND DEVELOPMENT</b>	Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.	4
<b>TOTAL</b>			<b>36</b>

**Text/Reference Books:**

1. <http://ndma.gov.in/> (Home page of National Disaster Management Authority).
2. <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.

**Course Title : ELECTIVE-V (Open)**

**Course Code: EE1318E054**

**L-T-P-C: 3-0-0-3**

Class Hours/week	3
Expected weeks	12
Total hrs. of classes	36

**ENGINEERING SYSTEM MODELING AND SIMULATION**

<b>MODULE</b>	<b>TOPIC</b>	<b>CONTENTS</b>	<b>HOURS</b>
<b>1</b>	<b>Introduction</b>	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.	<b>9</b>
<b>2</b>	<b>Models</b>	Mathematical and Statistical Models- Probability concepts, Queuing Models, Methods for generating random variables and Validation of random numbers.	<b>9</b>
<b>3</b>	<b>System Simulation</b>	Continuous & discrete event simulation languages_GPSS, GIMULA, CSMP, DYNAMO. Birth – Death process, parameter estimation & input-output validation.	<b>9</b>
<b>4</b>	<b>Case Study</b>	Developing simulation model for information centres, inventory systems and analysis of maintenance systems.	<b>9</b>
<b>TOTAL</b>			<b>36</b>

**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.

## PRACTICAL

**Course Title : COMPUTER AIDED POWER SYSTEM ANALYSIS LAB**

**Course Code: EE131811**

**L-T-P-C: 0-0-2-1**

**Expected No. of weeks : 12 (approx)**

<b>EXPERIMENT NO.</b>	<b>AIM OF EXPERIMENT</b>	<b>HOURS</b>
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
<b>TOTAL</b>		21

<b>EE131816</b>	<b>PROJECT</b>	L = 0 T = 0 P = 10 C = 5
GUIDELINES WILL BE UPLOADED/DISTRIBUTED BY THE UNIVERSITY FROM TIME TO TIME		
<b>EE131821</b>	<b>COMPREHENSIVE VIVA</b>	L = 0 T = 0 P = 0 C = 4
GUIDELINES WILL BE UPLOADED/DISTRIBUTED BY THE UNIVERSITY FROM TIME TO TIME		

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