ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

ELECTRICAL ENGINEERING (EE)

Semester V/ EE / B.TECH

Sl.No.	Sub Code	Subject	Hrs/week			Credits C
			L	T	P	
Theory						
1	EE131501	Control System-I	3	2	0	4
2	EE131502	Energy Management and Audit	3	0	0	3
3	EE131503	Power Electronics	3	2	0	4
4	EE131504	Power System- I	3	2	0	4
5	EE131505	Microprocessor and Microcontroller	3	2	0	4
6	HS131506	Principles of Management	2	0	0	2
Practical						
7	EE131511	Control System-I Lab	0	0	2	1
8	EE131513	Power Electronics Lab	0	0	2	1
9	EE131514	Power System- I Lab	0	0	2	1
10	EE131515	Microprocessor and Microcontroller Lab	0	0	2	1
Total			17	8	8	**25**
Total Contact Hours : 33						
Total Credit : **25**						

Course Title : CONTROL SYSTEM-I
Course Code: EE131501
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**FUNDAMENTALS OF CONTROL SYSTEM**	Concepts of Open loop and closed loop systems. Examples of modern control systems, Definition of linear, non-linear, time-invariant and time variant, continuous and discrete control system.	6
2	**PHYSICAL SYSTEM MODELLING**	Formulation of differential equations for dynamic systems. Mechanical and Electrical systems. Transfer functions of a linear system. Block diagrams and reduction techniques, Signal flow graphs. Mason's formula. Standard test signals - step, ramp, parabolic and impulse. Impulse response.	9
3	**INTRODUCTION TO CONTROL SYSTEM COMPONENTS**	Error detectors, servo motors, techno-generators and servo amplifiers. Determination of transfer functions.	5
4	**TIME DOMAIN ANALYSIS**	Poles, Zeros and characteristic equations, Relation between S-plane root locations and transient response. Performance specifications in time domain such as overshot, rise time, settling time and steady state error. Transient response of second order systems. Derivative and Integral Control and their effect on the performance of the 2^{nd} order system. System types and error constants. Generalized error co-efficient. Transient response of higher order systems (out line only). Routh's stability criterion, scopes and limitations of Routh's criterion.	10
5	**THE ROOT LOCUS TECHNIQUE**	Introduction, Rule for construction. System analysis and design (outline only) using root locus.	8
6	**FREQUENCY DOMAIN ANALYSIS**	Logarithmic plots, polar plots, log-magnitude Vs phase plots. Nyquist stability criterion, Stability analysis. Relative stability. Close loop frequency response. Experimental determination of transfer functions. M and N circle.	10
		TOTAL	**48**

TEXTBOOKS / REFERENCES:

1. I.J. Nagrath & M. Gopal, "Control System Engineering", New Age International (P) Ltd.
2. Hasan-Saeed, "Automatic Control Systems", Katsons
3. Ramesh Babu and Anandanatarajan: "Control System Engineering" (Scitech)
4. Modern Control System – Hassan Sayed
5. Modern Control Engineering – Ogata
6. Control System Engineering - Nagrath and Gopal
7. Control System Components – Gibson and Teylor

Course Title : ENERGY MANAGEMENT AND AUDIT
Course Code: EE131502
L-T-P-C: 3-0-0-3

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

MODULE	TOPICS	COURSE CONTENT	HOURS
1	**INTRODUCTION**	Energy Scenario, Energy Resources, Energy Sector Reforms & Restructuring - Energy Security - Energy Conservation Act and its features - Energy Conservation	6
2	**ENERGY MANAGEMENT**	Definition, Objectives of Energy Management, Energy audit, need of energy audit, types of audits, methodology of energy audit, steps of methodology.	8
3	**ENERGY AUDIT ACTIVITIES**	Energy audit activities, Energy management (audit) approach, Understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement, Maximizing system efficiencies, Optimizing the input energy requirements.	8
4	**ENERGY CONSERVATION OPPORTUNITIES**	Identification of Energy Conservation Opportunities, Fuel and energy substitution, Energy generation, Energy distribution, Technical and Economic feasibility, Thermal Energy Efficiency & Audits - Electrical Energy Efficiency - Audits – Energy audit in power distribution system – Loss estimation	10
5	**INSTRUMENTS OF ENERGY AUDIT**	Energy audit instruments, Duties and Responsibilities of Energy Managers and Auditors	4
		TOTAL	**36**

TEXTBOOKS / REFERENCES:

1. Energy management handbook, John Wiley and Sons - Wayne C. Turner

2. Guide to Energy Management, Cape Hart, Turner and Kennedy

Course Title : POWER ELECTRONICS
Course Code: EE131503
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**SEMICONDUCTOR POWER DEVICES**	(i) Power diodes, Power transistors, MOSFET, IGBT, UJT - their operating principles, structure and characteristics. (ii) Thyristors – Classification, Construction, Working principle, V-I characteristics, gate characteristics, turn-on and turn-off methods, Switching characteristics, Ratings, Protections, Mounting and Cooling. (iii) Series and parallel operation of SCRs. TRIAC -characteristics, modes of operation. GTO - operation. Triggering and control circuits.	10
2	**CONVERTER OPERATION WITH SCRS**	(i) **Single phase controlled rectifiers** - half-wave, full-wave and bridge fully controlled, half controlled circuits with R, RL, RL with freewheeling diode, RL with voltage source loads. (ii) **Three - phase controlled rectifiers** – half-wave and bridge circuits, six-pulse converter, fully controlled and half-controlled circuits with R and RL loads. Effects of load and source inductance. (iii) Dual converter and Cycloconverter operating modes. Line commuted inverters, firing and control circuits for different operations. AC voltage controller.	10
3	**SCR COMMUTATION CIRCUITS AND INVERTERS**	(i) Commutation schemes (different classes), Forced commutation circuits. (ii) **Single-phase and Three-phase Inverters** – series, parallel and bridge inverters, PWM inverter with square and sin wave output. McMurray and McMurray-Bedford inverter circuits. (iii) Voltage and current source inverters. Output voltage control, harmonics eliminations. Firing circuits for inverters.	10

4	**CHOPPERS**	(i) Principles of operation, classification, DC, AC, and multi- quadrant choppers. (ii) Buck, Boost, Buck-Boost converters. Jones and Morgan's choppers. Application.	10
5	**APPLICATIONS**	(i) Switched mode power supply (SMPS), Uninterruptible power supply (UPS), SCR battery chargers (ii) Induction heating, Dielectric heating.	8
		TOTAL	**48**

TEXTBOOKS / REFERENCES:

1. Power Electronics - Sen, P.C. - Tata Mc Graw Hill.
2. Power Electronics - P S Bimbhra -Khanna Publishers.
3. Power Electronics - M D Singh and K B Khanchandani -Mc Graw Hill.
4. Power Electronics, Circuits, Devices and Applications - Rashid M.H. - Prentice Hall of India.
5. Modern Power Electronics and AC Drives - B. K. Bose - Pearson Education.
6. Power Electronics - K. Hari Babu – SCITECH.

Course Title : POWER SYSTEM-I
Course Code: EE131504
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPICS	COURSE CONTENT	HOURS
1	**GENERAL INTRODUCTION**	Introduction to power system. Function & growth of electric power systems; Transmission of electrical energy; Comparison of D.C & A.C systems; Comparison of overhead & underground systems. Single line diagram.	6
2	**DISTRIBUTION**	Different systems and their comparison based on relative copper efficiencies, Concentrated and distributed loads in radial distributors fed at one and both ends. Ring mains. Stepped distributors, sub mains, feeders. Design of distributors, feeder and distribution substation.	6
3	**LINE CONSTANTS**	Resistance – Conductor materials. ACSR expanded ACSR, hollow and bundle. Conductors. Use of standard wire tables. Inductance- Inductance of solid cylindrical conductor, composite conductor. Concept of G.M.D. Inductance of single conductor with ground return, 2-conductor single phase line, inductance of three phase single circuit and double circuit lines with symmetrical and unsymmetrical spacing. Skin effect and proximity effect. Bundle conductors. Internal impedance of conductor. Bessel real and Bessel imaginary. Capacitance- Capacitance of isolated conductor, 2-conductor single phase line, three phase single circuit and double circuit lines with symmetrical and unsymmetrical spacing. Method of image and effect of ground. Charging current.	8
4	**PERFORMANCE OF TRANSMISSION LINES**	Performance of short- length and medium- length lines: Nominal- T and Nominal- pi representation. Performance	6

		of long transmission lines. Interpretation of the long- line equations. SIL. Ferranti effect. Generalized line constants and their application. Receiving- end, sending- end and universal Power-circle diagrams. Calculation of synchronous phase modifier capacity (SPM).line regulation. Maximum power limits. Efficiency of transmission line.	
5	**MECHANICAL DESIGN**	Transmission line structure-Types of conductors, line supports-poles, towers, strut and guy wires. Supporting structure for overhead lines. Towers (A,B,C,D and DE types), Disposition of conductors, spacing between conductors, length of span, calculation of sag and tension for equal and unequal suspension levels. Stringing chart, sag template, vibration and vibration damper.	6
6	**INSULATORS**	Different types of insulators. Leakage path, wet flashover and dry flashover distances, potential distribution over a string of suspension insulators, Methods of equalizing the potential. String efficiency.	4
7	**CABLES**	Insulating materials. Construction of single core and multi-core cables, Armouring, laying and jointing. H.V cables: pressure cables- oil filled and gas filled cables. Stress and capacitance of single core cable, most economical size of conductor. Capacitance and inter-sheath grading. Dielectric stress in bushing insulator. Capacitance and stress in 3 core cable, sheath effects, sheath current, insulation resistance, breakdown voltage and mechanism of breakdown. Thermal characteristics of cables.	4
8	**VOLTAGE CONTROL**	Sending end & receiving end voltage; Methods of voltage control – Synchronous machines, shunt capacitor	4

		& reactors, series capacitors, tape-changing transformers, booster transformers.	
9	**CORONA**	Corona discharge, disruptive corona voltage and visual critical voltage, factors effecting corona, corona power loss, empirical laws, line design based on corona, advantages and disadvantages of corona, radio interference, inductive interference between power and communication lines	4
		TOTAL	**48**

TEXT / REFERENCE BOOKS:

1. Electrical Power—S.L.Uppal.
2. Electrical Power System---C.L.Wadha.
3. Electrical Power System's design—M.V. Despande.
4. Switchgear principles—P.H.J.Crane.
5. Switchgear and Protection—S.S. Rao
6. Switchgear and Protection-- M.V. Despande.

Course Title : MICROPROCESSOR AND MICROCONTROLLER
Course Code: EE131505
L-T-P-C: 3-2-0-4

Class Hours/week	4
Expected weeks	12
Total hrs. of classes	36+12 = 48

MODULE	TOPICS	COURSE CONTENT	HOURS
1	**MICROPROCESSOR ARCHITECTURE**	Introduction to the microprocessor, The ALU, Up registers, Basic concepts of programmable device – Bus organization, system components etc., The interface section, The timing and control section, State transition sequence, Block diagram.	8
2	**PROGRAMMING MICROPROCESSORS**	Data representation, instruction formats, addressing modes, Instruction set, software design, assembly language programming, program looping, subroutine linkage, position independency, recursion.	8
3	**MEMORY INTERFACING**	Memory structure and its requirements, basic concepts and address decoding, interfacing circuit, address decoding and memory addresses, basics of 8155, interfacing of 8155 memory section.	8
4	**DATA TRANSFER SCHEMES**	Serial and parallel data transfer schemes, interrupts and interrupt service procedure. 8085 interrupts and vector locations, SIM and RIM instructions, RST instructions.	8
5	**I/O DEVICES**	OPAMPS, Opto-couples, DAC, ADC, sample& hold amplifiers, multiplexers, buffers, Timer counter, Data acquisition systems.	8
6	**INTRODUCTION TO MICROCONTROLLER**	Architecture, RISC and CISC processors.	4
7	**INSTRUCTION SET AND PROGRAMMING**	Instruction set and programming 8051micro controllers.	4
		TOTAL	**48**

REFERENCES:

1. Ramesh S.Gaonkar - Microprocessor Architecture, Programming and Applications (3e), Penram Pub
2. Mazidi M. A. & J. G. Mazidi - The 8051 Microcontroller and embedded systems, Pearson
3. Microprocessors and Interfacing: Nikhil Marriwala, Katson

Course Title : PRINCIPLES OF MANAGEMENT
Course Code: HS131506
L-T-P-C: 2-0-0-2

Class Hours/week	2
Expected weeks	12
Total hrs. of classes	24

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**MANAGEMENT**	Definition, nature, importance, evolution of management thoughts – pre & post scientific era, contributions made by Taylor, Fayol, Gilbreth,Elton Mayo, McGregor, Maslow – covering Time & Motion Study, Hawthrone Experiments; Is management a science or art? Functions of manager, ethics in managing and social responsibility of managers.	4
2	**PLANNING & CONTROL**	Why Management process starts with planning, steps in planning, planning premises, types of planning, barriers to effective planning, operational plan, strategic planning, Mckinsey's 7's Approach, SWOT analysis, Controlling-concept, Planning- control relationship, process of control, human response to control, dimension of control, MBO.	4
3	**DECISION MAKING & ORGANIZING**	Nature, process of decision making, decision making under Certainty and Uncertainty, decision-tree, group-aided decision, brain-storming. Organizing – concept, nature and process of organizing, authority and responsibility, delegation and empowerment, centralization and decentralization, concept of departmentation.	4
4	**STAFFING & MOTIVATION**	Concept, Manpower planning, Job design, recruitment & selection, training and development, performance appraisal, motivation, motivators and satisfaction, motivating towards organizing objectives, morale building.	3
5	**LEADERSHIP & COMMUNICATION**	Defining leadership and its role, should managers lead, leadership style, leadership development, Leadership behaviour. Communication- Process, Bridging gap-using tools of communication, electronic media in Communication.	3
6	**FINANCIAL MANAGEMENT**	Financial functions of management, Financial Planning, Management of Working Capital, Sources of Finance.	3

7	**MARKETING MANAGEMENT**	Functions of Marketing, Product Planning & Development, Marketing Organization, Sales Organization, Sales Promotion, Consumer Behaviour, Marketing Research and Information.	3
		TOTAL	**24**

TEXTBOOKS / REFERENCE BOOKS:

1. Robbins & Caulter, Management, Prentice Hall of India.
2. John R.Schermerhorn, Introduction to Management, Wiley-India Edition.
3. Koontz, Principles of Management, Tata-McGrew Hill.
4. Richard L. Daft, New Era of Management, Cengage Learning.
5. Stoner, Freeman and Gilbert. Jr., Management, Prentice Hall of India.
6. Koontz, Weihrich, Essentials of Management, Tata-McGrew Hill.
7. D.C. Bose, Principles of Management and Administration, Prentice Hall of India.

PRACTICALS

Course Title : CONTROL SYSTEM-I LAB
Course Code: EE131511
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Study of various Matlab Syntax related to control system	3
2	Study of Matlab preliminary commands and Matlab graphics functions	3
3	Determination of Transfer Function	3
4	Determination of Poles and Zeroes of Transfer Function	3
5	Study of different time response functions related to control system	3
	TOTAL	**15**

Course Title : POWER ELECTRONICS LAB
Course Code: EE131513
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Study of Power devices – power BJT, SCR, power MOSFET, IGBT etc.	3
2	Characteristics of SCR, TRIAC and MOSFET	3
3	Load voltage control using R, RC and UJT- Triggering of SCR – (Half wave and Full wave)	3
4	Load voltage control using RC- triggering of TRIAC using Lamp Load.	3
5	Single phase fully controlled SCR bridge circuit – R load, RL load – effect of freewheeling diode	3
6	Speed control of DC motor using SCR	3
7	Voltage/Power control of a load using PWM technique	3
8	PID control of PMDC motor with Speed measurement and Closed Loop Control	3
9	Triggering circuits for SCR chopper	3
10	Study of UPS/SMPS	3
	TOTAL	**30**

Course Title : POWER SYSTEM-I LAB
Course Code: EE131514
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	To determine the positive sequence line parameters L and C per phase per kilometre of a 3 phase single and double circuit transmission lines for different conductor arrangements	3
2	To understand the modelling and performance of short, medium and long transmission lines	3
3	To Study the Performance Characteristics of A Typical DC Distribution System (Radial Configuration)	3
4	To study the Ferranti Effect of long transmission line	3
5	To find the string efficiency of a string insulator with/without guard rings	3
6	To plot the power angle characteristics of given transmission lines	3
7	Develop a generalized program for calculation of corona loss	3
	TOTAL	**21**

Course Title : MICROPROCESSOR AND MICROCONTROLLER LAB
Course Code: EE131515
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Addition of immediate 8 bit numbers	3
2	Subtraction of immediate 8 bit numbers	3
3	Addition of 8 bit numbers stored in memory location	3
4	Block transfer of data in memory segments far apart	3
5	Block transfer of data in memory segments overlapping each other	3
6	Addition of an array of bytes stored in consecutive memory	3
7	Addition of unknown number of bytes stored in consecutive memory	3
8	Addition of two 16 bit numbers stored in memory	3
9	Subtraction of two 16 bit numbers stored in memory	3
10	Multiplication of two 8 bit unsigned numbers stored in memory	3
11	Division of one 8 bit unsigned number by another 8 bit unsigned number stored in memory	3
	TOTAL	**33**

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