Dr. Y. S. RAJASEKHARA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

ACHARYA NAGARJUNA UNIVERSITY

NAGARJUNA NAGAR - 522 510, GUNTUR (DT.), A.P., INDIA

ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH

SCHEME OF INSTRUCTION AND EXAMINATION, w.e.f. 2019-2022

III/IV B. TECH - SEMESTER I

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	EC 311	Linear Control Systems	OEC	3	0	0	40	60	3
2	EC 312	Analog Communications	PC	3	0	0	40	60	3
3	EC 313	Computer Organization	PC	3	0	0	40	60	3
4	EC 314	Digital Signal Processing	PC	3	0	0	40	60	3
5	EC 315	VLSI Design	PE	3	0	0	40	60	3
6	EC 351	Analog Communications Lab	PC	0	0	3	40	60	1.5
7	EC 352	Digital Signal Processing Lab	PC	0	0	3	40	60	1.5
8	EC 353	VHDL Lab	PC	0	0	3	40	60	1.5
9	EC 354	Mobile App Development	Skill Oriented Course	0	0	3	100	0	2
Total Credits									21.5

III/IV B. TECH - SEMESTER II

S.No.	Course Details		Category	Scheme of Instruction			Scheme of Examination		
	Code	Subject Name		Hours in a Week			Marks		Credits
				L	T	P	Internal	External	
1	EC 321	Microwave and Radar Engineering	PC	3	0	0	40	60	3
2	EC 322	Digital Communication	PC	3	0	0	40	60	3
3	EC 323	Computer Networks	PC	3	0	0	40	60	3
4	EC 324	Antennas & Wave Propagation	PE	3	0	0	40	60	3
5	EC 325	Embedded Systems	PE	3	0	0	40	60	3
6	EC 361	Digital Communication Lab	PC	0	0	3	40	60	1.5
7	EC 362	Verilog HDL Lab	PC	0	0	3	40	60	1.5
8	EC 363	Microwave Lab	PC	0	0	3	40	60	1.5
9	EC 364	Electronic Circuit Simulation	Skill Oriented Course	0	0	3	40	60	2
Total Credits									21.5

EC 311 **LINEAR CONTROL SYSTEMS** **L T P M C**
3 0 0 100 3

UNIT – I

Introduction: Basic concept of simple control system – open loop – closed loop control systems. Effect of feedback on overall gain – stability sensitivity and external noise. Types of feedback control systems – Liner time invariant, time variant systems and nonlinear control systems.
Mathematical models and Transfer functions of Physical systems: Differential equations – impulse response and transfer functions – translational and rotational mechanical systems. Transfer functions and open loop and closed loop systems. Block diagram representation of control systems – block diagram algebra – signal flow graph – Mason's gain formula.
Components of control systems: DC servo motor – AC servo motor – synchro transmitter & receiver.

UNIT – II

Time domain analysis: Standard test signals – step, ramp, parabolic and impulse response function – characteristic polynomial and characteristic equations of feedback systems – transient response of first order and second order systems to standard test signals. Time domain specifications - steady state response – steady state error and error constants. Effect of adding poles and zeros on over shoot, rise time, band width – dominant poles of transfer functions.
Stability analysis in the complex plane: Absolute, relative, conditional, bounded input –bounded output, zero input stability, conditions for stability, Routh –Hurwitz criterion.

UNIT - III

Frequency domain analysis: Introduction – correlation between time and frequency responses – polar plots – Bode plots – Nyquist stability criterion – Nyquist plots. Assessment of relative stability using Nyquist criterion – closed loop frequency response.

UNIT – IV

Root locus Technique: Introduction – construction of root loci Introduction to Compensation Techniques- Lag Compensation, Lead Compensation, Lag Lead Compensation.

UNIT-V

State space analysis: Concepts of state, state variables and state models –diagonalization – solution of state equations – state models for LTI systems. Concepts of controllability and Observability.

TEXT BOOKS:
1. B.C. Kuo, Automatic control systems, 7th edition, PHI.
2. I.J.Nagrath& M Gopal, Control Systems Engineering, 3rd edition, New Age International.
3. K. Ogata, Modern Control Engineering, 3rd edition, PHI.

REFERENCE BOOKS:
1. Schaum Series, Feedback and Control Systems, TMH
2. M.Gopal, Control Systems Principles and Design, TMH
3. John Van de Vegta, Feedback Control Systems, 3rd edition, Prentice Hall,1993.

EC 312 **ANALOG COMMUNICATIONS** **L T P M C**
3 0 0 100 3

UNIT – I

Amplitude Modulation: Time domain description, Frequency domain description, Single tone modulation, Generation of AM wave, Square law modulator, Switching Modulator, Detection of AM waves, Square law detector, Envelope detector, DSB-SC Modulation, Time-domain and frequency domain descriptions of DSB-SC, Generation of DSB-SC: Balanced modulator, Coherent detection of DSBSC modulated waves, Costas loop, Quadrature-Carrier multiplexing.

UNIT – II

SSB and VSB Modulations: Band-pass transmission, Complex low-pass representation of Narrow-band signals, Concepts of pre-envelope, Complex envelope and Natural envelope, Equivalent low-pass transmission model, Single side band modulation: Frequency domain description, Generation of SSB-SC wave, Frequency-discrimination method, Phase discrimination method, Demodulation of SSB-SC waves, Vestigial side-band modulation, Frequency domain description, Generation of VSB modulated wave, Envelope detection of VSB wave plus carrier, Comparison of AM techniques, Frequency Division Multiplexing (FDM).

UNIT – III

Angle Modulation: Introduction to Angle modulation, Relation between frequency Modulation and phase modulation, Single tone frequency modulation, Spectrum analysis of sinusoidal FM wave, Narrow Band FM and Wide Band FM, Transmission bandwidth of FM waves, Carson's Rule, Generation of FM waves, Indirect FM (Armstrong Method), Direct FM, Demodulation of FM waves, Balanced frequency discriminator – Zero-crossing detector, Linearized model of PLL, FM demodulation employing first order PLL, Practical Considerations, FM limiters, Applications.

UNIT – IV

Discrete Modulation: Generation and Demodulation of PAM, PWM and PPM; TDM, Comparison of Discrete Modulation Techniques.
Noise in Analog Modulation: AM Receiver model, Signal to noise ratios for coherent reception. DSB-SC receiver, SSC-SC receiver, Noise in AM receivers using envelope detection. AM threshold effect, FM receiver model, Noise in FM reception, Capture effect in FM, Threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM.

UNIT-V

Radio Transmitters: Frequency allocation for radio communication systems, Block diagrams and functions of radio transmitters for AM and FM systems.
Radio Recivers: TRF and super heterodyne receivers, RF, Mixer and IF stages, Choice of IF stages, Choice of IF, Image frequency, Alignment and tracking of radio receivers, AGC, Tone and volume controls, Receiver characteristics and their measurements, FM receivers, communication receivers, Fading and diversity reception

TEXT BOOKS:

1. Simon Haykin, Introduction to Analog and Digital Communication Systems, John Wiley and Sons, 3rd Edition, 2001
2. Leon W Couch II, Digital and Analog Communication Systems, Pearson Education, 2004
3. George Kennedy, Electronic Communication Systems, Mc Graw Hill, 4th Edition, 1999

REFERENCE BOOKS:

1. Taub and Schilling, Principles of Communication Systems, TMH, 2nd Edition, 1986
2. Sam Shanmugam, Analog and Digital Communication Systems, John Wiley, 1992.

EC 313 **COMPUTER ORGANIZATION** **L T P M C**
3 0 0 100 3

UNIT – I

Register Transfer and Micro-Operations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro-operations, Logic micro-operations, Shift micro-Operations, Arithmetic Logic shift Unit.
Basic Computer Organization and Design: Instruction codes, Computer Registers, computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-output and Interrupt, Design of basic Computer, design of Accumulator logic.

UNIT-II

Micro Programmed Control: Control Memory, Address Sequencing, MicroProgram example, Design of Control unit
Central Processing Unit: General Register organization, stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced instruction set (RISC).

UNIT -III

Computer Arithmetic: Addition and Subtraction, Multiplication Algorithms, Division Algorithms Floating-point Arithmetic operations.
Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associative Memory Cache Memory, Virtual Memory, Memory Management hardware.

UNIT-IV

Input-Output Organization: Peripheral Devices, Input-output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor, Serial Communication.

UNIT-V

Multi Processors: Characteristics of multiprocessors, Interconnection structures, Inter-processor arbitration, serial arbitration procedure, parallel arbitration logic, Inter-processor communication, Inter-processor synchronization, mutual exclusion with a semaphore.

TEXT BOOKS:
1. M..Morris Mano, Computer System Architecture, 3rd Edition, PHI, 2003.

REFERENCE BOOKS:
1. John P Hayes, ‘Computer Architecture and Organization’, 2nd edition.
2. V.Carl Hamacher et.al, ‘Computer Organization’ 2nd edition.
3. Tanenbaum: Structured Computer Organization, Pearson Education
4. William Stallings: Computer Organization and Architecture, PHI

EC 314 **DIGITAL SIGNAL PROCESSING** **L T P M C**
3 0 0 100 3

UNIT – I

Discrete Signals and Systems: Introduction to digital signal processing, Advantages and applications, Discrete time signals, LTI system: Stability and causality, Frequency domain representation of discrete time signals and systems.
Review of **Z-transforms** and **Inverse Z-transforms**

UNIT – II

DFT and FFT: Discrete Fourier Series, Properties of DFS, Discrete Fourier Transform, Properties of DFT, Linear convolution using DFT, Computations for evaluating DFT, Decimation in time FFT algorithms, Decimation in frequency FFT algorithm, Computation of inverse DFT.

UNIT – III

IIR Filter Design Techniques: Introduction, Properties of IIR filters, Design of Digital Butterworth and Chebyshev filters using bilinear transformation, Impulse invariance transformation methods. Design of digital filters using frequency transformation method.

UNIT – IV

FIR Filter Design Techniques: Introduction to characteristics of linear phase FIR filters, Frequency response, Designing FIR filters using windowing methods: rectangular window, Hanning window, Hamming window, Generalised Hamming window, Bartlett triangular window,Kaiser window, Processing Comparison of IIR and FIR filters

UNIT – V

Realization of Digital Filters: Direct, Canonic, Cascade, Parallel and Ladder realizations Effect of finite register length in FIR filter design, Introduction to Multi rate Signal Processing-Decimation, Interpolation, sampling rate convertion

TEXT BOOKS:

1. Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley & Sons, 2003.
2. S K Mitra, Digital Signal Processing: A Computer Based Approach, 2nd Edition, TMH, 2003
3. Alan V Oppenheim and Ronald W Schafer, Digital Signal Processing, Pearson Education/PHI, 2004. 4. P. Ramesh Babu, Digital Signal Processing, 2nd Edition, Scitech Publications, 2004.

REFERENCE BOOKS:

1. Johnny R. Johnson, Introduction to Digital Signal Processing, PHI, 2001.
2. Andreas Antoniou, Digital Signal Processing,TMH, 2006.
3. John G.Proakis, Dimitris G Manolakis, digital Signal Processing: Principles, Algorithms and Applications, Pearson Education / PHI, 2003

EC 315	**VLSI DESIGN**	**L**	**T**	**P**	**M**	**C**
		3	**0**	**0**	**100**	**3**

Course Objectives:

The objectives of the course are to:

1. Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors.
2. Study the fundamentals of CMOS circuits and its characteristics.
3. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
4. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
5. Provide concept to design different types of logic gates using CMOS inverter.

Course Outcomes:

On successful completion of this course, the student should be able to:

1. Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
2. Choose an appropriate inverter depending on specifications required for a circuit.

3. Draw the layout of any logic circuit which helps to understand and estimate parasitics of any logic circuit.
4. Design different types of logic gates using CMOS inverter.
5. Provide design concepts to design building blocks of data path of any system using gates.
6. Understand basic programmable logic devices
7. Understand the modeling Styles in VHDL.

UNIT – I

An introduction to MOS technology: Introduction to IC technology, Basic MOS transistors, NMOS fabrication, CMOS fabrication and BiCMOS technology. Basic Electrical Properties of MOS and BiCMOS Circuits: I_{ds} versus V_{ds} relationships, threshold voltage V_t, Transconductance ($g_{m)}$, Figure of merit (ω), Pass transistor, NMOS inverter, Pull-up to pull- down ratio, CMOS inverter, BICMOS inverters, Latch-up in CMOS circuits.

UNIT – II

MOS and BICMOS circuit Design processes: MOS layers, Stick diagrams, Layout diagrams, Design rules and layout, Sheet resistance Rs, Standard unit of capacitance, The Delay unit, Inverter delays, Propagation delays, Wiring capacitances, Scaling models, Scaling factors for device parameters.

UNIT – III

Subsystem design and layout: Architectural issues, Switch logic, Gate Logic, examples of Structured Design (combinational logic). Design of an ALU subsystem: Design of 4-bit adder, adder element requirements, a standard adder element, Implementing ALU functions with an adder. A further consideration of adders: Manchester carry chain, carry select adder, carry skip adder.

UNIT – IV

VLSI design flow, Introduction to ASICs, Full Custom ASICs, standard cell based ASICs, Gate array based ASICs, Programmable logic devices, PLAs, PALs, CPLDs and FPGAs.

UNIT – V

VHDL Hardware Description Language: Program Structure, Types and Constants, functions and Procedures, Libraries and Packages, Structural Design Elements, Dataflow design Elements, Behavioral design Elements, VHDL programs, The Time Dimension and Simulation, Synthesis.

TEXTBOOKS:

1. Douglas A.Pucknell and Kamran Eshranghian, Basic VLSI Design, 3rd edition, PHI, 2002.
2. Debaprasad Das, VLSI Design, Oxford University Press, 2nd edition, 2015.
3. Michael John Sebastian Smith, Application Specific Integrated Circuits, Addison Wesley, 2003.
4. K Lal Kishore and VSV Prabhakar, VLSI Design, I K International Publishing House, 2009
5. J.Bhasker, A VHDL Primer, Pearson Education India, 3rd edition, 2015.
6. John F Wakerly, Digital Design Principles & Practices, 3rd Edition, Pearson Education, 2002.

REFERENCES:

1. Neil H E Weste and Kamran Eshranghian, Principles of CMOS VLSI Design, A system perspective, 2nd edition, Pearson Education, 2002.
2. Stephen Brown and Z Vonko Vranesic, Fundamentals of Digital Logic with VHDL Design, TMH, 2002.
3. Douglas L. Perry, VHDL Programming by Example, McGraw Hill Education, 4th edition 2017

EC 351 **Analog Communications Lab**

L	T	P	M	C
0	0	3	100	1.5

1. Amplitude Modulation and Demodulation
2. DSB SC Modulation and Demodulation
3. SSB SC Modulation and Demodulation
4. Frequency Modulation and Demodulation
5. Pre Emphasis - De Emphasis Circuits
6. Verification of Sampling Theorem
7. PAM and Reconstruction.
8. PWM and PPM: Generation and Reconstruction
9. Effect of Noise on the Communication Channel
10. Time Division Multiplexing & amp; De multiplexing
11. Frequency Synthesizer.
12. AGC Characteristics.
13. PLL as FM Demodulator.
14. Spectrum analyzer and analysis of AM & amp; FM signals
15. Frequency Division Multiplexing & amp; De multiplexing

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

EC 352 **Digital Signal Processing Lab**

L	T	P	M	C
0	0	3	100	1.5

Experiments Based on Tool Boxes

1. Simulation of AM.
2. Simulation of FM.
3. Simulation of LPF and HPF.
4. Fourier Transforms.
5. Simulation of M-ary PSK.
6. Simulation of DPCM.
7. Evaluation of DFT and IDFT of 16 Sample Sequence using DIT Algorithm.
8. Evaluation of DFT and IDFT of 16 Sample Sequence using DIF Algorithm.
9. Design of IIR Butterworth Filter using Impulse Invariant Method.
10. Design of FIR Filter using Windowing Technique.
11. Convolution of Two Signals.
12. Correlation of Two Signals.
13. DFT Analysis of a Noise Corrupted Signal.

NOTE: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

EC 353 **VHDL Lab**

L	T	P	M	C
0	0	3	100	1.5

VHDL Modelling and Synthesis of the following Experiments

1. Logic gates
2. Adders (Hall adder & Full Adder)
3. Code Converter (Binary to Gray & Gray to Binary)
4. 4x16 Decoder
5. 16x4 Encoder
6. Comparator

7. Arithmetic Logic Unit (ALU)
8. BCD to 7-Segment Display
9. Multiplexer/De-multiplexer
10. Flip Flops: JK/T/D
11. Counter
12. Moore state Machine
13. Mealy State Machine
14. Traffic light controller
15. Universal Asynchronous Receiver Transmitter (UART)

Additional experiments beyond the syllabus

1. Stop Watch
2. Sine Wave Generator
3. Delay Generator
4. PN Sequence Generator
5. Cyclic Redundancy Checker

NOTE: A minimum of 10(Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

EC 354	**Mobile App Development**	**L**	**T**	**P**	**M**	**C**
		0	**0**	**3**	**100**	**2**

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Develop an application that makes use of databases.
4. Develop an application that makes use of Notification Manager
5. Develop a native application that uses GPS location information
6. Implement an application that for basic calculator
7. Implement an application that creates an alert upon receiving a message
8. Write a mobile application that makes use of RSS feed
9. Develop a mobile application to send an email.
10. Develop a Mobile application for simple needs (Mini Project)

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EC 321 **MICROWAVE AND RADAR ENGINEERING** **L T P M C**
3 0 0 100 3

UNIT-I

Introduction to Microwave Engineering-Microwave frequency band designations, Advantages and applications of Microwaves. Cavity Resonators-Rectangular cavity resonators, circular cavity Resonators. Wave guide components-Microwave TEE junctions-Coupling mechanism and scattering parameters for H-plane TEE,E-plane TEE, Magic Tee, ideal transmission line of length L. Power transmission in wave guides. Applications of Magic Tee. Directional couplers and applications. Faraday rotation-based Isolator and circulator. Measurement of- Impedance, frequency, Power and VSWR.

UNIT-II

Limitations of conventional tubes at Microwave Frequencies. Microwave Tubes-Linear Beam (O type) tubes-Two cavity Klystron- amplifier process, Expression for output power and efficiency, multi cavity klystron, Reflex klystron- Mathematical theory of bunching, power output and efficiency. Structure of TWT and amplification process.
M type tubes- eight cavity cylindrical magnetron, resonance and π mode operation, Hull cut-off voltage equation, separation of π mode, sustained oscillations in magnetron.

UNIT-III

Microwave semiconductor devices-Transferred Electron Devices - Gunn Diode - Operation and characteristics of Gunn Diode, Domain formation, RWH theory of Gunn Diode, equivalent circuit of Gunn Diode, Basic modes of operations, Applications. Tunnel Diode,
Avalanche transit time devices- IMPATT diode, TRAPATT diode, PIN Diode, Schottky Diode, Varactor Diode.

UNIT-IV

Introduction of RADAR, The simple form of Radar equation, Radar Block diagram and operation, prediction of Range performance, minimum detectable signal, Pulse repetition frequency and range Ambiguities. Integration of Radar pulse. Receiver Noise, Signal to Noise ratio. Probability of detection and false alarm. Radar cross section of Targets,

UNIT-V

CW and Frequency modulated Radar. MTI radar, Non-coherent MTI, delay line cancellers, Range gated Doppler filters. Pulse Doppler radar.
Tracking with Radar- Sequential lobing, conical scan, Mono pulse Tracking radars.
Super heterodyne Receivers, Low Noise front ends. Display. Duplexer types. Receiver Protectors, Radomes.

TEXT BOOKS:

1. Foundation for Microwave Engineering By RE Collin, IEEE Press Series, 2003
2. Microwave Devices & Circuits By Samuel Y Liao, 3rd Edition, Pearson Education, 2003
3. Microwave & Radar Engineering By M.Kulakarni, Umesh Publications, 2001.
4. Introduction to Radar Systems By Merill Skolnik, 2nd Edition, TMH, 2003

REFEERENCE BOOKS:

1. Microwave Engineering By ML. Sisodia and V.I. Gupta, New Age International, 2005
2. Radar Systems and Radio Aids of Navigation By A.K. Sen and A.B.Bhattacharya, Khanna Publishers.

EC 322 **DIGITAL COMMUNICATION** **L T P M C**
3 0 0 100 3

UNIT – I

Pulse Code Modulation: Quantization Process, Quantization Noise, Pulse Code Modulation Line Codes Noise Considerations in PCM Systems Virtues, Limitations, and Modifications of PCM Delta Modulation, Differential Pulse Code Modulation, Adaptive differential Pulse Code Modulation.
Base Band Pulse Transmission: Matched filter, Properties, Error Rate due to Noise Intersymbol interference, Nyquist's criterion for Distortionless Baseband Binary Transmission, Correlative level coding, Optimum Linear receiver Eye Pattern.

UNIT – II

Digital Passband Transmission: Geometric representation of signals, Conversion of the continuous AWGN channel into A vector channel Likelihood Functions Maximum Likelihood decoding Correlation Receiver probability of error Passband Transmission model coherent BPSK, QPSK, M-PSK Coherent BFSK, MSK, GMSK Non Coherent BFSK DPSK Comparison of Digital Modulation Schemes.

UNIT – III

Spread Spectrum Modulation: PN sequence A Notion of spread spectrum direct Sequence spectrum spread spectrum with Coherent BPSK Signal Space Dimensionality and Processing gain Probability of error frequency Hop spread spectrum.

UNIT - IV

Fundamental Limits in Information Theory: Uncertainty, Information, Entropy, Source Coding Theorem, Data Compaction, Discrete memoryless channels, Mutual information, Channel capacity, Channel coding theorem, Information capacity theorem, Data Compression.

UNIT – V

Error Control Coding: Discrete Memoryless channels Linear Block codes, Cyclic Codes, Convolution Codes, Maximum Likelihood and Sequential Decoding of Convolution Codes.

TEXT BOOKS:
1. Simon Haykin, Communication Systems, 4th edition John Wiley & Sons, 2001
2. Modern Digital and Analog Communication Systems, 3rd edition, OUP, 1998
3. Leon W Couch II, Digital and Analog Communication Systems, 6th Edition, Pearson, 2004

REFERENCE BOOKS:
1. John G Proakis, Digital Communications,4th Edition, McGraw Hill,2001
2. Bernard Sklar, Digital Communication,2nd Edition, Pearson Education,2001
3. Taub and Schilling, Principles of Communication Systems, 2nd Edition,TMH,1986

EC 323 **COMPUTER NETWORKS** **L T P M C**
3 0 0 100 3

UNIT-I

Introduction: Uses of Computer Networks, Network Hardware, Network Software, Reference Models (OSI and TCP/IP only).
Physical Layer: Introduction to Guided Transmission Media, Wireless Transmission.

UNIT-II

Data Link Layer: Data link layer design issues, Error Detection and Correction, Elementary Data link protocols, Sliding window protocols.
Medium Access Control Sublayer: The Channel Allocation problem, Multiple access protocols, Ethernet, Wireless LANs, Broadband wireless, Bluetooth.

UNIT-III

Network Layer: Network layer design issues, Routing Algorithms (The Optimality principal, shortest path Routing, Flooding, Distance vector routing, Link state routing, Hierarchical routing, Broadcasting routing, Multicasting routing.
Congestion control Algorithms, Quality of Service (Requirements, Techniques for Achieving Good Quality of Service).

UNIT-IV

Transport Layer:
Elements of Transport Protocols, TCP (Introduction of TCP, The TCP service model, TCP Protocol, TCP Connection Establishment, TCP Connection Release, TCP Congestion Control).

UNIT-V

Application Layer: The Domain Name System, Electronic Mail, The World Wide Web (Architectural Overview only), Multimedia

TEXT BOOKS:

1. Andrew S Tanenbaum, Computer Networks, 5th Edition, PHI.
2. Behrouz A. Foruzan, Data Communication and Networking, 4th Edition, TMH, 2004.

REFEERENCE BOOKS:

1. James F.Kurose, Keith W.Ross, "Computer Networking", Third Edition, Pearson Education
2. Behrouz A Forouzan, "Data Communications and Networking", Fourth Edition, TMH (2007).
3. Kurose & Ross, "COMPUTER NETWORKS" – A Top-down approach featuring the Internet", Pearson Education – Alberto Leon – Garciak.

EC 324	**ANTENNAS AND WAVE PROPAGATION**	**L**	**T**	**P**	**M**	**C**
		3	**0**	**0**	**100**	**3**

UNIT-I

RADIATION: Radiation Mechanism, Potential functions-heuristic approach, Maxwell's equation approach, Potential functions for sinusoidal oscillations, alternating current element, Power radiated by current element, Application to short antennas, assumed current distribution, Radiation from quarter wave Monopole / half wave dipole, Traveling wave antennas and the effect of the point of feed on standing wave antennas.

UNIT-II

Antenna Fundamentals: Isotropic, Directional, Omni-directional patterns, principal pattern, near-andfar-field regions, Radiation density, Radiation intensity, reciprocity, directivity and power gain, effective aperture, Half power Beam width, polarization, input impedance, efficiency, Friss transmission equation.

UNIT-III

Array Antennas: Two element array, Uniform linear array, Side lobe level and beam width of broadside array, Beam width of end fire array, Principle of multiplication of patterns, Effect of earth on vertical patterns, Binomial array, Basic principle of Dolph-Tschebyscheff array.

UNIT-IV

Characteristics of Typical Antennas: V and Rhombic antennas, Folded Dipole, Loop antenna, Yagi- Uda array, Helical antenna, Log periodic antenna, Pyramidal and conical Horn antenna, Corner reflector antenna, Parabolic reflector antennas - Paraboloid and parabolic cylinder, Cassegrain system of reflectors, Basic principles of slot antennas, Basic characteristics of micro strip antennas, feedingmethods, methods of analysis, design of rectangular and circular patch antennas.

UNIT-V

Radio Wave Propagation: Ground wave Propagation, Earth constants, Space-wave Propagation, Effect of curvature of an Ideal Earth, Variations of Field strength with height in space-wave Propagation, Atmospheric effects in space-wave Propagation, Radio-Horizon, Duct Propagation, Extended-range Propagation resulting from Tropospheric Scattering, ionospheric Propagation, Gyro frequency, Refraction and reflection of Sky Waves by the Ionosphere, Critical Frequency, Skip Distance, Maximum Usable Frequency.

TEXT BOOKS:

1. Edward C Jordan and Keith G Balmain, Electromagnetic Waves and Radiating Systems, 2nd Edition, PHI, 2003
2. Constantine A Balanis, Antenna Theory: Analysis and Design, Harper and Row Publishers, 2002
3. G.S.N.Raju, Antennas and Wave Propagation, 1st Edition, Pearson Publication, Singapore.
4. J.D. Kraus, Antennas, McGraw Hill, 1988.

REFERENCE BOOKS:

1. R.E. Collin, Antennas and Radio Wave Propagation, McGraw Hill, 1985.
2. R.C. Johnson and H. Jasik, Antenna Engineering Handbook, McGraw ill, 1984.
3. I.J. Bahl and P. Bhartia, Micro Strip Antennas, Artech House, 1980.
4. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill, 2005
5. F.E. Terman, Electronic and Radio Engineering, Mc Graw Hill, 1985.

EC 325	EMBEDDED SYSTEMS	L	T	P	M	C
		3	0	0	100	3

UNIT – I

Introduction - Introduction to Embedded Systems : Processor Technology, Role of Processor Selection in Embedded Systems, Design cycle in the development phase for an Embedded System, Using of target system or its Emulator and in-Circuit emulator, Use of software tools for development of an Embedded Systems.
Design Technology : Design of custom single purpose processor, optimization of custom single purpose processor, RT level - combination logic and sequential logic.

UNIT – II

RTOS and Overview:
Real Time Operating Systems: Architecture of Kernel, Task, Task States and Task Scheduler, Message Queues, Event Registers, Pipes, Signals, Semaphores, Memory Management, Interrupt Routines in an RTOS environment, Basic Design Using RTOS.

UNIT – III

ARM Microcontroller Overview

ARM-32 bit Microcontroller: Thumb-2 technology and applications of ARM, Architecture of ARM Cortex M3, Various Units in the Architecture, Debugging support, General Purpose Registers, Special Registers, Exceptions, Interrupts, Stack operation, Reset sequence

UNIT – IV

ARM Cortex M3 Microcontroller

ARM Cortex M3 Instruction Sets and Programming: Assembly basics, Instruction list and description, Thumb and ARM instructions, Special instructions, Useful instructions, CMSIS, Assembly and C language Programming

UNIT – V

Networks for Embedded Systems: The I^2C Bus, The CAN bus, SHARC link ports, Ethernet, Bluetooth: specification, Core protocol, IEEE 1149.1 (JTAG) Testability.

TEXT BOOKS:

1. Raj kamal "Embedded systems architecture, programming and design" Tata McGraw-Hill Publishing company Limited.
2. Embedded System Design: A Unified Hardware/Software Introduction Frank Vahid and Tony Givargis
3. Joseph Yiu, The Definitive Guide to the ARM Cortex-M3, 2nd Edition, Newnes, (Elsevier), 2010

REFERENCE BOOKS:

1. Jonathan W Valvano, Embedded Microcomputer Systems, Brooks/cole, Thompson Learning
2. David E. Simon, An Embedded Software Primer, Pearson edition.
3. KVKK Prasad, Embedded and real time systems, Dreemtech Press, 2005.
4. ARM System Developer's Guide-Designing and Optimizing System Software, Andrew N.Sloss, Dominic SYMES, Chris Wright

EC 361	Digital Communication Lab	L	T	P	M	C
		0	0	3	100	1.5

1. Generation and Detection of Time Division Multiplexing.
2. Generation and Detection of Pulse Code Modulation.
3. Generation and Detection of Delta Modulation.
4. Generation and Detection of DPCM.
5. Generation and Detection of DPSK.
6. Generation and Detection of Spread spectrum.
7. Generation and Detection of QPSK.
8. Generation and Detection of ASK.
9. Generation and Detection of FSK.
10. Generation and Detection of PSK.
11. Study of Companding system.
12. Error detection and correction using hamming code.
13. Adaptive Delta Modulation and CVSD.
14. Differential Pulse Code Modulation and Demodulation.
15. Differential Phase Shift Keying.

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

EC 362 **Verilog HDL Lab**

L	T	P	M	C
0	0	3	100	1.5

Verilog Modelling and Synthesis of the following Experiments

1. Logic gates
2. Adders (Hall adder & Full Adder)
3. Code Converter (Binary to Gray & Gray to Binary)
4. 4x16 Decoder
5. 16x4 Encoder
6. Comparator
7. Arithmetic Logic Unit (ALU)
8. BCD to 7-Segment Display
9. Multiplexer/De-multiplexer
10. Flip Flops: JK/T/D
11. Counter
12. Moore state Machine
13. Mealy State Machine
14. Traffic light controller
15. Universal Asynchronous Receiver Transmitter (UART)

Additional experiments beyond the syllabus

1. Stop Watch
2. Sine Wave Generator
3. Delay Generator
4. PN Sequence Generator
5. Cyclic Redundancy Checker

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

EC 363 **Microwave Lab**

L	T	P	M	C
0	0	3	100	1.5

1. To study Microwave Components.
2. To Plot the V-I Characteristics of Gunn diode and determine the threshold Voltage.
3. To study the Characteristics of reflex Klystron Oscillator.
4. Measurement of guided wavelength of the given Rectangular wave guide (Klystron or Gunn or both)
5. Calculate Low VSWR High VSWR using VSWR Meter.
6. Attenuation and power measurement due to component under test and with the frequency.
7. Measure an unknown Impedance of a given load (using smith chart also)
8. Measurement of scattering parameters of Magic Tee or Circulators.
9. Scattering coefficient measurement using the Vector Network Analyzer.
10. To demonstrate Spectrum Analysis Measurement techniques of a signal source and measure frequency using spectrum analyzer.
11. Gain of Horn Antenna, radiation Pattern and beam width.
12. To measure the dielectric constant of given solid material.
13. To measure coupling coefficient, Insertion loss & Directivity of a Direction Coupler.
14. To measure the Q- factor of the given wave guide.
15. To determine isolations, coupling coefficients and input VSWR' s for E and H plane waveguide Tee and Magic Tee junctions.

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

EC 364	Electronic Circuit Simulation	L	T	P	M	C
		0	0	3	100	2

1. Obtain the V-I characteristics of silicon and Germanium diodes.
2. Design a Zener diode voltage regulator.
3. Design and verify the operating point for a self-bias circuit.
4. Study the characteristics of a half wave and full wave rectifier.
5. Study the characteristics of a bridge rectifier.
6. Obtain the frequency response of a CE amplifier.
7. Obtain the frequency response of a two stage RC couple CE amplifier.
8. Design and simulate class A power Amplifier.
9. Simulate a differentiator and integrator using OPAMP.
10. Simulate a low pass and high pass filter using OPAMP.
11. Simulate a RC phase shift and Wein bridge oscillator using OPAMP.
12. Design and simulate a constant resistance and bridged T equalizer.
13. Simulate an Amplitude Modulator and Demodulator.
14. Simulate a Clipping and Clamping Circuit.
15. Simulate a Frequency Modulator and Demodulator.

NOTE: A minimum of 10 (Ten) experiments have to be performed and recorded by the candidate to attain eligibility for University Practical Examination.

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