(III YEAR B.E.) SEMESTER 'B'

EE 35507 CONTROL SYSTEMS

PREREQUISITE: - Engineering Mathematics, Network Analysis

COURSE OUTCOME:-

Students should be able to:

1: Develop mathematics models (TF and state space) of various physical systems.

2: Define time domain and frequency domain specifications of a control system.

3:Determine stability of a control system using time domain techniques and design appropriate controller for a given problem.

4: Propose alternate solution via compensator design to get desired frequency domain specifications.

5: Explain concepts of controllability and observability as well design of state feedback controller.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	-	-	100	3	-	3

THEORY:-

Unit 1. Modeling of Systems and Simulation: Modeling of thermal, hydraulic pneumatic processes, mechanical, electrical systems, impulse response, concept of transfer function, block diagram algebra, signal flow graph, Mason's formula. Control system Component: Error detectors, servomotors, servo-amplifiers, modulators demodulators, pneumatic controllers, hydraulic controller.

Unit 2. General Feedback Theory: Mathematical feedback theory, return ratio, return difference effects of feedback on closed loop performance. Time domain analysis: Test signals, transient behaviour of closed loop systems such as position servo and process servo systems, derivative and rate feedback, control, steady state behaviour of position and process servomechanisms, steady errors, integral control, stability of Routh-Hurwitz Criterion.

Unit 3. Frequency domain analysis: Concept of frequency polar indices plot, bode plots, frequency domain performance, M_p and ω_p effects of adding poles and zeroes of frequency domain performance, conformal mapping, principle of argument. Nyquist criterion, transportation lag, relative stability, conditionally stable system constant M and constant N loci, root loci.

Unit 4. State space analysis: Open loop system. Description, state space, eigenvalues and eigenvectors, modal transformation, solution of state differential equation, method of feedback in state space closed loop system description in state space controllability and observability in the sense of feedback control, effect of feedback on eigenvalues, eigenvectors and on modal transformation, solution of closed loop state differential equation, and introduction of phase plane analysis.

Unit 5. Compensation techniques: Types of compensation, reasons of compensation, design of compensation using phase lead networks. Stability analysis: Concept of BIBO stability, Routh-Hurwitz criteria, Nyquist criterion, relative stability, positive definiteness and semi-definiteness of quadratic forms, Lyapunov stability criteria.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments

1. To determine the performance characteristics of an angular position error detector using potentiometers.
2. To determine the characteristics of a Synchro Transmitter Receiver pair and use as a torque synchro and angular error detector.
3. To find the transfer function of an A.C. Servomotor.
4. To find the transfer function of a D.C. Servomotor.
5. To control the angular position of an AC servo motor as a carrier control system.
6. Determination of the time response characteristics of a DC Servo angular position control system.
7. To perform closed loop Speed control of a D.C Servomotor.
8. To determine the performance characteristics of a DC motor speed control with PWM type power driver.
9. To determine the performance characteristics of a DC motor speed control with SCR type power driver.
10. Analysis of Proportional + Integrator + Derivative (PID) control actions for First and second order systems.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Kuo B.C. Automatic Control System.
2. Ogata K., Modern Control Engineering.
3. Nagrath I.J. and Gopal M., Control Systems Engineering.

REFERENCE BOOKS RECOMMENDED:-

1. Melsa J.L. and Schuttz D.G. Linear Control Systems.

EC35511: MOBILE COMMUNICATION

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to:

1. Understand basics of cellular communication and its various standards.
2. To know the fading mechanism and effect of Large Scale Fading on Mobile communication.
3. Analyze the fading channel characteristics on small-scale and study their effects on radio wave propagation.
4. Demonstrate knowledge of different fading mitigation techniques.
5. Understand fundamental concepts of various speech coding, modulation techniques and GSM architecture.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	-	-	100	3	-	3

Unit 1: Review of cellular architecture, Frequency Re-use, Channel Assignment Strategies, Handoff Process, Factors affecting Handoff Process, Handoff Strategies, Interference and System Capacity, Co-channel Interference (CCI), Adjacent Channel Interference (ACI), Cell Splitting, Sectoring, Microcell Zone concept, Repeaters, Trunked Radio System.

Unit 2: Large Scale Fading: Multipath propagation and fading, Reflection, Diffraction, Scattering, Large scale path loss models, Free Space Propagation loss equation, propagation path loss, Ground reflection (Two-Ray) model, Link budget design, Log-normal Shadowing.

Unit 3: Small Scale Fading: Power delay profile, channel parameters (delay spread, Doppler spread, coherence bandwidth, coherence time, LCR and ADF) and types of fading channel, Rayleigh and Ricean Distributions.

Unit 4: Fading mitigation techniques: Concept of Diversity, Receiver Diversity methods, Transmitter diversity, performance analysis for Rayleigh fading channels, Equalization principle and adaptive equalization, CDMA principle and implementation, OFDM.

Unit 5: Basic properties of speech: Speech coding for wireless system such as time domain and frequency domain coder, vocoders, popular speech coders in GSM. Modulation techniques for mobile communication and their performance. GSM architecture and specification, Radio link features in GSM, GSM logical channels and frame structure.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

TEXT BOOKS RECOMMENDED:-

1. Rappaport T.S., Wireless Communications: Principles and Practice, 2nd ed., 2004 PHI.
2. Aditya K. Jagannatham, Principles of Modern Wireless Communications Systems Published by McGraw-Hill Education
3. Andreas F. Molisch Wireless Communications, 2nd ed., 2001, Wiley Pub.

REFERENCE BOOKS RECOMMENDED:-

1. Wilkis and Garg, Principles of GSM Technology, 2nd ed. 2004, PHI.
2. Fehar K., Wireless Digital Communication, 2nd ed. 2001, PHI.
3. Ramji Prasad and Richard Van Nee, OFDM Wireless Multimedia Communication, 2nd ed. 1998, Artech House.

EC 35513: COMPUTER NETWORKS

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to:

1. Understand the basics of Computer Network Architecture, Topology, and Network Model.
2. Analyze the design issues of various MAC layer protocols for deployment of Ethernet/IEEE Standards.
3. Illustrate the design issues of Network Layer and Transport layer protocols in Computer Networks.
4. Develop the concepts of Routing Algorithms and Routing Protocols.
5. Describe the design issues of WAN and Advanced Computer Network Architecture.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	2	70	30	40	60	200	3	1	4

THEORY:

UNIT 1: Review of concepts of layering and layered models - OSI and TCP/IP. Basic Overview of TCP/IP Protocol Stack, Circuit Switching and Packet switching, various types of networks, different LAN, MAN and WAN topologies, Network Hardware and Software Components, Transmission media, access devices like NIC, repeaters, switches, routers, protocols.

UNIT 2: Data Link Layer: Medium Access Protocols, LAN technology: Transmission medium, topology and Medium Access Control (MAC) techniques, Local Area Network types: IEEE 802.x standards – Ethernet, Fast Ethernet, Gigabit Ethernet, Switched Ethernet, Token Ring protocols, FDDI protocols

UNIT 3: Network and Transport layer: Internetworking with TCP/IP:- Internet/ IP addressing schemes & various Internet services, Network Layer: Internet protocol (IP) suite including IPV4 protocol and IPV6 protocol. Transmission Control Protocol:- basic features, transport protocols TCP and UDP, Connection Establishment and Closure, Flow Control and Congestion Control at Transport Layer

UNIT 4: Introduction to IP routing and services: Routing algorithms, various interior Gateway protocols like RIP, OSPF, and Routing among the ISPs using BGP. IP Services: Network Management with SNMP, ARP.

UNIT 5: WAN technology and Application Layer Services (HTTP, FTP, Email, and DNS), WAN technology: Introduction to label switching and MPLS, Introduction to Software defined networking. QoS design guidelines, VoIP

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments:

1. Study and Comparison of Various Network Topologies, Their Advantages, Disadvantages and Applications
2. Study of Various Networking Devices, Their Advantages, Disadvantages and Applications & Case Study of Optical Fiber.
3. To Configure a Machine on WINDOW Platform.
4. To Configure a Machine on LINUX Platform.
5. To Study how to Transfer Data From One Machine to Another Using FTP i.e. File Transfer Protocol
6. Installation of Ubuntu (Open Source LINUX) on a Machine.
7. Configuration of TELNET Service on a LINUX Machine.
8. Configuration of NFS Service on LINUX Machine
9. To Study SAMBA SERVER.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:

1. Comer, Internetworking with TCP/IP Vol. 1, PHI.
2. Stalling W., Data and Computer Communication, PHI.
3. Forouzan B., Data Communication and Networking, TMH.
4. Kurose, Ross, Computer Networking: A Top-Down Approach, Pearson, 7 th edition.

REFERENCE BOOKS RECOMMENDED:

1. Tanenbaum, Computer Networks, PHI.
2. Radia Pearlman, Interconnections, bridges, routers, switches and internetworking protocol.
3. Charles Spurgeon, Ethernet: The Definitive Guide, O'Reilly Media Publication

EC 35514: APPLIED DIGITAL SIGNAL PROCESSING

COURSE OUTCOMES:-

At the end of this course students will demonstrate the ability to:

1. Apply Fourier and z-transforms to represent and analyze LTI discrete time systems.
2. Compute numerically the response of discrete time systems (DTS) for finite time inputs.
3. Analyze and design digital IIR and FIR filters.
4. Implement the DTS and analyze the effects of finite word length and estimate the power spectrum.
5. Analyze and design multirate signal processing systems and understand applications of Digital Signal Processing.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	2	70	30	40	60	200	3	1	4

THEORY:

UNIT 1: Discrete-time Sequences, Discrete-time systems attributes, z-Transform, Transform analysis of LSI systems, Frequency analysis, Inverse systems, Linear phase systems and Minimum phase systems.

UNIT 2: Discrete Fourier Series, Discrete Fourier Transform (DFT), Linear convolution using DFT, Fast Fourier Transform (FFT) Algorithms. Linear filtering approach for computing DFT.

UNIT 3 : Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth, Chebyshev and Elliptic Approximations; Lowpass, Bandpass, Bandstop and High pass filters.

UNIT 4: Implementation of Discrete Time Systems, Effect of finite register length in FIR filter design. Parametric and non-parametric spectral estimation.

UNIT 5: Sampling and reconstruction of signals, Discrete time processing of continuous time signals, Sampling rate conversion using Discrete-time processing, Introduction to multirate signal processing. Applications of DSP.

ASSESMENT:

Mid-term test, Assignment, Tutorial, Quiz and End semester exam.

PRACTICALS:

List of Experiments:

1. Introduction to MATLAB
2. Basic Operations on Matrices
3. Generation of different types of Sinusoidal Signals
4. Generation of different Discrete type sequences
5. Decimation and interpolation for discrete time systems with frequency responses
6. z-Transform & checking stability through pole-zero plot
7. Methods of Inverse z-Transforms & concept of Residues and poles
8. Response of Linear constant co-efficient difference equation [LCCDE]
9. Linear Convolution in time domain and z-domain
10. To calculate DTFT using different methods and plot its magnitude and phase response.

11. Properties of DTFT: Time-shifting, Frequency-shifting, Convolution, Modulation and Time-reversal.
12. N-point DFT & its properties and FFT of various sequences
13. Circular Convolution
14. Sampling and Aliasing concept
15. Plot frequency response of Digital FIR and IIR LPF
16. Plot frequency response of Digital FIR and IIR HPF
17. Plot frequency response of Digital FIR and IIR BPF
18. Plot frequency response of Digital FIR and IIR BRF
19. Plot frequency response of Low-pass and High-pass COMB filter
20. Design a Digital Resonator with given specifications
21. Design a Notch filter with given specifications
22. Design an FIR LPF using a Rectangular window
23. Design an FIR Linear-phase filter using a Hamming window
24. Design an IIR LPF Butterworth filter using Bilinear Transformation
25. Design an IIR LPF Butterworth filter using Impulse Invariant method
26. Image Processing using MATLAB
27. Echo Generation using TMS320C6713 DSP PROCESSOR
28. Design of a Band-pass filter using TMS320C6713 DSP PROCESSOR

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:

1. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH
2. D.G.Manolakis and V.K.Ingle Applied Digital Signal Processing: Theory and Practice, Cambridge University Press, 2011.
3. Tarun Kumar Rawat, Digital Signal Processing, Oxford University Press, 2015

REFERENCE BOOKS RECOMMENDED:

1. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.
2. John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms and Applications, Prentice Hall, 1997.
3. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, 1992.
4. E.C.Ifeachor and B.W.Jervis, Digital Signal Processing: A Practical Approach, Pearson.

PEC 2

EC 35661: EMBEDDED SYSTEMS

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to:

1. Classify various RISC microcontrollers and explain AVR microcontroller's architecture.
2. Identify the features of AVR microcontrollers and interface them with various modules for real-time application designs.
3. Interpret the architecture of mixed-signal processors (MSP430) and learn its programming.
4. Understand the ARM Processor's Architecture and Basic Concept of RTOS.
5. Explain the ARM controller architecture, its programming and make use of RTOS for application designs.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	2	70	30	40	60	200	3	1	4

UNIT-1: AVR Microcontrollers:

Introduction to Embedded system and its architecture. AVR ATmega 8 bit Microcontroller, its architecture, memory mapping, instruction set, addressing modes, assembly language programming.

UNIT-2:AVR Microcontroller's Interfacing & Basic I/O Programming:

ATmega I/O ports, timers/counters, programming to generate delay and wave form generation, Interfacing of ATmega with LoRa Module, ZigBee Module and WiFi Module.

UNIT-3: MSP 430 Microcontroller:

Introduction to MSP 430 microcontroller, Architecture MSP430 memory organization, I/O system organization, MSP 430 instruction Set and assembly language programming.

UNIT-4: MSP 430 Microcontroller's Interfacing:

Basic Elements of Interfacing of MSP 430, System clock, fundamental Interrupts concept, times and event counter, GPIO ports, Iinterfacing with USART, Modem.

UNIT-5: ARM Microcontroller & RTOS:

Introduction to ARM Microprocessor based systems, Architecture of ARM and Cortex M3, Instruction sets, Assembly and embedded 'C' programming. Interfacing for application development. Introduction of Real Time Operating Systems (RTOS), interrupt routines in RTOS.

ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam

TEXT BOOKS RECOMMENDED:

1. ARM Microprocessor systems, CORTEX M Architecture, programming & interface, CRC press, Muhammad Tahir & Kashif Javed
2. AVR, Microcontroller & Embedded system, Person Edu., Mazidi
3. Introduction to Embedded systems Using microcontroller and the MSP430, Springer, Manuel, Rogelio, & Isidoro.

REFERENCE BOOKS RECOMMENDED:

1. Microcontroller in Practice, Springer, L. Susnea, M. MitSecu,
2. Embedded Systems , TMH publications, Prof. Rajkamal
3. MSP 430 Microcontroller Basics, Newnes, John Davies.

IT 35662: INTELLEGENT SYSTEMS

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to:

CO1 Explain the basics concepts of A.I. and problem solving through searching.

CO2 Apply fuzzy logic concept for given situation.

CO3 Design the neural network model for given real world scenario.

CO4 Describe various machine learning algorithms to solve real time problem.

CO5 Apply various machine algorithm for given dataset.

CO6 Explain concept of intelligent system and agents and significant of machine learning.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
3	-	-	70	30	-	-	100	3	-	3

UNIT 1: Artificial Intelligence:

Concept of Artificial Intelligence and intelligent agents. Areas of Artificial Intelligence. Problem solving and search methods, Knowledge, reasoning, and planning (KRP), Uncertainties and probabilities in KRP.

UNIT 2: Fuzzy Systems: Foundations of Fuzzy Logic. Foundations of Fuzzy Control. Types of Fuzzy Controllers. Fuzzy Logic Toolbox. Creation of Fuzzy Inference System with Fuzzy Logic Toolbox. Creation of Fuzzy Controllers.

UNIT 3: Neural Networks: Neuron Model. Perceptron Model. Modeling of Basic Logic Functions using the Perceptrons. Feedforward Neural Network with Backpropagation Error. Approximation of Functions by a Two-layer Feedforward eural Network. Character Recognition using Two-layer Feed-forwardNeuralNetwork.

UNIT 4: Machine learning: Basics, Types and Applications of ML
Supervised Learning: Introduction to Supervised Learning, Linear Methods for Regression, Support Vector Machines. Naive Bayes, Decision Tree, Ensemble methods: Bagging, boosting, Evaluating learning algorithms. Classification problems; decision boundaries; nearest neighbor methods, Logistic regression,

UNIT 5: Unsupervised Learning: Introduction to Unsupervised Learning, Cluster Analysis, Clustering K-means, hierarchical agglomeration clustering, Expectation Maximization method, Mixture of Gaussians, Factor analysis, PCA (Principal components analysis), Reinforcement Learning.

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ASSESMENT: Mid-term test, Assignment, Tutorial, Quiz and End semester exam

Text Books :-

1. Rich & Knight , “Artificial Intelligence” ,2nd Edition,Tata Mcgraw Hill.
2. Rajsekaran and Pai, “Neural Network and Fuzzy Logic”, 2nd Edition,Prentice Hall of India.

3.T.Mitchell “Machine Learning,” Mc-Graw Hill, 1997.

Reference Books:-

1. Russel & Norvig, “Artificial Intelligence”,2nd Edition ,Pearson Education.
2. Patterson, “Introduction to AI and expert System”,2nd Edition, Prentice Hall of India.
3. S.N. Sivananadan & S.N. Deepa, “Principles of Soft Computing”, 1st Edition,Wiley India.
4. Ethem Alpaydin,Introduction to Machine Learning”, MIT Press,2004.
5. Jacek M Zurada, “Introduction to Artificial Neural System”, JAICO Publishing.

EC 35881: ELECTRONICS DESIGN AND SIMULATION

COURSE OUTCOMES:

At the end of this course students will demonstrate the ability to:

1. Understand various types of Microcontrollers and their Architecture.
2. Analyze various Simulation software for Microcontrollers
3. Write code and simulate various microcontroller based circuits.
4. Interface various peripheral devices with microcontroller and calculate power requirement.
5. Install Linux based OS for Microcontrollers.
6. Design a microcontroller based working hardware project.

Hours / Week			Maximum Marks				Total Marks	Credits		
			Theory		Practical					
L	T	P	End Sem	CW	SW	End Sem		Th	Pr	Total
-	-	4	-	-	40	60	100	-	2	2

1. Study of Various Microcontroller families and their comparison. Understanding various ports of a microcontroller.

2. Various Simulation software and their limitations, Simulation of microcontroller and there programming methodology.

3. Interfacing various sensors, motors and other peripheral devices with microcontroller.

4. Power calculations. Installation of Linux OS for microcontrollers.

5. **MINOR PROJECT**: Students will submit a microcontroller based project in a group at the end of the semester.

ASSESMENT:

Internal viva, Continuous evaluation of experiments, Journal write-up, and Additional experiments conducted, Quiz, End semester exam.

TEXT BOOKS RECOMMENDED:

1. Muhammad Ali *Mazidi*. Janice Gillispie *Mazidi*. Rolin D. McKinlay.The 8051 Microcontroller and Embedded Systems. , 2e, Pearson Education
2. Rajkamal, Embedded Systems: Architecture Programming and Design, 2e, TMH Education.

REFERENCE BOOKS RECOMMENDED:

1. Jeremy Blum, Exploring Arduino , 1e, Wiley
2. Davies, John H, MSP430 Microcontroller Basics, 1e, Elsevier
3. Muhammad Ali Mazidi. Rolin D. Mckinlay, PIC Microcontroller and Embedded Systems, 1e, Pearson Education India.
4. Simon Monk, Programming the Raspberry Pi: Getting started with Python, 2e, McGraw Hill Education.