Scheme & Syllabus of UG

Engineering Program

Bachelor of Technology

(B.Tech.)

Electronics & Communication Engineering

2020-21

IPS ACADEMY

INSTITUTE OF ENGINEERING & SCIENCE, INDORE

(A UGC Autonomous Institute affiliated to RGPV)

IPS Academy, Institute of Engineering & Science

(A UGC Autonomous Institute, Affiliated to RGPV, Bhopal)

Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

Bachelor of Technology (B.Tech.) V Semester

S.No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	Mid Sem. Exam.	Quiz/ Assignment	End Sem	Term work / Lab Work & Sessional		L	T	P	
1.	EC 501	DC	Microprocessor & Microcontroller	70	20	10	30	20	150	2	1	2	4
2.	EC 502	DC	Digital Communication	70	20	10	30	20	150	2	1	2	4
3.	EC 503	DE	Departmental Elective	70	20	10	-	-	100	4	-	-	4
4.	EC 504	OE	Open Elective	70	20	10	-	-	100	3	-	-	3
5.	EC 505	D Lab	CNTL Lab	-	-	-	30	20	50	-	-	4	2
6.	EC 506	O/E Lab	MATLab Programming	-	-	-	30	20	50	-	-	4	2
7.	EC-507	IN	Evaluation of Internship-II	-	-	-	-	100	100	-	-	6	3
8.		IN	Internship-III	To be completed anytime during Fifth/Sixth semester. Its evaluation/credit to be added in Seventh Semester.									
9.	EC 508	P	Minor Project 1	-	-	-	-	50	50	-	-	4	2
10.	Additional Credits[#]	*[#]Additional credits can be earned through successful completion of credit based MOOC's Courses available on SWAYAM platform (MHRD) at respective UG level.*											
			Total	280	80	40	120	230	750	11	2	22	24

Departmental Electives	Open Electives
503 (A) CNTL	504 (A) EMT (Electro Magnetic Theory)
503 (B) Mobile Communication	504 (B) Computer System Organization
503 (C) Advanced Control system	504 (C) Process Control Instrumentation

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	1 Credit	1 Credit

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC501	Microprocessor & Microcontroller	2:1:2 (40 Hrs.)	4

Prerequisite: - Digital electronics, basics of computer architecture, buses & instructions cycle.

Course Objective: The objective of this course is that students can learn fundamental architectural & programming concepts of basic processors like 8085, 8086 and 8051 microcontroller, their interfacing with peripherals to design real life applications.

THEORY:

Module 1 **(8 Hrs)**

Microprocessor & Microcontroller history, evolution, applications, 8 bit processor 8085 Architecture, Instruction set, Addressing modes, Interrupts, Timing Diagrams, Memory & I/O interfacing, Assembly Language Programming with 8085.

Module 2 **(8 Hrs)**

Introduction to 16/32 bit microprocessors (8086, 8088, 68000 etc.), Architecture of 8086, instruction set, Minimum and Maximum mode configurations, Assembly Language Programming with 8086.

Module 3 **(8 Hrs)**

Peripherals & Interfacing- RAM, ROM, Programmable Peripheral Interface (8255), Programmable Interval Timer (8253/54), Interrupt Controller (8259), DMA controller 8257, USART.

Interfacing of 8/16 bit processor & designing of Applications using RS232, A/D, D/A converter, external memory, LCD, keyboard and stepper motor.

Module 4 **(8 Hrs)**

Overview of architecture of microcontroller 8051, SFRs, instruction set of 8051, timers and counters, Interrupts, Serial communication in 8051.

Module 5 **(8 Hrs)**

Assembly language programming of 8051, 8051 Interfacing, Applications, ADC and DAC, Stepper motor interfacing, 8051 connections to RS-232, Study of Von Neumann v/s Harvard architecture, CISC and RISC instructions set architecture, serial peripheral buses (UART, I2C, SPI), Introduction to Real time systems..

PRACTICALS

Experiment List:

1. Write a program to add/ subtract two 8 bit numbers in 8085 and check for carry/ burrow
2. Write a program using 8086 for division of a defined double word by another word and verify
3. To add two binary numbers each 8 byte long in 8086.
4. To find the maximum number in a given string (16 bytes long) and store it in location 0310 in 8086

5. To sort a string of 8 bit numbers in descending order in 8086
6. To multiply an ASCII string of eight numbers by a string ASCII digit. The result is a string of unpacked BCD digits.
7. Write an ALP in 8051 to add/subtract/multiply/divide two 8 bit no's available at register R0 & R1 of bank 0 and store the result in register R0/R1/R2/R3 of bank 1 and display the same on LED one by one.
8. Write an ALP in 8051 to transfer a block of data from one location (00H-07H) to another location (08H-0FH).
9. Write an ALP in 8051 to run timer 0, timer1 for 1 msec. & 5msec. to generate square wave on P 0.0 & P 0.1.
10. Write an ALP in 8051 to design pulse counter on 3.4 using counter 0 and give output on P2.
11. Write an ALP in 8051 to generate square wave on P1.2 using timer 0 interrupt and frequency can be controlled with input data on P2.
12. Write an ALP in 8051 to display IES IPS on 16*2 LCD.

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Course Outcome: -
Students earning credits will develop ability to:

1. Understand architecture & programming of 8 bit microprocessors.
2. Understand architecture & programming of 16 bit microprocessors.
3. Design and analyze various peripheral interfacing required for microprocessor and microcontroller based circuits.
4. Understand architecture & programming of 8 bit microcontroller.
5. Design and analyze microprocessor based circuits.

Text/ Reference Book:

1. Rey Bhurchandi, "Advanced Microprocessor Architecture", 2nd edition, TMH, 2001.
2. Bray, "The Intel Microprocessors: Architecture, Programming and Interfacing", 2nd edition, PHI, 2003.
3. Soumitra Kumar Mandal, **"**Microprocessors And Microcontrollers Architecture, Programming & Interfacing Using 8085, 8086 And 8051", 1st edition, Mc Graw Hill India, 2011.
4. Muhammad Ali Mazidi, "The 8051 Microcontroller and Embedded Systems using Assembly and C", 2nd edition, Pearson, 2012.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC502	Digital Communication	2:1:2 (40 Hrs.)	4

Recommended Prerequisite: Engineering Mathematics, Electronics

Course Objective: To understand the key modules of digital communication systems with emphasis on digital modulation techniques. To get introduced to the concept and basics of information theory and the basics of source and channel coding/decoding.

THEORY:

Module 1 **(8 Hrs.)**

Cumulative distribution function, Probability density function, Mean, Variance and standard Deviations of random variable, Gaussian distribution, Error function, Correlation and Autocorrelation, Central-limit theorem, Error probability, Power Spectral density of digital data.

Module 2 **(8 Hrs.)**

Sampling theorem, sampling of band pass signals, Pulse Amplitude Modulation (PAM), types of Sampling (natural, flat-top), equalization, signal reconstruction and reconstruction filters, aliasing and anti-aliasing filter, Pulse Width Modulation (PWM), Pulse Position Modulation (PPM).Quantization, quantization error, Pulse Code Modulation (PCM), commanding, scrambling, TDM-PCM, Differential PCM, Delta modulation, Adaptive Delta modulation, vocoders.

Module 3 **(8 Hrs.)**

Phase shift Keying (PSK)- Binary PSK, differential PSK, differentially encoded PSK, Quadrature PSK, M-arry PSK, frequency Shift Keying (FSK)- Binary FSK (orthogonal and no orthogonal), M-arry FSK. Comparison of BPSK and BFSK, Quadrature Amplitude Shift Keying (QASK), Minimum Shift Keying (MSK).

Module 4 **(8 Hrs.)**

Pulse shaping to reduce inter channel and inter symbol interference- Duobinary encoding, Nyquist criterion and partial response signaling, Quadrature Partial Response (QPR) encoder decoder. Regenerative Repeater- eye pattern, equalizers, baseband signal receiver, probability of error, maximum likelihood detector, Bayes theorem, optimum receiver for both baseband and passband receiver- matched filter and correlates, probability of error calculation for BPSK and BFSK.

Module 5 **(8 Hrs.)**

Introduction to information theory, uncertainty and information, average mutual Information and entropy, source coding theorem, Huffman coding, Shannon-Fano-Elias coding, Introduction, channel models, channel capacity, channel coding, information capacity theorem, Shannon limit.

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

PRACTICALS

List of Experiments:

1. Study of Sampling Process and Signal Reconstruction and Aliasing.
2. Study of PAM, PPM and PDM.
3. Study of PCM Transmitter and Receiver.
4. Time Division Multiplexing (TDM) and Demultiplexing.
5. Study of ASK, PSK and FSK Transmitter and Receiver.

Assessment: Internal Viva, continuous evaluation of experiments, journal write up, Quiz and End semester exam.

Course Outcomes:

Students earning credits will develop ability to:

1. To know the basics of random variable and distribution functions in digital communications
2. To understand how the signal is converted from analog to digital signals
3. To learn the digital modulation techniques
4. To know how the signal is received and demodulation techniques
5. To understand the information theory used for channel coding

Text/ Reference Books:

1. Taub and Schilling, "Principles of Communication Systems", 2ed Edition, TMH, 2007.
2. Lathi, "Modern Digital and Analog Communication Systems", 4th Edition, Oxford University Press, 2010.
3. Simon Haykins, "Communication Systems", 5th Edition, John Wiley, 2009.
4. 4.Ranjan Bose, "Information Theory Coding and Cryptography", 2th Edition, TMH, 2008.
5. Skylar and Ray, "Digital Communications", 2th Edition, Pearson Education, 2001.
6. Rao, "Digital Communications", 2th Edition, TMH, 2017.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC503 (A)	CNTL	4:0:0 (40 Hrs.)	4

Recommended Prerequisite: Engineering Physics, Mathematics.

Course Objective: Fundamentals of transmission lines theory is studied in the subjects.

THEORY:

Module 1 **(8 Hrs.)**

Characteristic Parameters of symmetrical and asymmetrical two port networks and their design Image impedance, iterative impedance, characteristic impedance, propagation coefficient, image transfer coefficient , iterative transfer coefficient, Lattice and Bridged T networks, reactive matching networks, matching techniques, insertion loss, symmetrical and asymmetrical attenuators and their design.

Module 2 **(12 Hrs.)**

Passive LC Filters Analysis and design of Low pass, high pass, band pass and band elimination filters, m-derived filters, composite filters, Filter specifications, Butterworth approximation, Chebyshev approximation, elliptic function approximation, frequency transformation.

Module 3 **(6 Hrs.)**

Positive real function LC, RL, RC, and RLC network synthesis, Foster and Cauer network, minimum positive real function, Brune's method, Bott-Duffin method, Synthesis-Coefficient.

Module 4 **(6 Hrs.)**

Transmission line fundamentals Lumped parameter equivalent, voltage and current on a transmission line, infinite line, characteristic impedance and propagation constant, waveform distortion, attenuation and phase equalizers, distortion-less line, loading, liner reflection on a line, reflection coefficient, input and transfer impedances, open circuit and short circuit line, reflection factors, reflection loss, insertion loss, T and π equivalents of a line, location of line fault, construction and design of two wire line and coaxial cable.

Module 5 **(8 Hrs.)**

Line at radio frequencies Parameters of line and coaxial cable at radio frequencies, dissipation-less line, voltage and current on a dissipation-less line, standing waves, standing wave ratio, input impedance of open circuit and short circuit, power and impedance measurement on lines, eighth-wave, quarter-wave and half wave line, circle diagram, Smith chart, solution of problems using Smith chart, single and double stub matching .introduction to micro-strip lines and its analysis.

Sky wave propagation- Introduction, structural details of the ionosphere, wave propagation mechanism, refraction and reflection of sky waves by ionosphere, ray path, critical frequency, MUF, LUF, OF, virtual height, skip distance, relation between MUF and skip distance.

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

Course outcome:

Students earning credits will develop ability to:

1. Analyze transmission line and find the line parameter at various points in different load conditions.
2. Apply various principles related to Filters.
3. Analyze LC, RL, RC, and RLC network synthesis
4. Analyze the the transmission lines parameters.
5. Understand the effects and parameters associated with different layers of atmosphere affecting the propagation of EM waves.

Text/Reference Books:

1. Ryder: Networks and Transmission Lines, PHI Learning.
2. Valkenberg: Introduction to Modern Network synthesis, Wiley India.
3. Suresh: Electric Circuits and Networks, Pearson Education.
4. Raju: Electromagnetic field theory and Transmission Lines, Pearson Education.
5. Ganesan: Transmission Lines and Waveguides, TMH. 6. Rao: Electromagnetic Waves and Transmission Lines, PHI learning.

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EC-503(B)	Mobile Communication	4L: 0T: 0P (04 hrs.)	Credits:04

Recommended Prerequisite: Communication engineering, wireless communication, digital Communication

Course Objective:

1. The objective of this unit is to understand the basic concepts of cellular mobile communication.
2. The objective of this unit is to understand mobile radio propagation, its types such as free space propagation and ground wave reflection.
3. The objective of this unit is to understand about Co channel interference reduction, Types of Non co channel interference.
4. The objective of this unit is to understand frequency division multiplexing and traffic channel and control channel
5. The objective of this unit is to understand spread spectrum multiple access and Capacity of cellular systems.

Module 1 **(8 hrs.)**

Introduction to wireless communication systems, different generations of wireless networks. 5 G technology and its performance, Cellular system design fundamentals, frequency reuse, handoff strategies, Interference and system capacity, Trunking and grade of service.

Module 2 **(8 hrs.)**

Mobile radio propagation**:** free space propagation model, Ground reflection propagation model, Long term fading, Small scale multipath propagation, Time dispersion parameters, Coherence bandwidth, Doppler spread and coherence time, types of small scale fading, Clarke's model for flat fading, level crossing and fading statistics.

Module 3 **(8 hrs.)**

Capacity in cellular systems, cell splitting and sectoring, cell-site antennas and mobile antenna, cochannel interference reduction, Frequency management and channel assignment.

Module 4 **(8 hrs.)**

Frequency division and time division multiple access. Global System for Mobile: System Architecture. GSM Radio subsystem,. GSM.. GSM Traffic Channel and Control Channel, Frame Structure.

Module 5 **(8 hrs.)**

MAC protocol: hidden and exposed terminal, near and far terminal problems, IEEE 802.11 system architecture, protocol architecture, physical layer, MAC layer, CSMA/CA, introduction to WLL and hiper LAN.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Understand the basic Concept of mobile system and its design, frequency reuse, channels, Co channel interference, reduction factor, Hand off mechanisms, Cell splitting concept.

2. Illustrate the basic concept of free space propagation model, Ground reflection propagation model, Long term fading, Small scale multipath propagation
3. Analyze of Co channel interference reduction, Frequency management and channel assignment.
4. Analyze and discuss the concept GSM Radio subsystem,. GSM.. GSM Traffic Channel and Control Channel
5. Understand various wireless MAC layer protocols.

Text/ Reference Books:

1. Mobile cellular telecommunication- W. C. Lee, McGraw-Hill
2. Wireless communication -T. S. Rappaport, Prentice Hall
3. Wireless communication – Simon Haykins, Pearson
4. Mobile communication - Schiller J., Addison Wesley.
5. Wilkis and Garg, Principles of GSM Technology, 2nd ed. 2004, PHI.
6. Fehar K., Wireless Digital Communication, 2nd ed. 2001, PHI.
7. Ramji Prasad and Richard Van Nee, OFDM Wireless Multimedia Communication, 2nd ed. 1998, Artech House.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC503 (C)	Advanced Control System	4:0:0 (40 Hrs.)	4

Prerequisite: Control System

Course Objective: This subject deals with state space, describing function, phase plane and stability analysis including controllability and observability. It also deals with modern control and optimal control systems.

THEORY:

Module 1 **(8 Hrs)**

Advantages and disadvantages of digital control system, Ideal sampler, sampled and hold circuit, zero order hold circuit, Z transform, Inverse Z transform by various method, mapping between s plane and Z plane, solution of the linear difference equation.

Module 2 **(8 Hrs)**

Pulse transfer function, general procedure for obtaining pulse transfer function, pulse transfer function of cascaded elements, pulse transfer function of closed loop systems. Transfer function of discrete data system, stability analysis of closed loop system in the z plane, Jury stability test.

Module 3 **(8 Hrs)**

Non Linear Systems: Introduction, common physical non linearity's, phase plane method, basic concepts ,singular points, stability of non linear system , construction of phase trajectories, system analysis by phase plane method, Describing functions methods, basic concepts derivation of describing function, liapunov's stability criterion.

Module 4 **(8 Hrs)**

Review of root locus, lead compensation, lag compensation, lag- lead compensation and their comparison, review of state space methods, observability and controllability of system, pole placement by state feedback.

Module 5 **(8 Hrs)**

Tuning rules of PID controller, modifications of PID controllers, Introduction to software package used in control systems- MATLAB SIMULINK.

Assessment: Internal Assessment for continuous evaluation, mid-term tests, Tutorials, Quizzes, Class Performance, etc. End semester Theory Exam.

Course outcome:

1. Discuss state variable approach for linear time invariant systems in both the continuous and discrete time systems.
2. Develop of state models for linear continuous time and discrete time systems.
3. Apply vector and matrix algebra to find the solution of state equations for linear continuous time and discrete time systems.
4. Define controllability and observability of a system and test for controllability and

observability of a given system.

5. Design pole assignment and state observer using state feedback.

Text/ Reference Book:

1. I.J. Nagarath and M., "Control Systems Engineering", New Age 5th Edition, 2007
2. Digital Control and State Variable Methods, "Conventional and Intelligent Control Systems (For the Modules 3,4 and 5)", M. Gopal, McGraw Hill 3rd Edition, 2008
3. Slotine & Li, "Applied Non-Linear Control, Englewood Cliffs", Prentice-Hall, 1991.
4. Bandyopadhyay M. N., "Control Engineering: Theory and Practice", Prentice-Hall of India Private Limited, 2003.
5. Ogata, K., "Discrete-time Control Systems", Pearson Education, 2005.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC 504(A)	Electromagnetic Theory	3:0:0 (40 Hrs.)	3

Prerequisite: Engineering Physics, Mathematics.

Course Objective: The objective of the subject is to analyze transmission line and find the line parameter at various points in different load conditions, various principles related to EM field to real life problems, solution to specific application and can find the effect of medium on wave propagation, & understand the effects and parameters associated with different layers of atmosphere affecting the propagation of EM waves.

THEORY:

Module 1 **(8 Hrs)**

Transmission line fundamentals: Transmission line fundamentals: Voltage and current on a transmission line, infinite line, characteristic impedance and propagation constant, waveform distortion, attenuation and phase equalizers, reflection coefficient, standing wave ratio, open and short circuit lines. Smith chart and impedance matching using transmission lines.

Module 2 **(8 Hrs)**

Electromagnetism and Maxwell's Equations: Basic of vector calculus, Basics of electrostatics Gauss law, Boundary relations. Electric field in dielectric and conductor, continuity equation, methods of images. Basic laws of magnetostatics, Ampere's law, Boundary conditions, vector magnetic potential, magnetization vector and its relation to magnetic field. Development of Maxwell's Equation

Module 3 **(8 Hrs)**

Uniform plane waves: Wave equations and their solutions, wave polarization, Poynting vector, phase and group velocity, Plane electromagnetic waves in free space, dielectric medium and conducting medium, Skin depth.

Module 4 **(8 Hrs)**

Waves at interface of different mediums: Waves propagation in lossy dielectrics, plane waves in lossless dielectrics, reflection of a plane wave at normal incidence, reflection of a plane wave at oblique incidence, Brewster's angle.

Module 5 **(8 Hrs)**

Radio wave propagation: Ground wave propagation- Introduction, plane earth reflection, space wave and surface wave, transition between surface and space wave, tilt of wave front due to ground losses. Space wave propagation- Introduction, field strength relation, effects of imperfect earth, curvature of earth and interference zone, shadowing effect of hills and buildings, absorption by atmospheric phenomena, variation of field strength with height, super refraction, scattering, tropospheric propagation, fading, path loss calculations.

Sky wave propagation- Introduction, structural details of the ionosphere, wave propagation mechanism, refraction and reflection of sky waves by ionosphere, ray path, critical frequency, MUF, LUF, OF, virtual height, skip distance, relation between MUF and skip distance.

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

Course outcome:

Students earning credits will develop ability to:

1. Analyze transmission line and find the line parameter at various points in different load conditions.
2. Apply various principles related to EM field to real life problems.
3. Analyze plane wave as solution to specific application and can find the effect of medium on wave propagation.
4. Analyze the EM wave propagation to real life mediums which can be classified as lossy and lossless mediums.
5. Understand the effects and parameters associated with different layers of atmosphere affecting the propagation of EM waves.

Text/Reference Books:

1. R. K. Shevgaonkar, "Electromagnetic waves", 2nd Edition, Tata McGraw Hill.
2. W. Hayt, "Engineering Electromagnetics", 4th Edition, Tata McGraw Hill.
3. David K. Cheng, "Field and Wave Electromagnetics**"**, 2nd Edition, Pearson.
4. Matthew N.O. Sadiku, "Elements of Electromagnetics**"**, 4th Edition, Oxford University Press.
5. B. Singh, H. Hiziroglu, "Electromagnetic field theory fundamentals", 2nd Edition, Oxford Press
6. E. Jordan, K. G. Balman, "Electromagnetic waves and radiating system", 2nd Edition, Prentice Hall India.

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC504 (B)	Computer System Organization	3:0:0 (40 Hrs.)	3

Prerequisite: - Computer system, digital electronics

THEORY:

Module 1 **(8 Hrs)**

Computer Basics and CPU: Von Newman model, various subsystems, CPU, Memory, I/O, System Bus, CPU and Memory registers, Program Counter, Accumulator, Instruction register, Micro operations, Register Transfer Language, Instruction Fetch, decode and execution, data movement and manipulation, Instruction formats and addressing modes of basic computer.

Module 2 **(8 Hrs)**

Control Unit Organization: Hardwired control unit , Micro and nano programmed control Unit, Control Memory, Address Sequencing, Micro Instruction formats, Micro program sequencer, Microprogramming, Arithmetic and Logic unit : Arithmetic Processor, Addition, subtraction, multiplication and division, Floating point and decimal arithmetic and arithmetic unit,

Module 3 **(8 Hrs)**

Input Output Organization: Modes of data transfer – program controlled, interrupt driven and direct memory access, Interrupt structures, I/O Interface, Asynchronous data transfer, I/O processor. Data transfer – Serial / parallel, synchronous/asynchronous, simplex/half duplex and full duplex.

Module 4 **(8 Hrs)**

Memory organization: Memory Maps, Memory Hierarchy, Cache Memory - Organization and mappings. Associative memory. Virtual memory, Memory Management Hardware.

Module 5 **(8 Hrs)**

Multiprocessors: Pipeline and Vector processing, Instruction and arithmetic pipelines, vector and array processors, Interconnection structure and inter-processor communication.

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

Course outcome:

Students earned credits will develop ability to

1. Illustrate the basic methods for the design of digital basic structure of computer.
2. Illustrate basic computer arithmetic operations & understand control Unit operations. .
3. Analyze and design memory organization that uses banks for different word size operations
4. Analyze and design the concept of cache mapping techniques & concept of I/O organization.
5. Discuss conceptualize instruction level parallelism & Pipeline and Vector processing

Text /Reference Books:

1. Morris Mano: Computer System Architecture, PHI.
2. William Stallings: Computer Organization and Architecture, PHI
3. Tanenbaum: Structured Computer Organization, Pearson Education

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC504 (C)	Process Control Instrumentation	3: 0: 0 (40 Hrs.)	3

Prerequisite: Engineering Mathematics, Fundamental of control system.

THEORY:

Module 1 **(8 Hrs)**

Introduction: Historical Perspective, incentives of process control, synthesis of control system. Classification and definition of process variables. Mathematical modeling: Need and application of mathematical modeling, Lumped and distributed parameters, Analogies, thermal, Electrical, and chemical systems, Modeling of CSTR, Modeling of heat exchanger, Interactive and non- interactive type of system, Dead time elements, Developing continuous time and discrete time models from process data.

Module 2 **(8 Hrs)**

Control Modes: Definition, Characteristics and comparison of on-off, proportional, Integral, Differential, PI, PD, PID, Dynamic behavior of feedback controlled processes for different control modes, Control system quality, IAE, ISE, IATE criterion, Tuning of controllers Ziegler-Nichols, Cohen-Coon Methods, controller trouble shooting.

Module 3 **(8 Hrs)**

Realization of Control Modes: Realization of different control modes like P, I, D in Electric, Pneumatic, Hydraulic controllers. Use of DDC and PLC, Process monitoring, man machine interface, real time systems: RTS introduction and its characteristics.

Module 4 **(8 Hrs)**

Actuators: Hydraulic, Pneumatic actuators, Solenoid, E-P converters, control valves, Types, Functions, Quick opening, Linear and equal percentage valve, Ball valves, Butterfly valves, Globe valves, Pinch valves, valve application and selection, Cavitations and flashing, Dampers and variable speed Drives.

Module 5 **(8 Hrs)**

Advanced Controls: Introduction to advanced control system like Cascade, Feed forward, Ratio, Selective, Override, Split range and Auctioneering control, Plant wide control. PI Diagrams: Symbols, Terminology, Case studies, a brief study of instrumentation and control relevant to industries.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Analyze and classify various process variables.
2. Designing of PID control systems.
3. Understand the process monitoring using PLC.

4. Analyze and classify various actuators.
5. Express a brief study of instrumentation and control relevant to industries

Text/ References Books:

1. Dale Patrick, Stephen Fardo, “Industrial Process Control System”.
2. Shinskey F.G., “Process Control System”, III Ed., McGraw Hill.
3. Smith C.A. & A.B. Corripio, “Principle & Practiced Automatic Process Control”, J. Willey.
4. Rao M & S.Qiv, “Process Control Engg.”, Gorden & Breach.
5. S Levi and AK Agrawala. Real-time system design. McGraw-Hill International.
6. GeorgeStephanopoulos “ Chemical Process Control” PHI, Delhi
7. C.D. Johnson “Process control instrumentation technology’ PHI
8. Harriott- Process Control 1st ed., TMH
9. Patranabis- Principles of Process Control 2nd ed., TMH

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Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC505	Communication Networks and Transmission Lines Lab	0:0:4	2

Prerequisite: - Engineering Mathematics, Electromagnetic theory.

Lab Objective: The main objective of CNTL lab is to understand the fundamentals of communication networks and their relation with transmission lines. Study of characteristic impedance, input impedance, attenuators, filters and various types of transmission lines using kits comes under laboratory practical of CNTL.

PRACTICALS

Experiments List:

1. To measure the characteristic impedance of a transmission line.
2. To measure the input impedance of a transmission line.
3. To measure the Attenuation of a transmission line.
4. To measure the phase difference between the current and voltage at the input of transmission line.
5. To draw frequency characteristic of a line.
6. To Study of stationary waves.
7. To plot phase shift along line.
8. To locate the fault within the transmission line.
9. To study transmission line under pulsed condition.

Experiments on virtual labs –

10. Observe the transient phenomenon of terminated coaxial transmission lines in order to study their time domain behavior.
11. Study the behavior of terminated coaxial transmission lines in frequency domain.
12. Introduction to Smith chart and its application for the unknown impedance measurement.
13. Find the change in characteristics impedance and reflection coefficients of the transmission line by changing the dielectric properties of materials embedded between two conductors.

Assessment: Internal viva, Continuous evolution of experiments, Journal write-up, Quiz and End semester exam.

Text / Reference Books:

1. Umesh Sinha, "Transmission lines and networks", 2nd Edition, Satya Prakashan, 2016.
2. B. R. Gupta, "Networks filters and transmission lines", 2nd Edition, S. K. Kataria Publication, 2001.
3. J. D. Ryder, "Networks, Lines and Fields", 2nd Edition, Prentice Hall of India, 2008.

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Scheme Based on AICTE Flexible Curriculum

Department of Electronics & Communication Engineering

Subject Code	Name of the Subject	L: T: P (Hrs.)	Credits
EC506	MATLAB programming	0: 0: 4	2

Recommended Prerequisite: Engineering Mathematics, C Language

Course Objective: The objective of this laboratory is to provide the basic knowledge of MATLAB software which is used to simulate and implement the trigonometry formula, effect of variation in controller parameter on system response, solve system equations in state-variable form.

PRACTICALS

Experiments List:

1. Familiarize with the MATLAB environment and running some basic commands in MATLAB.
2. To determine transpose, inverse values of given matrix.
3. To perform addition, subtraction, multiplies and divides of binary number of Digital System.
4. To plot Pole Zero Map of a discrete transfer function using MATLAB simulation.
5. To generate the amplitude modulated wave using MATLAB simulation.
6. To generate frequency modulated wave using MATLAB simulation.
7. To generate & analyze CRC code of given data.
8. To evaluate the stability of a system using state space model.
9. To perform operation in image processing for analyzing an image using MATLAB.
10. To implement the trigonometry formula using MATLAB Simulink.

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

Course Outcomes:

Students earning credits will develop ability to:

1. Aware of MATLAB software and perform basic programs.
2. Perform Real time application and know about basic key features of MATLAB software
3. Develop a program related to control system in MATLAB software.
4. Develop a program related to data communications in MATLAB software.
5. Generate and analyze the image using image processing tool box in MATLAB software.