ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Guwahati

Course Structure and Syllabus

ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)

Semester V/ EEE / B.TECH

Sl.No.	Sub Code	Subject	Hrs/week			Credits
			L	T	P	C
Theory						
1	EE131501	Control System-I	3	2	0	4
2	EEE131502	Microprocessors and Microcontrollers-II	3	2	0	4
3	EE131503	Power Electronics	3	2	0	4
4	EE131504	Power System- I	3	2	0	4
5	EC131505	Digital Signal Processing	3	0	0	3
6	HS131506	Principles of Management	2	0	0	2
Practical						
7	EE131511	Control System-I Lab	0	0	2	1
8	EEE131512	Microprocessors and Microcontrollers-II Lab	0	0	2	1
9	EE131513	Power Electronics Lab	0	0	2	1
10	EC131515	Digital Signal Processing 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 : MICROPROCESSORS AND MICROCONTROLLERS-II
Course Code: EEE131502
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	**ATMEL AVR MICROCONTROLLER FUNDAMENTALS**	The AVR Microcontrollers: History and Features. Overview of AVR ATMega8L microcontroller Architecture: Memory organization, system clocks, power management.	8
2	**ATMEL AVR ATMEGA8 MICROCONTROLLER PROGRAMMING**	AVR microcontroller software development & programming tools (avr-gcc toolchain, makefiles, AVRStudio). ATMega8 microcontroller on chip peripherals and programming: I/O Ports, Timers, Interrupts, USART, Analog to Digital Converter.	12
3	**ARM PROCESSOR FUNDAMENTALS**	ARM Processor Families, Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts and the Vector Table, Core Extensions, Architecture Revisions.	8
4	**ARM INSTRUCTION SET & PROGRAMMING**	ARM instruction set: programming model, assembly language, Thumb instruction set, memory organization, data operations and flow control. CPUs: Input/output mechanisms, isolated and memory mapped IO; interrupts and real time operations, ARM interrupts vectors, priorities and latency; supervisor modes, exceptions, traps, co-processors; cache memory and memory management.	14
5	**MICRCONTROLLER DEVELOPMENT FRAMEWORKS**	Overview of Microcontroller Development Frameworks aimed at ARM and AVR processor architectures (Mbed, Arduino)	6
		TOTAL	**48**

TEXTBOOKS / REFERENCES:

1. ARM System Developer's Guide Designing and Optimizing System Software: Andrew N. Slos, Dominic Symes Chris Wright (Morgan Kaufmann Publishers)

2. AVR Microcontroller and Embedded Systems: Using Assembly and C - Muhammad Ali Mazidi (Pearson Education)

3. Make: AVR Programming: Learning to Write Software for Hardware:Elliot Williams

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 & reactors, series capacitors, tape-	4

		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 : DIGITAL SIGNAL PROCESSING
Course Code: EC131505
L-T-P-C: 3-0-0-3

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

MODULE	TOPIC	COURSE CONTENT	HOURS
1	**INTRODUCTION**	What is DSP, block diagram of DSP System, its application and advantages **Discrete time signals (an overview):** Concept of discrete time signals, basic idea of sampling and reconstruction of signals, sequences-periodic, energy, power, unit sample, unit step, unit ramp, real and complex exponentials, arithmetic operation and sequences.	4
2	**LTI SYSTEMS (AN OVERVIEW)**	Definition, representation, impulse response, derivation of the output sequence, linear convolution, graphical and analytical method, stability and causality condition, recursive and non-recursive systems, FIR and IIR systems Linear Time Invariant (LTI) systems characterized by constant coefficient difference equations.	4
3	**Z TRANSFORM**	Definition of z transforms and Region of Convergence (ROC), Properties of ROC and Z transform. Inverse Z transform by power series expansion method, partial fraction method, contour integration or residue method. **Analysis of LTI Discrete Time Sequence using z transform:** Transfer function of LTI discrete time system, Impulse response and transfer function, response of LTI discrete time system using z transform, convolution and deconvolution using z transform, causality and stability of LTI discrete time system, characterization of LTI discrete time system by linear constant coefficient difference equation, determination of poles and zeros of rational Z transform.	6

4	**REALIZATION OF DIGITAL FILTERS IN BLOCK DIAGRAM AND SIGNAL FLOW GRAPH REPRESENTATION**	**IIR filters:** Direct form I, Direct Form II, cascade, parallel and ladder form structure **FIR Filters:** Direct Form structure, Cascade form structure, Linear phase FIR structure	3
5	**a) DISCRETE TIME FOURIER TRANSFORM (DTFT) OR SIMPLY FOURIER TRANSFORM OF A DISCRETE TIME SIGNAL** **b) TRANSFER FUNCTION OF LTI DISCRETE TIME SYSTEM IN FREQUENCY DOMAIN**	Definition: Frequency Spectrum of discrete time signals, Magnitude and phase spectrum, Inverse Discrete time Fourier Transform, Comparison of Fourier Transform of discrete and continuous time signal, properties of Discrete Time Fourier transform Frequency response of LTI discrete time system, properties of Frequency response	4
6	**a) REPRESENTATION OF PERIODIC SEQUENCES** **b) FOURIER REPRESENTATION OF FINITE DURATION SEQUENCES**	Discrete Fourier series, Properties of Discrete Fourier Series, Periodic convolution Discrete Fourier Transform (DFT), Properties of DFT, Circular Convolution, Linear Convolution using DFT, relation between DFT and z transform	4
7	**EFFICIENT COMPUTATION OF DFT**	Fast Fourier Transform (FFT), Decimation in time FFT algorithm: In place Computation, Decimation in Frequency FFT algorithm: in place computation	3
8	**a) DESIGN OF DISCRETE TIME IIR FILTERS FROM CONTINUOUS TIME FILTERS** **b) BASIC LOWPASS ANALOG FILTER APPROXIMATION**	i) Impulse Invariance Method: transformation of analog system function H_a (s) to digital system function H(Z). Relation of s-plane to z plane. Design steps for Impulse Invariance method. Drawback of Impulse Invariance Method ii) Bilinear transformation method: Comparison of Impulse Invariance Method and Bilinear transformation method i) Butterworth filter approximation ii) Chebyshev filter approximation iii)Elliptic filter approximation	5

9	**FIR FILTER DESIGN**	i) Ideal Frequency Response of Linear Phase FIR filters: Characteristics of FIR Filters with linear phase ii) Design of Linear Phase FIR filter using windows iii) Commonly used windows: Rectangular window, Hamming window, Hanning window, Blackman window	3
		TOTAL	**36**

TEXT BOOKS:

1. A Nagoorkani, "Digital Signal Processing", McGraw Hill Education (India) Pvt. Ltd (2e)
2. J.G.Proakis, D.G. Manolakis and D. Sharma, "Digital Signal Processing: Principles, Algorithm and Application", Pearson
3. P.Ramesh Babu, "Digital Signal Processing", Scitech

REFERENCES:

1. A. V. Oppenheim, R.W. Schafer and J.R. Buck, "Discrete Time Signal Processing", Pearson
2. S.K.Mitra," Digital Signal Processing: A Computer based Approach", TMH (4e)
3. S. Salivahannan, A. Vallabraj and C. Gnanapriya, "Digital Signal Processing", TMH, 2e
4. M.H. Hayes, "Digital Signal Processing", Schaum's Outline, TMH, 2e

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 : MICROPROCESSORS AND MICROCONTROLLERS-II LAB
Course Code: EEE131512
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1	Overview of the firmware development process for ARM7 microcontrollers using LPC2148 based NGX Blueboard (using manufacturer provided example source codes)	3
2	Development of firmware using C and assembly targeting the use of the on chip peripherals such as Timers, ADC, DAC, ...	3
3	Debugging over JTAG interface	3
4	Introduction to firmware development for AVR ATMega8 using the avr-gcc based toolchain	3
5	Configuring the ATMega8 micorcontroller (clock frequency, fuse bits for memory protection)	3
6	Introduction to I^2C & SPI bus protocols and interfacing of DS1307 RTC and MPU6050	3
	TOTAL	**18**

REFERENCES:

1. ARM System Developer's Guide Designing and Optimizing System Software: Andrew N. Slos, Dominic Symes Chris Wright (Morgan Kaufmann Publishers)

2. AVR Microcontroller and Embedded Systems: Using Assembly and C - Muhammad Ali Mazidi (Pearson Education)

3. Make: AVR Programming: Learning to Write Software for Hardware:Elliot Williams

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 : DIGITAL SIGNAL PROCESSING LAB
Course Code: EC131515
L-T-P-C: 0-0-2-1
Expected No. of weeks : 12 (approx)

Programs Executed by the Digital Signal Processor TMS320C6713 on the C6713 DSK board

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1.	Signal Generation : Generation of monotone (Sinusoidal / Square/ Triangular) and multi-tone (sinusoidal) signal (with varying frequency, sampling rate and amplitude)	2
2.	Linear Convolution: Implementation of linear convolution of two data stream.	2
3.	FIR Filtering: Designing of a (i) Low Pass (ii) Band Pass (iii) High Pass FIR filter. Application on real audio signals.	2
4.	IIR Filtering: Designing of a (i) Low Pass (ii) Band Pass (iii) High Pass FIR filter (Butterworth with different order). Application on real audio signals.	2
5.	Fourier transform / Fourier Series: Implementation of Fourier transform and Fourier series for a data stream (N Samples).	2
	TOTAL	**10**

Programs written and simulated using MATLAB

EXPERIMENT NO.	AIM OF THE EXPERIMENT	HOURS
1.	Given a causal system y(n)=0.9y(n-1)+x(n) (a)Find H(z) and sketch its pole-zero plot. (b)Plot the magnitude response and phase response.	3
2.	A third–order low pass filter is described by the difference equation y(n)=0.0181x(n)+0.0543x(n-1)+0.543x(n-2)+0.0181x(n-3)+1.76y(n-1)-1.1829y(n-2)+0.2781y(n-3).Plot the magnitude and phase response of the filter and verify that it is a low pass filter.	3
3.	Compute DFT of a sequence and plot magnitude and phase response (a) without function and (b) using function.	3
4.	For two given sequences, find linear convolution.	3

5.	For two given sequences, find circular convolution using DFT method.	3
6.	Convert analog filter into digital filter using (a) Impulse invariance transformation and (b) Bilinear transformation.	3
7.	Design a 25-tap (N=25) LPF with cut off frequency0.5pi radian using (a) Rectangular window and (b) Hamming window. Plot their frequency response.	2
8.	Design a 25-tap (N=25) HPF with cut off frequency 0.6pi radian using (a) Hamming window and (b) Blackman window. Plot their frequency response.	2
9.	Design a Butterworth LPF satisfying the following specifications Passband attenuation=0.4dB Stopband attenuation=20dB Stopband frequency=400Hz Passband frequency=800Hz	2
10.	Write a Matlab program to plot magnitude response and phase response of digital Chebyshev type-I low pass filter.	2
	TOTAL	**26**

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