Course Structure (R20) – V Year

Semester-V									
S.No.	**Code**	**Course Name**	**Category**	**L**	T	**P**	**IM**	**EM**	**Credits**
1.	2004501	Embedded systems and IoT	ESC	3	0	0	40	60	3
2.	2004502	Communication Systems	PCC	3	0	0	40	60	3
3.	2004503	Antennas and Wave Propagation	PCC	3	0	0	40	60	3
4.	2004504	**Professional Elective Course-I** Electronic Measurements and Instrumentation	PEC	3	0	0	40	60	3
	2004505	Computer Architecture and Organization	PEC	3	0	0	40	60	3
	2004506	Optical Communication	PEC	3	0	0	40	60	3
5.		**Job oriented or Open Elective course– I**	OEC	2	0	2	40	60	3
6.	2004507	Communication Systems Lab	PCC	0	0	3	40	60	1.5
7.	2004508	Embedded systems and IoT lab	ESC	0	0	3	40	60	1.5
8.	20SC509	Introduction to Machine learning using Python **(Skill oriented course – III)**	SC	1	0	2	40	60	2
9.	20MC510	**Management Organizational behavior**	MC	3	0	0	40		0
10.	2004510	**Community Service Project**	PROJ				100		1.5
Total									**21.5**

		Semester-VI							
S.No	**Code**	**Course Name**	**Category**	**L**	T	**P**	**IM**	**EM**	**Credits**
1.	2004601	Digital Signal Processing(DSP)	PCC	3	0	0	40	60	3
2.	2004602	Microwave Engineering	PCC	3	0	0	40	60	3
3.	2004603	Control Systems	PCC	3	0	0	40	60	3
4.	2004604	**Professional Elective Course - II** CMOS VLSI Design	PEC	3	0	0	40	60	3
	2004605	Information Theory & Coding	PEC	3	0	0	40	60	3
	2004606	Sensors and Actuators	PEC	3	0	0	40	60	3
5.	2006601	**Humanities Elective** Human Resource Development	HS	3	0	0	40	60	3
	2006602	**Digital Marketing**							
	2006603	**Project Management**							
6.	2004607	DSP Lab	PCC	0	0	3	40	60	1.5
7.	2004608	Microwave & Optical Communication Lab	PCC	0	0	3	40	60	1.5
8.	2004609	VLSI Design Laboratory	PCC	0	0	3	40	60	1.5
9.	20SC610	Advanced English Communication lab (**Skill Oriented Course – I**V)	SC	1	0	2	40	60	2
10.	20MC609	**Constitution of India**	MC	2	0	0	40		0
Total									**21.5**
		Industry Internship (Mandatory) for 6 - 8 weeks duration during summer							

Course Title	Embedded Systems and Internet of Things (IoT)				B. Tech. ECE V Sem			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2004501	**ESC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	--	3	40	60	100
Mid Exam Duration: 90Min					**End Exam Duration: 3Hrs**			

Course Objectives:

- This course imparts knowledge on, introduction to IoT, its complete architecture & internet Protocols involved enabling IoT communication over the network.
- The course also offers an introduction to IoT platforms, end devices, networks and cloud services.
- Using case analysis, assignments, Labs & projects students will acquire skills necessary to identify building blocks of an IoT application.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understanding of the communication protocols in IoT communications
CO 2	Identify issues and design challenges in IoT applications.
CO 3	Describe the topologies and architectures of various processors and IoT
CO 4	Apply appropriate hardware and software components for IoT applications.
CO 5	Develop a models for IoT applications

UNIT-I

Introduction to Embedded systems: Embedded system overview, features and architecture considerations-ROM, RAM, timers, data and address bus, Memory and I/O interfacing concepts, memory mapped I/O. CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture.

UNIT-II

Introduction & Overview of Internet of things: Introduction to The Internet of things today, Vision of internet of things, An IoT architecture outline, Functional blocks of IoT, industrial IoT, Challenges in IOT, Hardware and Software tools required for IoT application development.

Case Study: Simple Link ™ Wi-Fi ® Enabled Electronic Smart Lock.

UNIT-III

Internet/Web and Networking Basics: Introduction to internet & network topologies, TCP/IP protocol, TCP/IP Layers and their relative Protocols, IP addressing(IPV4), IP Address Classification & Subnet, Local IP, Gateway IP and DNS,TCP & UDP Communication, Overview of MAC Address, Energia Wi-Fi Library API's .

Case Study: Connected microcontrollers essential to automation in buildings.

UNIT-IV

MSP 432 processor: MSP 432 processor features, Architecture, its Booster Packs, Development Environment, Libraries, Fundamental Programming Concepts**,** TM4C123G Launchpad, Sensor hub Boosterpack,CC3220 SF Launch pad.

UNIT-V

Cloud Communication in IOT: IOT device to cloud storage communication Model, need of Cloud services in IOT, Different Cloud storage services, Cloud Data processing and frame format, Introduction to clouds like Temboo, Blynk, Pubnub etc.

IOT Platform and Application development: IoT applications in home, infrastructures, Healthcare, Transport, buildings, security, Industries, and other IoT electronic equipment, Adapting IPV6 for IOT Requirement(overview).

Text Books:

1. Internet of Things: Converging Technologies for Smart Environments and Integrate Ecosystems, Dr. OvidiuVermesan, Dr. Peter Friess, River Publishers.
2. Vijay Madisetti, ArshdeepBahga, "Internet of Things: A Hands-On Approach", Universities Press.

Reference Books:

1. Embedded Ethernet And Internet Complete (Designing and Programming Small Devices for Networking)by Jan Axelson.
2. Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur,AdamDunkels, Morgan Kuffmann.
3. Mazidi, Muhammad Ali, "TI MSP432 ARM Programming for Embedded Systems (ARM books)" Volume 4, MicroDigitalEd, 2016.
4. K.V. Shibu, "Introduction to Embedded systems", Second edition McGrawHill Education.

1. *http://www.ti.com/ww/en/internet_of_things/iot-overview.html.*
2. *http://energia.nu/reference/*
3. *Internet of Things (IoT): A vision, architectural elements, and future directions JayavardhanaGubbia, RajkumarBuyyab,∗, SlavenMarusic a, MarimuthuPalaniswami a*
4. *http://www.ti.com/wireless-connectivity/simplelink-solutions/overview/overview.html.*
5. *https://www.hivemq.com/blog/mqtt-essentials-part2-publish-subscribe.*
6. *Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010*

Course Title	Communication Systems					B. Tech. ECE V Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004502	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs			

Course Objectives:

- To analyze different modulation and demodulation techniques.
- To analyze various transmitter and receiver functions and circuits.
- To understand the noise in communication

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand various modulation techniques and sources of noise.
CO 2	Apply basic principles to compute various modulation parameters, noise characteristics, entropy, channel capacity.
CO 3	Analyze various modulators, demodulators, transmitters, receivers, Inter-symbol Interference and error control techniques.
CO 4	Compare various modulation and demodulation techniques and signaling schemes.
CO 5	Design error control coding techniques

UNIT-I

Introduction to communication systems: Modulation, its needs and types, Fundamental physical limitations.

Analog Modulation Schemes: AM, DSBSC and SSB- Generation and detection methods, FDM, Phase and frequency modulation, NBFM, WBFM, Multi-tone FM, Transmission band width of FM, direct and indirect generations of FM, Demodulation methods.

UNIT-II

Radio Transmitters and Receivers: Block diagram study of radio broadcast AM and FM transmitters, Super heterodyne AM and FM receivers, Measurement of sensitivity, selectivity, choice of IF, AGC.

Noise: External and internal sources of noise, Noise calculations, Noise equivalent resistant, Noise figure, Noise temperature, Effect of noise in AM and FM modulation system.

UNIT-III

Pulse Modulation: PAM generation and detection, PDM and PPM, Generation and detection. TDM, Comparison of TDM & FDM.

Waveform Coders: PCM system and its bandwidth requirement, Noise in PCM Systems, Quantization noise and SNR, Differential PCM, Delta modulation and Noise in delta modulation, Adaptive delta modulation.

UNIT-IV

Base band data transmission: Introduction, Inter-symbol Interference, Nyquist's Criterion for distortion less binary data, M-ary signaling scheme, Binary Vs M – ary, Eye diagrams.

Digital modulation schemes (Band Pass Data Transmission): Correlator and Matched filter receivers, ASK, FSK (coherent & Non Coherent), PSK, DPSK, Comparison of digital modulation schemes, M-ary signaling schemes- QPSK and QAM-case studies.

UNIT-V

Information theory: Introduction, Unit of information, Entropy, Rate of Information, Joint and conditional entropy, mutual information, channel capacity-Binary symmetric and non symmetric channels, Continuous Gaussian channel (Shannon- Hartley theorem)

Error control coding: Linear block codes- matrix description, Hamming codes, Decoding, Burst and random error correcting codes- Convolutional codes, code tree diagram, state diagram, trellis diagram.

Text Books:

1. Simon Haykin, "Communication Systems", Wileyestern,1978, 4th edition.

2. Sam Shanmugam,, K "Analog & Digital Communication Systems", John Willey & Sons.

Reference Books:

1. R.P. Singh & S.D. Sapre, "Communication Systems, Analog & Digital", Tata McGraw-Hill

2. B.P. Lathi, "Modern Digital and Analog Communication Systems", Oxford University Press, 2nd Edition, 1996.

3. Bernard Sklar, "Digital Communications", Prentice-Hall PTR, 2nd Edition, 2001.

4. Kennedy and Davis, "Electronic communication systems",4thEdition, Mc Graw International edition, 1992.

Course Title	ANTENNAS AND WAVE PROPAGATION				B. Tech. ECE V Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2004503	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs		

Course Objectives: The course should enable the students to:

- Be Proficient in the radiation phenomena associated with various types of antennas and understand basic terminology and concepts of antennas along with emphasis on their applications.
- Analyze the electric and magnetic field emission from various basic antennas with mathematical formulation of the analysis.
- Explain radiation mechanism of different types of antennas and their usage in real time field.
- Justify the propagation of the waves at different frequencies through different layers in the existing layered free space environment structure.

Course Outcomes: On successful completion of this course, the students will be able to

CO 303.1	Define various antenna parameters
CO 303.2	Describe the radiation mechanisms of various antennas.
CO 303.3	Analyze characteristics of antenna arrays.
CO 303.4	Calculate Various parameters of antenna.
CO 303.5	Analyze the effects of atmosphere on wave propagation.

UNIT-I

Antenna Basics: Introduction, Basic antenna parameters- patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Effective height, Antenna Apertures, Friis transmission formula, Illustrative problems. Fields from oscillating dipole, Antenna temperature, front–to-back ratio, basic Maxwell's equations, retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Directivity, Effective Area and Effective Height, Natural current distributions, far fields.

UNIT-II

Antenna Arrays: Point sources- Definition, Patterns, arrays of 2 Isotropic sources. Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays, Derivation of their characteristics and comparison, BSA with Non-uniform Amplitude Distributions, Binomial Arrays.

UNIT-III

VHF, UHF AND Microwave Antennas: Arrays with Parasitic Elements, Yagi - Uda Arrays,

Folded Dipoles & their characteristics. Helical Antennas, Horn Antennas, Parabolic Reflector, Micro strip Antennas. Antenna Measurements: Introduction, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods), case study.

UNIT-IV

Wave Propagation-I: Introduction, Characterizations and general classifications, different modes of wave propagation, Ray/ Mode concepts. Ground wave propagation - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections. Space wave propagation- Introduction, field strength variation with distance and height, effect of earth's curvature, absorption, Super refraction, M-curves and duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations.

UNIT-V

Wave Propagation-II: Sky wave propagation- Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Energy loss in Ionosphere, Summary of Wave Characteristics in different frequency ranges.

Text Books:

1. John D. Kraus, Ronald J. Marhefka and Ahmad S. Khan, "Antennas and wave propagation", TMH, New Delhi, 4th Edition, (Special Indian Edition), 2010
2. E.C. Jordan and. Balmain, "Electromagnetic Waves and Radiating Systems", PHI, 2nd Edition, 2000.
3. C.A. Balanis, "Antenna Theory" John Wiley & Sons, 2nd Edition, 2001.

Reference Books:

1. K.D. Prasad, "Antennas and Wave Propagation", Satya Prakashan, Tech India Publications, New Delhi, 2001.
2. F.E. Terman, "Electronic and Radio Engineering," McGraw-Hill, 4 th Edition, 1955.
3. Warren L. Stutzman, Gary A. Thiele, "Antenna Theory and Design", John Wiley & Sons, 3rd Edition.
4. Richard C. Johnson, "Antenna Engineering Handbook", McGraw-Hill, 1993.

Course Title	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION				B. Tech. ECE V Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2004504	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	40	60	100
Mid Exam Duration: 90Min					**End Exam Duration: 3Hrs**		

Course Objectives:

- To know various measuring systems and their functionality.
- To understand various measurement metrics for performance analysis.
- To explain principles of operation and working of different electronic instruments.
- To familiarize the characteristics, operations, calibrations and applications of the different Oscilloscopes.
- To provide exposure to different sensors and transducers.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the principle of operation of various Analog Instruments, Digital Instruments, CROs, Bridges and transducers.
CO 2	Describe the working f various analog and digital instruments.
CO 3	Compare the various Analog Instruments, Digital Instruments, CROs, Bridges and transducers.
CO 4	Apply the various Analog Instruments, Digital Instruments, CROs, Bridges and transducers in measurements.

UNIT-I

Performance characteristics of Instruments: Static characteristics- Accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement. Dynamic Characteristics- Speed of response, Fidelity, Lag and Dynamic error.

Analog Instruments: Transistor Voltmeter, Micro Voltmeter (Chopper type) – DC Differential voltmeter – AC voltmeters – Multi meter -wave analyzers (AF & RF) – Harmonic distortion analyzer- Spectrum analyzer-Applications.

UNIT-II

Digital Instruments: Digital Voltmeters (Ramp, Dual slope, stair case, successive approximation types) Digital multi meter, Universal counter, Digital tachometer, Digital Phase meter.

UNIT-III

Cathode Ray Oscilloscopes: Motion of electron in electronic field and in magnetic field- Block diagram of CRO, CRT, Electrostatic deflection sensitivity – Vertical and Horizontal deflection systems – Principle of operation of dual beam, dual trace, sampling and storage CRO‟s.

UNIT-IV

Bridges: Wheat stone bridge, Kelvin Bridge, Measurement of inductance- Maxwell's bridge, Anderson Bridge. Measurement of capacitance -Schering Bridge, Wien Bridge Errors and precautions in using bridges- Q meter and measurement methods

UNIT-V

Transducers: Active & passive transducers **,** Resistance, Capacitance, inductance; Strain gauges, LVDT, Piezo Electric transducers, Resistance Thermometers, Thermocouples, Thermistors, Sensistors.

Measurement of physical parameters - Force, Pressure, V e l o c i t y , Humidity, Moisture, Speed, Proximity and Displacement. Data Acquisition Systems.

Text Books:

1. H.S. Kalsi , "Electronic instrumentation", second edition , Tata McGraw Hill, 2004.
2. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", 5th Edition, PHI, 2002.

Reference Books:

1. Ernest O. Doebelin and Dhanesh N Manik, "Measurement Systems", 6th Ed., TMH,2010
2. David A. Bell , "Electronic Instrumentation & Measurements", 2nd Edition , PHI , 2003.
3. Robert A.Witte, "Electronic Test Instruments, Analog and Digital Measurements", 2nd Ed.,Pearson Education,2004.
4. K. Lal Kishore , "Electronic Measurements & Instrumentations", Pearson Education - 2005

Course Title	COMPUTER ARCHITECTURE AND ORGANIZATION				B. Tech. ECE V Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2004505	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs		

Course Objectives:

- To understand the architecture of a modern computer with its various processing units. Also the Performance measurement of the computer system.
- To understand the memory management system of computer.
- To understand the various instructions, addressing modes.
- To understand the concept of I/O organization.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the architecture of modern computer, different instruction types, concepts of I/O Organization and Memory systems.
CO 2	Analyze the Performance of a computer using performance equation, Instruction Sequencing, Input/output Operations
CO 3	Describe Addressing Modes, Buses memory circuits, Micro programmed Control and Execution of Complete Instruction
CO 4	Compare the buses and memory systems.

UNIT-I

Basic Structure Of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

Machine Instruction and Programs: Instruction and Instruction Sequencing, Register Transfer Notation, Assembly Language Notation, Basic Instruction Types.

UNIT-II

Central Processing Unit: General registers Organization, Stack Organization, Instruction formats, Addressing Modes, Program Control, RISC, Parallel Processing, Pipelining, Arithmetic Pipeline, and Instruction Pipeline.

Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

UNIT-III

Input/Output Organization: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access.

Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB).

UNIT-IV

The Memory Systems: Basic memory circuits, Memory System Consideration, Read Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING

Secondary Storage: Magnetic Hard Disks, Optical Disks,

UNIT-V

Processing Unit: Fundamental Concepts: Register Transfers, Performing an Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control, Micro programmed Control- Microinstructions, Micro program Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

Text Books:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky - "Computer Organization", McGraw Hill, 5thEdition2011.
2. John P. Hayes - "Computer Architecture and Organization", McGrawHill,3rdEdition, 2002.

Reference Books:

1. William Stallings - "Computer Organization and Architecture "– Pearson/PHI, Sixth Edition,
2. Andrew S. Tanenbaum - "Structured Computer Organization" PHI/Pearson, 4th Edition2012.
3. Sivaraama Dandamudi - "Fundamentals of Computer Organization and Design", Springer Int.Edition, 2003. J .P. Hayes, "Computer Architecture and Organization", McGraw-H

Course Title	OPTICAL COMMUNICATION					B. Tech. ECE V Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004506	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	-	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs			

- To understand the functionality of various components of fiber optical fiber communication system.
- To understand the properties and principles of different types of optical fibers, and losses that occur in fibers.
- To understand the working principle of optical sources (LED and LASER) and power launching schemes.
- To analyze the operation of various optical detectors (PIN & APD) and optical receiver.
- To understand the design of optical systems, WDM and Measurements.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Understand** the structures of Optical fibers based on modes, refractive index and fiber materials, principle of Optical Sources and detectors.
CO 2	**Describe** Transmission Characteristics of optical fibers, Rays & Modes in Optical Fiber, fiber Power Launching, Joints and splicing.
CO 3	**Compare** the types of optical sources and optical detectors on the basis of construction and principle of operation.
CO 4	**Analyze** the different kind of losses and dispersions in fibers, parameters in Optical system design.
CO 5	**Evaluate** various parameters in designing Optical receivers.

UNIT-I

Introduction to Optical fibers: Historical Development, General communication System, Optical Fiber Communication System, Advantages & Applications of Optical Fiber Communication, Ray Theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Rays & Modes in Optical Fiber, V-Number, Mode coupling, Cylindrical Fiber- Step Index & Graded Index Fibers, Single & Multi mode fibers, Cut off wavelength, Mode Field Diameter, Effective Refractive Index, Simple problems.

UNIT-II

Fiber Materials: Glass fibers, Halide glass fibers, Active glass fibers, Chalgenide glass fibers, Plastic optical fibers, Mechanical Properties of Fibers, Fiber Optic Cables.

Transmission Characteristics of optical fibers: Attenuation, Losses in optical fiber-Absorption Losses, Scattering Losses, Bending Losses, Core and Cladding losses, Dispersion-Chromatic dispersion, Material dispersion, Wave guide dispersion, Polarization Mode Dispersion, Intermodal dispersion, Fiber Birefringence

UNIT-III

Optical Sources: Introduction, Light Emitting Diodes (LEDs), LED Structures-Surface Emitting LED & Edge emitting LED, Light Source Materials, Quantum efficiency and LED Power, Modulation of LED, Advantages of LED, LASER Diodes, Laser action processes, Laser Diode Modes and Threshold Conditions, Laser Diode Rate Equations, External Quantum Efficiency, Resonant Frequencies, Advantages of LASER Diode, Comparison of LED & LASER Diodes.

Photo Detectors: Requirements of photo detectors, PIN photo detector, Avalanche photo diode (APD), Detector response time, Structures for InGaAs APDs, Temperature effect on avalanche gain, comparisons of photo detectors, case studies.

UNIT-IV

Power launching and Coupling: Introduction, Source to Fiber Power Launching, Source output pattern, power coupling calculation, power launching versus wavelength, Equilibrium Numerical Aperture, Lensing schemes for Coupling Improvement, Non imaging microsphere, Laser diode to fiber coupling, LED coupling to single mode fibers.

Fiber to fiber Joints-Mechanical misalignment, Fiber Splicing-Splicing techniques, splicing single mode fibers, Optical Fiber Connectors-Connector types, Single mode fiber connectors-Connector return losses, Passive components-2 x 2 fiber coupler, Star couplers.

UNIT-V

Optical receiver operation: Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Optical system design-Point to point links, system considerations, Link Power budget, Rise time budget, Transmission distance, Concept of WDM-Operational principle, Types, Fiber grating filters. Measurements-Optical Time domain Reflectometer (OTDR), Attenuation Measurements-Cut back technique & Insertion loss method, Dispersion Measurements, EYE Patterns.

Text Books:

1. Gerd Keiser, "Optical fiber communications", McGraw Hill International Edition, 4th Edition, 2010.
2. John M. Senior, "Optical fiber communications", Prentice Hall of India, 3rd Edition, 2010.

Reference Books:

1. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", TMH, 2010.
2. S. C. Gupta, "Text book on optical fiber communication and its applications", Prentice Hall of India, 2005.
3. Satish Kumar, "Fundamentals of Optical Fiber communications", Prentice Hall of India, 2009.

Course Title	Communication Systems Lab				B. Tech. ECE V Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004507	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		-	-	3	1.5	40	60	100
						End Exam Duration: 3Hrs		

Course Objectives:

- Design and generation of AM, PM, FM,ASK,PSK, QPSK communication techniques.
- Usage of Communications test equipment.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Apply the knowledge of Amplitude, Frequency and Pulse Modulation Systems in developing analog Communication systems.
CO 2	Apply the knowledge of TDM, PCM, Delta Modulation, FSK, PSK, DPSK,QPSK in developing Digital Communication systems.
CO 3	Perform measurements like Sensitivity, Selectivity and Fidelity of Communication subsystems and systems.
CO 4	Test equipment to test various communication systems they develop
CO5	Apply the knowledge of Amplitude, Frequency and Pulse Modulation Systems in developing analog Communication systems.

Part- A: Analog Communication Lab:

1. Amplitude modulation and demodulation.
2. Frequency modulation and demodulation.
3. Characteristics of Mixer.
4. Pre-emphasis & de-emphasis.
5. Pulse Amplitude Modulation and demodulation.
6. Pulse Width Modulation and demodulation.
7. Pulse Position Modulation and demodulation.
8. Radio Receiver measurements – Sensitivity, Selectivity, & Fidelity.

Part- B: Digital Communication Lab:

1. Sampling Theorem – verification.
2. Time division multiplexing.
3. Pulse Code Modulation.
4. Delta modulation.
5. Frequency shift keying - Modulation and Demodulation.
6. Phase shift keying - Modulation and Demodulation.
7. Differential phase shift keying - Modulation and Demodulation.
8. QPSK - Modulation and Demodulation

Course Title	Embedded Systems and IoT Lab				B. Tech. ECE V Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004508	ESC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		--	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- This course imparts knowledge on, Arduino Uno, Raspberry pi, MSP430F5529LP and TM4c123G Launch pad.
- The course also offers an introduction to IoT platforms, end devices and cloud services.
- Using these fundamentals learnt in the Lab, students can do projects and will acquire skills necessary to implement an IoT application.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand and Identify issues and design challenges in IoT applications.
CO 2	Select appropriate hardware and software components for IoT applications.
CO 3	Conceptual knowledge will help students to build IoT projects.
CO 4	Understanding of the communication protocols in IoT communications
CO 5	Familiarize with application program interfaces for IoT

Hardware required: MSP430F5529LP, Arduino Uno, Raspberry pi, TM4C123G Launch pad, Sensor hub Booster pack, CC3220 SF Launch pad.
Software required: Energia v17, Code Composer studio, Arduino Uno, Raspbian, CC3100 SDK, CC3220 SDK & a Serial terminal software**.**

Lab 1.

a) Program the MSP430 for Led blink, switch usage, ADC, PWM generation & serial communication.

b) Write a program by using WiFi libraries, to connect your Launchpad with the available Encrypted/non-encrypted WiFi network.

Lab 2.

a) Write a program to connect the launch pad with WiFi & print IPAddress, GatewayIP, Subnetmask on Serial Monitor.

b) Write a program to assign a static IP, Gateway & Subnet to a WiFi Connected controller.

Lab 3.

a) Design a Client server model between two WiFi modules and establish the communication between the two.

b) Write a program to design client server model based on TCP & UDP communication Protocols.

Lab 4.
Design a HTTP based web server to manipulate the GPIO's of WiFi Module and monitor Sensor data connected with WiFi Module.

Lab 5.
Use Blynk API's and write a program to control your Launchpad with Mobile Application.

Lab 6.
Using temboo credentials connect your launchpad with Yahoo weather to receive weather details in serial terminal.

Lab 7.
With the help of Temboo services, generate Code for CC3220SF launchpad and upload it from TI CCS Cloud.

Lab 8.
Design a Simple MQTT Based communication model to retrieve sensor data from a cloud Storage.

Lab 9.
Getting started with WLAN Access point & Station using CC3100SDK using CCS and SimplinkWiFi Library.

Lab 10.
Import and execute Email Send Application using CC3100 SDK in CCS and understand Simplink API usage.

Note: Use either MSP430, Arduino or Raspberry pi Launch pad to perform the above experiments.

ADDITIONAL EXPERIMENTS

- Traffic light control interfacing
- Stepper motor control interfacing

Note: Use either MSP430, Arduino or Raspberry pi Launch pad to perform the above experiments.

Course Title	Introduction to Machine Learning using Python				B. Tech. ECE V Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20SC509	SC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		1	-	2	2	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To create awareness on machine learning
- To know step by step procedure to run ML model
- To differentiate the supervised and unsupervised algorithms
- To know the architecture of ANN and CNN.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand fundamentals of Machine Learning
CO 2	Analyze flow chart to build a Machine Learning model
CO 3	Apply concepts of Machine learning in real time
CO 4	Develop ANN and CNN models for real time applications

UNIT-I

The Fundamentals of Machine Learning: Introduction, Types of Machine Learning Systems-Supervised/Unsupervised Learning, Batch and Online Learning, Instance-Based Versus Model-Based Learning; Main Challenges of Machine Learning-Insufficient Quantity of Training Data, Non representative Training Data, Poor-Quality Data, Irrelevant Features, Over fitting the Training Data, Under-fitting the Training Data, Stepping Back, Testing and Validating.

UNIT-II

End-to-End Machine Learning Project: Working with Real Data, Look at the Big Picture-Frame the Problem, Select a Performance Measure, Check the Assumptions, Get the Data-Create the Workspace, Download the Data, Take a Quick Look at the Data Structure, Create a Test Set, Discover and Visualize the Data to Gain Insights-Visualizing Geographical Data, Looking for Correlations, Experimenting with Attribute Combinations, Prepare the Data for Machine Learning Algorithms-Data Cleaning, Handling Text and Categorical Attributes, Custom Transformers, Feature Scaling, Transformation Pipelines, Select and Train a Model.

UNIT-III

Classification : Training a Binary Classifier, Performance Measures-Measuring Accuracy Using Cross-Validation, Confusion Matrix, Precision and Recall, Precision/Recall Tradeoff, The ROC Curve; Multiclass Classification, Error Analysis, Multi label Classification, Multi output Classification,

Training Models: Linear Regression, The Normal Equation, Computational Complexity, Gradient Descent-Batch Gradient Descent, Stochastic Gradient Descent, Mini-batch Gradient Descent; Polynomial Regression, Learning Curves, Regularized Linear Models, Ridge Regression, Lasso Regression, Elastic Net ,Early Stopping; Logistic Regression-Estimating

Probabilities, Training and Cost Function, Decision Boundaries, Softmax Regression.

UNIT-IV

Support Vector Machines: Linear SVM Classification-Soft Margin Classification, Nonlinear SVM Classification-Polynomial Kernel, Adding Similarity Features, Gaussian RBF Kernel, and Computational Complexity

Dimensionality Reduction : The Curse of Dimensionality, Main Approaches for Dimensionality Reduction-Projection, Manifold Learning; PCA- Preserving the Variance, Principal Components, Projecting Down to d Dimensions, Using Scikit-Learn, Explained Variance Ratio, Choosing the Right Number of Dimensions, PCA for Compression, Incremental PCA, Randomized PCA, Kernel PCA.

UNIT-V

Introduction to Artificial Neural Networks: From Biological to Artificial Neurons,-Biological Neurons, Logical Computations with Neurons, The Perceptron, Multi-Layer Perceptron and Back propagation ;Training an MLP with Tensor Flow's High-Level API , Training a DNN Using Plain Tensor Flow -Construction Phase , Execution Phase Using the Neural Network, Fine-Tuning Neural Network Hyper parameters,-Number of Hidden Layers, Number of Neurons per Hidden Layer , Activation Functions

Convolutional Neural Networks : The Architecture of the Visual Cortex, Convolutional Layer Filters, Stacking Multiple Feature Maps, Tensor Flow Implementation, Memory Requirements Pooling Layer, CNN Architectures, LeNet-5, Alex Net, GoogLe Net and Res Net.

Text Books:

1. Aurélien Géron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems", O'reilly publishers, 2017
2. Chris albon, "Machine Learning with Python cookbook", O'reilly publishers, 2018

Reference Books:

1. Oliver Theobald, "Machine Learning For Absolute Beginners", A Plain English Introduction (2nd Edition)
2. John Paul Mueller and Luca Massaron, "Machine Learning (in Python and R) For Dummies" (1st Edition)

Course Title	MANAGEMENT & ORGANIZATIONAL BEHAVIOR (MC)				B. Tech. ECE V Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
20MC510	MC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	-	40	-	40
Mid Exam Duration: 90Min					End Exam Duration: -			

Course Objectives: The main objective of the course is to learn

- To aid students in understanding human behavior in organizations,
- To provide students with a comprehensive exposure to organizational behavior theories, research and workplace issues.
- The course also provides an overview of the theories and practices of management in organizational contexts.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Explain the Importance & Role of Management in the Organizations.
CO 2	Evaluate the different aspects related to Decision Making and Controlling Process
CO 3	Describe the different theories related to Individual behavior in the Organization
CO 4	Analyze Group Behavioral influence in the Organization.
CO 5	Evaluate the process and climate effects in Organization Behavior.

UNIT-I

Role of Management:

Concept – Significance – Functions – Principles of Management - Patterns of Management: Scientific – Behavioural – Systems – Contingency.

UNIT-II

Decision Making & Controlling – Process – Techniques. Planning – Process – Problems — Making It Effective. Controlling - System of Controlling – Controlling Techniques – Making Controlling Effective

UNIT-III

Individual Behaviour& Motivation – Understanding Individual Behaviour – Perception – Learning – Personality Types – Johari window- Transactional Analysis- Motivation – Concept of Motivation - Motivational Theories of Maslow, Herzberg, David McClelland, and Porter and Lawler

UNIT-IV

Group Behavior & Leadership: Benefits of Groups – Types of Groups – Group Formation and Development. Leadership and Organizational Culture and Climate: Leadership – Traits Theory – Managerial Grid – Transactional Vs Transformational Leadership – Qualities of good leader- Women Leadership in India.

UNIT-V

OrganisationalBehaviour: Organizing Process – Departmentation Types – Making Organizing Effective – Organisational culture- Types of culture – Organisational Culture VsOrganisational climate - Conflict management - Change Management

Textbooks:

1. Organisational Behaviour, Stephen P. Robbins, Pearson Education
2. Management and Organisational Behaviour, Subbarao P, Himalaya Publishing House
3. Principles of Management, Koonz,Weihrich and Aryasri, Tata McGraw Hill.

References:

1. Organisational Behaviour ,S.S.Khanka, S.Chand
2. Organisational Behaviour , Mishra .M.N ,Vikas
3. Management and Organisationalbehaviour, Pierce Gordner, Cengage.
4. Behaviour in Organizations, Hiriyappa .B.New Age Publications
5. Organisational Behaviour, Sarma, Jaico Publications.
6. Principles of Management ,Murugesan ,Laxmi Publications

Course Title	DIGITAL SIGNAL PROCESSING				B. Tech. ECE VI Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004601	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs			

Course Objectives:

- To become familiar with Discrete Fourier Transform and its efficient computation.
- To understand various IIR and FIR realization techniques.
- To know the design of IIR and FIR filters.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Apply** FFT to compute DFT and IDFT, Various transformation techniques and Windows in designing digital filters, Decimation and Interpolation in the development of Multirate systems.
CO 2	**Realize** Various Digital Filters.
CO 3	**Solve** problems related to IIR and FIR filters, sampling rate conversion.
CO 4	**Design** IIR filters, FIR filters, Decimator and Interpolator.

UNIT-I

Discrete Fourier series: DFS representation of periodic sequences, Properties of discrete Fourier series, Discrete Fourier Transform (DFT), properties of DFT, linear convolution of sequences using DFT.

Fast Fourier Transforms: Efficient computation of the DFT, Decimation in time and decimation in frequency FFT algorithms, FFT algorithms for composite N.

UNIT-II

Realization of Digital Filters: Block diagram representation of linear constant-coefficient difference equations, basic structures of IIR filters- direct form I, direct form II, transposed form, cascade form, parallel forms, basic structures of FIR filters-Direct form, Cascade form, Linear phase structure, Lattice structures.

UNIT-III

IIR Digital Filters: General considerations-Causality and its implications, Characteristics of Practical Frequency-selective filters, Design of analog filters-Butterworth and chebyshev approximations, IIR filter design by backward difference, Impulse Invariance, Bilinear transformation, design examples: frequency transformations, Illustrative Problems.

UNIT-IV

FIR Digital Filters: Symmetric and Anti-symmetric FIR filters, Design of Linear Phase FIR digital filters using windows, Frequency sampling technique, comparison of IIR and FIR filters, Illustrative Problems, applications of DSP (Dual Tone Multifrequency signal detection, Spectral analysis of sinusoidal and non-stationary signals).

UNIT-V

Multirate Signal Processing: Review of sampling, Introduction to Multirate sampling, Decimation, and interpolation, Sampling rate conversion by a rational factor, Multistage implementation of sampling rate conversion, Applications of multirate signal processing.

Text Books:

1. A.V. Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.
2. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and Aapplications", Pearson Education/PHI, 4th Edition, 2007.
3. Sanjit K Mitra, "Digital signal processing", A computer base approach- Tata McGraw-Hill, 3rd Edition, 2009.

Reference Books:

1. Andreas Antoniou, Digital signal processing: Tata McGraw-Hill, 2006.
2. Digital signal processing: M H Hayes, Schaum's Outlines, Tata McGraw-Hill, 2007.
3. A. Anand Kumar, "Digital Signal Processing," PHI Learning, 2011.

Course Title	MICROWAVE ENGINEERING				B. Tech. ECE VI Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004602	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs			

Course Objectives:

- To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
- To impart Knowledge about various microwave components, microwave junctions, microwave tubes and microwave signal characteristic measurements.
- To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S Matrix for various types of microwave junctions.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	List applications of microwaves and state principles of various microwave devices (L1)
CO 2	Explain principle and working of microwave tubes and semiconductor devices (L2)
CO 3	Describe fabrication of Microstrip lines; Microwave bench setup for various microwave measurements (L2)
CO 4	Determine S – parameters of various microwave devices (L3)
CO 5	Compute microwave signal parameters, power output and efficiency of microwave active devices (L4)

UNIT-I

Microwave Transmission Lines: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – TE/TM modes, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Impossibility of TEM mode. Related Problems.

Microstrip Lines: Introduction, Characteristic Impedance of Microstrip lines, Zo Relations, Effective Dielectric Constant, Losses.

UNIT-II

Microwave Tubes: Limitations and Losses of conventional tubes at microwave frequencies, Re-entrant Cavities, Microwave tubes – O type and M type classifications, Otype tubes :2 Cavity Klystrons – Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory –, Applications, Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Electronic Admittance; Oscillating Modes and output Characteristics, Electronic and Mechanical Tuning, Applications,

UNIT-III

Helix TWTs: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Suppression of Oscillations.

M-type Tubes: Introduction, Cross-field effects, Magnetrons – Different Types, 8-Cavity Cylindrical Travelling Wave Magnetron – Hull Cut-off Condition, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics.

UNIT-IV

Waveguide Components and Applications: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide irises, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card, Rotary Vane types; Waveguide Phase Shifters – Dielectric, Rotary Vane types, Scattering Matrix– Significance, Formulation and Properties, S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Hybrid Ring; Directional Couplers – 2Hole, Bethe Hole types, Ferrite Components– Faraday Rotation, Gyrator, Isolator, Circulator and case studies.

UNIT-V

Microwave Solid State Devices: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diode – Principle, RWH Theory, Characteristics, Basic Modes of Operation, Oscillation Modes, IMPATT Diode, Varactor Diode, case studies.

Microwave Measurements: Description of Microwave Bench – Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q- factor, Phase shift, VSWR, Impedance Measurement

Text Books:

1. Samuel Y. Liao, 'Microwave Devices and Circuits,' PHI, 3rd Edition, 2003.
2. Annapurna Das and Sisir K.Das, 'Microwave Engineering,' McGraw Hill Education, 3rd Edition, 2017.

Reference Books:

1. R.E. Collin, 'Foundations for Microwave Engineering,' John Wiley, 2nd Edition, 2007.
2. M.Kulkarni , 'Microwave and Radar Engineering,'Umesh Publications, 4th Edition, 2012.
3. George Kennedy, 'Electronic Communication System,'McGrawHill, 6th Ed., 2017.
4. David M. Pozar, 'Microwave Engineering, An Indian Adaptation: Theory and Techniques,' Wiley, 2020.

Course Title	CONTROL SYSTEMS				B. Tech. ECE VI Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004603	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	40	60	100
Mid Exam Duration: 90mins					End Exam Duration: 3Hrs			

Course Objectives:

- To learn Merits and demerits of open loop and closed loop systems; the effect of feedback
- The use of block diagram algebra and Mason's gain formula to find the overall transfer function
- To learn Transient and steady state response, time domain specifications and the concept of Root loci.
- To learn Frequency domain specifications, Bode diagrams and Nyquist plots
- To learn State space modeling of Control system

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the concepts of control systems classification, feedback effect, mathematical modeling, time response and frequency response characteristics, state space analysis
CO 2	Analyze time response analysis, error constants, and stability characteristics of a given mathematical model using different methods
CO 3	Apply various criteria to test the stability of a given system.
CO 4	Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications

UNIT-I

Control System Concepts: Open loop and closed loop control systems and their differences- Examples of control systems-classification, transfer function, effect of feedback, mathematical modeling of physical systems, block diagram, reduction techniques, signal flow graphs and mason's gain formula.

UNIT-II

Time Domain Analysis: Standard test signals, time response of first and second order systems-time response specifications, steady state error and error constants, response of P, PI, and PID controllers.

UNIT-III

Concept of Stability and Root Locus: The concept of stability, necessary conditions for stability – routh Hurwitz's criterion – limitations of routh's stability – root locus concept – construction of root loci, effect of poles & zeros on stability, case studies.

UNIT-IV

Frequency Domain Analysis: Introduction, correlation between time and frequency response, frequency domain specifications, bode plots, Nyquist stability criterion - gain and phase margin.

UNIT-V

Compensation Techniques: System design and compensation-realization of basic lead, lag and lead-lag cascade compensation in frequency domain.

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, state models - differential equations & Transfer function models - Block diagrams. Diagonalization, Transfer function from state model, Solving the Time invariant state Equations-State Transition Matrix and its Properties.

Text Books:

1. Katsuhiko Ogata, "Modern Control Engineering", 5th edition, Prentice Hall of India Pvt. Ltd., 2010.
2. I. J. Nagrath and M. Gopal, "Control Systems Engineering", 5th edition, New Age International (P) Limited Publishers, 2007.
3. "Control Systems" by A. Anand Kumar, Prentice Hall of India Pvt. Ltd.
4. Control System Engineering byA. NagoorKani,RBA PUB

Reference Books:

1. M.Gopal, "Control Systems Principles & Design", 4 th Edition, Mc Graw Hill Education, 2012.
2. B. C. Kuo and Farid Golnaraghi, "Automatic Control Systems", 8 th edition, John wiley and sons, 2003.
3. Joseph J Distefano III, Allen R Stubberud & Ivan J Williams, "Feedback and Control Systems", 2nd Edition, Schaum's outlines, Mc Graw Hill Education, 2013.
4. Graham C. Goodwin, Stefan F. Graebe and Mario E. Salgado, "Control System Design" Pearson, 2000.

Course Title	CMOS VLSI Design					B. Tech. ECE VI Sem		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004604	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs			

Course Objectives:

The main objectives of this course are:

- Basic characteristics of MOS transistor and examines various possibilities for Configuring inverter circuits and aspects of latch-up are considered.
- Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
- Circuit parameters which greatly ease the design process. Understand the concepts of scaling MOS circuits.
- Understand FPGA design, synthesis and different case studies.
- Need for Design of Low-Power VLSI Circuits.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand the properties, Layout, Stick Diagrams, parameters of MOS devices and Sources of Power Dissipation.
CO 2	Analyze the inverters, Stick Diagrams, propagation delay, FPGA design flow, Logic synthesis and Power Dissipation.
CO 3	Apply Design Rules and Layout diagrams, CMOS logic.
CO 4	Design inverters, layouts, CMOS Logic Structures
CO 5	Synthesize RTL, logic and high level models.

UNIT-I

Introduction and Basic Electrical Properties of MOS Circuits: VLSI Design Flow, Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Ids versus Vds Relationships, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio for nMOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, body bias effect, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and Bi-CMOS technology.

UNIT-II

MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, Generalobservations on the Design rules, 2µ m Double Metal, Double Poly, CMOS/BiCMOS rules, 1.2µ m Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams- Translation to Mask Form.

UNIT-III

Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation

Delays.

Scaling Of MOS Circuits: Scaling models and scaling factors, scaling factors for device parameters, Limitations of scaling.

CMOS Logic Structures: Static CMOS Design (CMOS logic, Pseudo-nMOS logic, Transmission gate logic, Pass transistor logic), Dynamic CMOS Design (Dynamic CMOS logic, Domino CMOS logic, Clocked CMOS Logic, Cascade Voltage Switch Logic)

UNIT-IV

FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families, Xilinx XC4000 series FPGA, Xilinx Spartan II FPGAs, and Xilinx Vertex FPGA, case studies.

Introduction to synthesis: Logic synthesis, RTL synthesis, High level Synthesis.

UNIT-V

Sources of Power Dissipation: Introduction, Short-Circuit Power Dissipation, Dynamic Power Dissipation, Leakage Power Dissipation, Total power dissipation, Voltage Scaling, Reduction of Switched Capacitance, Reduction of Switching Activity, Need for low-power VLSI Design.

Text Books:

1. Kamran Eshraghian, Douglas and A. Pucknell and Sholeh Eshraghian, "Essentials of VLSI Circuits and Systems", Prentice-Hall of India Private Limited, 2005 Edition.
2. Sung-Mo Kang, YusufLeblebici, "CMOS Digital Integrated Circuits Analysis and Design", Tata McGraw- Hill Education, 2003 Edition.

Reference Books:

1. Michael D.Ciletti, "Advanced Digital Design with the Verilog HDL", Xilinx DesignSeries, Pearson Education.
2. A. Bellamour, M. I. Elamasri, "Low Power CMOS VLSI Circuit Design",Kluwer Academic Press, 1995.

Course Title	INFORMATION THEORY AND CODING				B. Tech. ECE VI Sem			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2004605	PEC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	-	--	3	40	60	100
Mid Exam Duration: 90Min					End Exam Duration: 3Hrs			

Course Objectives:

- To know various information measures.
- To understand various information channels.
- To explain different source code algorithms.
- To familiarize quantization and transform coding.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Understand concepts of Dependent &Independent Source, Measure of information, Entropy, Rate of information
CO 2	Represent the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms
CO 3	Model the continuous and discrete communication channels using input, output and joint probabilities
CO 4	Analyze quantization and transform coding.

UNIT-I

Information Theory: Introduction to Information Theory and Coding, Definition of Information Measure and Entropy, Extension of An Information Source and Markov Source, Adjoint of An Information Source, Joint and Conditional Information Measure, Properties of Joint and Conditional Information Measures and A Morkov Source Properties of Joint and Conditional Information measures and a Markov source.

UNIT-II

Source Coding: Source coding theorem, Prefix Codes, Kraft McMillan Inequality property, Encoding of the Source Output, Shannon's Encoding Algorithm, Shannon Fano Encoding Algorithm, Huffman codes, Extended Huffman coding, Arithmetic Coding.

UNIT-III

Information Channels I: Introduction to Information Channels, Equivocation and Mutual Information, Properties of Different Information Channels, Reduction of Information Channels, Properties of Mutual Information and Introduction to Channel Capacity, Calculation of Channel Capacity for Different Information Channels, Shannon's Second Theorem.

UNIT-IV

Information Channels II: Error Free Communication Over Noisy Channel, Error Free Communication Over A Binary Symmetric Channel and Introduction to Continuous Sources and Channels, Differential Entropy and Evaluation of Mutual Information for Continuous Sources

and Channels, Channel Capacity of A Band Limited Continuous Channel.

UNIT-V

Quantization: Introduction to Quantization, Lloyd-Max Quantizer, Companded Quantization, Variable Length Coding and Problem Solving in Quantizer Design, Vector Quantization, Transform Coding-Idea of Transform Coding, Choosing the weights of basis vector, forward transform, Energy preserving, Optimal bit allocation .

Text Books:

1. T. M. Cover, J. A, Thomas, "Elements of information theory," Wiely Interscience, 2 nd Edition, 2013
2. R. W. Hamming, "Coding and information theory," Prentice Hall Inc., 1986.

Reference Books:

1. Bose, "Information Theory, Coding and Cryptography", McGraw hill Education, 2017.
2. S. Gravano, "Introduction to Error Control Codes", Oxford, 2007.
3. Robert B. Ash, "Information Theory", Dover Publications, 2003.
4. Todd k Moon, "Error Correction Coding: Mathematical Methods and Algorithms", Wiley, 2021.

Course Title	**SENSORS AND ACTUATORS**				**B. Tech. ECE VI Sem**		
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum Marks**		
2004606	**PEC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	-	--	3	40	60	100
Mid Exam Duration: 90 Min					**End Exam Duration: 3Hrs**		

Course Objectives:

- To know the importance of Sensors and Actuators.
- To understand working of magnetic sensors
- To understand actuators and solenoids
- To explain principles of operation and working of rotary actuators.
- To familiarize controls in NC machine fluidic system

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	Understand the principle of various sensors and actuators.
CO 2	Compare various sensors and actuators and apply in real time scenario
CO 3	Model linear actuators and differentiate various solenoids
CO 4	Analyze the noise in various sensors and actuators, controls in NC machine and fluidic system.

UNIT-I

Introduction- Classification of Sensors and Actuators - Magnetic Sensors - Linear and Latching Solenoid Actuators - Stepper Motors - Special Magnetic Devices - Rotary and Linear Actuators - Magnetic Materials and Technology - Soft Magnetic Materials - Hard Magnetic Materials - Coating Technologies - Magnetic Materials Market and Applications.

UNIT-II

Magnetic Sensors - Theory of Magnetic Sensors - Magnetic Sensor Analysis - VR Sensors - Solid-State Sensors - Magnetic Sensor Applications - Magnetic Speed Sensor Requirements - Magnetic Speed Sensor Applications - Magnetic Position Sensor Applications - VR Sensor Noise.

UNIT-III

Gas sensors- Optical gas sensor- Metal oxide semiconductor gas sensor- Field effect transistor gas sensor- Piezoelectric gas sensor- Polymer gas sensor- Nano-structured based gas sensors.

UNIT-IV

Rotary Actuators - Disk Rotary Actuators - Disk Rotary Actuator Analysis - Disk Rotary Actuator Design - Disk Rotary Actuator Excitation Electromagnetic Circuit - Disk Rotary Actuator Toothed Magnetic Part - Disk Rotary Actuator PM - Claw Pole Rotary Actuators - Claw Pole Rotary Actuator Analysis - Claw Pole Rotary Actuator Design -Claw Pole Rotary Actuator Excitation Electromagnetic Circuit - Claw Pole Actuator Toothed Magnetic Part - Claw Pole Actuator PM - Cylindrical Rotary Actuators - Cylindrical Rotary Actuator PM - Cylindrical Rotary Actuator Excitation Electromagnetic Circuit - Cylindrical Rotary Actuator Toothed Magnetic Structure - Rotary Actuator Applications - Disk Rotary Actuator Application - Claw Pole Rotary Actuator Application - Cylindrical Rotary Actuator Application.

UNIT-V

Controls in NC Machines and fluidic control- stepping motors- feedback devices- encoders - resolvers - inductosync –Tachogenerators - principles of fluid logic control -Coanda effect - basic fluidic devices - fluidic logic gates – bistable flipflop - OR and NOR gates - exclusive OR

gates - fluidic sensors - backpressure sensor - cone jet proximity sensor - interruptible jet sensor.

Text Books:

1. Andrzej M. Pawlak , "Sensors and Actuators in Mechatronics, Design and Applications" , Taylor & Francis Group, 2006
2. Andrew Parr, "Hydraulics and Pneumatics", Jaico Publishing House, Mumbai.

Reference Books:

1. YoramKoren, 'Computer control of Manufacturing Systems', Tata McGraw Hill Publishers, New Delhi
2. Robert H. Bishop, "Mechatronic systems, Sensors and Actuators Fundamentals and Modelling, Taylor & Francis Group, 2007
3. Adams, Thomas M., Layton, Richard A., "Introductory MEMS- Fabrication and Applications" -, Spinger, 2010.
4. Tai-Ran Hsu , MEMS and Microsystems: Design and manufacture, ,McGraw-Hill, 2002

Course Title	**HUMAN RESOURCE DEVELOPMENT (Humanities Open Elective)**			**B.Tech. VI Sem (Humanities Open Elective)**
Course Code	**Category**	**Hours/Week**	**Credits**	**Maximum Marks**

2006601	Humanities & Social Sciences (HSMC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2Hrs						External Exam Duration: 3Hrs		

Course Objectives: The main objective of the course is to learn

- To develop capability of all individuals working in an organization in relation to their present role
- To develop team spirit.
- To develop co-ordination among different units of an organization.
- To develop organization health by continuous reveal of individual capability keeping peace with the technological changes.
- To develop better interpersonal & employer-employee relationships in an organization.

Course Outcomes: On success Completion This course, the students will be able to

CO1	To understand key functions in management as applied in practice.
CO2	To understand in more specific management related areas from planning till controlling.
CO3	To understand about the authority and responsibility, and different organizational structure..
CO4	To understand about the role of leadership, motivation and communication in an organization.
CO5	To understand the importance of globalization and diversity in modern organizations.

Unit I

Introduction to Human Resource Development: Meaning, significance and objectives of Human Resource Development, Human Resource Management and Human Resource development functions, Human Resource Development challenges

Unit II

HRD Need Assessment & Designing of HRD programs: Strategic/ Organizational Analysis- Task Analysis- Person Analysis- prioritizing HRD needs, defining the objectives of HRD Intervention - Selecting the trainer - Selecting the Training methods - Preparing training material Scheduling an HRD program

Unit III

Implementation &Evaluation of HRD programs: Training methods - Classroom training Approaches - Computer based Training, Purpose of HRD Evaluation- Kirkpatrick's evaluation

frame work - Data collection for HRD Evaluation - Assessing the impact of HRD programs in Monetary Terms

Unit IV

Career Management and Development: Introduction to Career management, meaning - Stages of life and Career Development - process of career Development - Issues in career development.

Unit V

HRD & Diversity: Introduction – Organizational culture – Labor Market changes and discrimination adapting to demographic changes

Text books:

1. Jon M Werner,Randy L DeSimone: Human Resource development (Thomson/Cengage)
2. Raymond A Noe: Employee Trainee Development (Tata McGraw Hill)
3. Dr. D.K Bhattacharya, Himalaya Publishing House

References:

1. John P. Wilson Human Resource Development (Kogan Page Business Books)
2. Tripathi P.C : Human Resource Development (Sultan Chand & Sons)
3. Uday Kumar Haldar : Human Resource Development (Oxford)

Course Title	**Digital Marketing** **(Humanities Open Elective)**			**B.Tech. VI Sem** **(Humanities Open Elective)**
Course Code	**Category**	**Hours/Week**	**Credits**	**Maximum Marks**

2006602	**Humanities & Social Sciences (HSMC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**40**	**60**	**100**
Mid Exam Duration: 2Hrs						**External Exam Duration: 3Hrs**		

Course Objectives: The main objective of the course is to learn

- To provide foundation in the key concepts on digital marketing.
- Understand how and why to use digital marketing for multiple goals within a larger marketing and/or media strategy.
- Learn to develop, evaluate, and execute a comprehensive digital marketing strategy and plan.
- Understand the major digital marketing channels - online advertising: Digital display, video, mobile, search engine, and social media
- Learn how to measure digital marketing efforts and calculate ROI

Course Outcomes: On success Completion This course, the students will be able to

CO1	**Analyze** the confluence of marketing, operations, and human resources in real-time delivery.
CO2	Demonstrate cognitive knowledge of the skills required in conducting online research and research on online markets, as well as in identifying, assessing and selecting digital market opportunities.
CO3	Explain emerging trends in digital marketing and critically assess the use of digital marketing tools by applying relevant marketing theories and frameworks.
CO4	Investigate and evaluate issues in adapting to globalized markets that are constantly changing and increasingly networked.
CO5	Interpret the traditional marketing mix within the context of a changing and extended range of digital strategies and tactics.

UNIT - I

Understanding Digital Marketing: Concept, Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

UNIT - II

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Mobile Marketing, Migrating from Traditional Channels to Digital Channels. Marketing in the Digital Era Segmentation – Importance of Audience Segmentation, How Different Segments use Digital Media - Digital Media for Customer Loyalty.

UNIT – III

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan.

UNIT – IV

Search Engine Marketing and Online Advertising: Importance of SEM, Understanding Web Search – Keywords, HTML Tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost-per-Click), Display Ads - Choosing a Display Ad Format, Landing Page and its Importance.

UNIT – V

Social Media Marketing: Understanding Social Media, Social Networking with Face book, LinkedIn, Blogging as a Social Medium, Social Sharing with YouTube. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

Text Books:

1. Seema Gupta, Tata McGraw Hill.
2. Dave Chaffey, Pearson Education
3. Dr AntornyPuthussery

Reference Books:

1. Kevin Hartman, Digital Marketing Analytics,
2. Digital Marketing – Self learning management series, Vibrant Publishers
3. Digital Marketing, Vandana Ahuja, Oxford publishing house
4. Fundamentals of Digital Marketing, Puneet Singh Batia – Pearson Education
5. Digital Marketing by Seema Gupta (IIM-B)
6. Digital Marketing: Strategy, Implementation¬& Practice by Dave Chaffey & Fiona Ellis Chad wick
7. Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation - Damian Ryan and Calvin Jones.

Course Title	**Project Management** **(Humanities Open Elective)**	**B.Tech. VI Sem** **(Humanities Open Elective)**

Course Code	Category	Hours/Week			Credits	MaximumMarks		
2006603	Humanities & Social Sciences(HSMC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 2Hrs						External Exam Duration: 3Hrs		

Course Objectives: The main objective of the course to learn

- To impart the basic concepts of Project selection.
- To develop an understanding of Project Planning and design, construction and execution, monitoring and control, completion.
- To achieve the Project's main goal within the constraints.
- To optimize the allocated necessary inputs.
- To shape and reform the client's vision or tone got late with the masregards the project's objectives.

Course Outcomes: On success Completion This course, the students will be able to

CO1	Remembering and recalling the principles of project management and methods involved in the process of project management.
CO2	**Understanding**ofProjectPlanning,design,construction,execution,maintaining and controlling
CO3	**Applying** techniques in Project Evaluation, Scheduling and Controlling.
CO4	**Classifying** and **analysis** risks in Project management and project scheduling

UNIT-I

Introduction to Project Management: Need for Project management, Taxonomy of project, Project life cycle, Project management Process, Principles of Project Management. Project Identification and Selection, Pre – feasibility study, Project Planning Process, Resources allocation, Project Break-even Point.

UNIT- II

Financial Evaluation of Projects: Cost of the Project, Means of finance, Financial Evaluation of projects – Payback period method, Accounting Rate of Return method, Net Present Value method, Internal Rate of Return method, Benefit Cost Ratio method (Profitability Index), (simple Problems).

UNIT-III

Project Risk & Quality Management: Introduction, Role of Risk management, Risk Identification – Steps in risk management –, Risk analysis (Sensitivity Analysis, Probability Analysis, Mean – Variance Analysis Decision trees, Simulation), Techniques for managing risk. Project Quality Management and ValueEngineering:Quality,Quality Concepts and Value Engineering.

UNIT-IV

Project Scheduling (Network Analysis): Development of Project network, Time estimation, Determination of the critical Path, PERT Model, Project Crashing.(Simple Problems)

UNIT-V

Project Execution & PMS: Process Of Project Execution and Control, Project Management Information System (PMIS), Project Performance Measurement and Evaluation (PPME).

ProjectManagementSoftware: Essential Requirement of Project Management Software, Common Features available in most of the project management software.

TextBooks:

1. Project management Best Practices: Achieving Global Excellence by Harold Kerzner; John Wiley & Sons; 3rd edition.
2. Project Management: Engineering, Technology and Implementation: united states Edition by Avraham Shtub and Jonathan F.Bard, Pearson; 1st edition.
3. The Essentials of Project Management by Dennis Lock; Routledge.
4. PrasannaChandra,Projects,TataMcGrawHill.
5. NagarajanK,ProjectManagement4th edition,NewAgeInternational(P)Ltd.
6. LSSrinath,PERT/CPM,AffiliatedEast-WestPress2005.

ReferenceBooks:

1. Project management by Stephen Hartley; Routledge, 4th Edition.
2. Project management: a systems Approach to Planning, Scheduling, and controlling by Harold Kerzner; Wiley; 12th edition.
3. Project Management & Appraisal by SitangshuKhatua; published by Oxford University.
4. NicholasJ.M.&Steyn H, Project Management, Elsevier,Himalayapublications.
5. NarendraSingh,ProjectManagement and Control,HPH,2003.
6. Harvey Maylor, Project Management,PearsonEducation.
7. Panneerselvam Senthilkumar,ProjectManagement,PHI.

Course Title	**DIGITAL SIGNAL PROCESSING LAB**				**B. Tech. ECE VI Sem**			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2004607	**PCC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		-	--	3	1.5	40	60	100
						End Exam Duration: 3Hrs		

Course Objectives:

- To become familiar with MATLAB fundamentals
- To write MATLAB programme for basic DSP operations
- To understand the uses of TMS320C6748 processors
- To write C language code for basic DSP operations and executed using TMS processors

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Analyze discrete/digital signals using mat lab and the basic operations of signal processing.
CO 2	Obtain the spectral parameters of windowing functions.
CO 3	Design FIR and IIR filters for desired specifications
CO 4	Design and implement DSP algorithms in software using a computer language such as C with TMS320C6748 floating point processor.

List of Experiments: (Minimum of 5 experiments are to be conducted from each part)
Software Experiments (PART – A)

1. Frequency response of a system described by a difference equation.
2. Generation of DTMF Signals.
3. To compute power density spectrum of a sequence.
4. Convolution of two discrete-time sequences with and without built in command.
5. Correlation between two discrete-time sequences with and without built in command.
6. DFT of a given signal with and without built in command.
7. Design of FIR filter using windowing technique.
8. Design of IIR filters using Impulse invariance or bilinear transformation.
9. Implementation of a Decimation Process.
10. Implementation of a Interpolation Process.

Using DSP Processor kits (Floating point) and Code Composure Studio (CCS) (PART – B)

1. Introduction to DSP Processors.
2. Generation of Sine wave & Square wave.
3. Finding Power and (or) Energy of a given signal.
4. Convolution of two discrete-time sequences.
5. Correlation between two discrete-time sequences.
6. DFT of a given signal
7. Design of FIR filter using windowing technique and verify the frequency response of the filter.

Course Title	**MICROWAVE & OPTICAL COMMUNICATIONS LAB**					**B. Tech. ECE VI Sem**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2004608	**PCC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		-	-	P	1.5	40	60	100
Mid Exam Duration: 90Min						**End Exam Duration: 3Hrs**		

Course Objectives:

- To provide knowledge on various types of microwave sources.
- To verify the S-matrix of different Junctions
- To study waveguide and attenuation characteristics.
- To study the characteristics of optical sources and measure optical fiber parameters.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Analyze** the characteristics of different microwave sources.
CO 2	**Measure** the parameters of wave guide and microwave junctions.
CO 3	**Examine** the characteristics of optical fiber and sources.
CO 4	**Analyze** the microwave antenna performance

Part – A (Any 7 Experiments):

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance Measurement.
7. Waveguide parameters measurement.
8. Scattering parameters of Directional Coupler.
9. Scattering parameters of Magic Tee.
10. Characteristic of Three Port Circulator

Part – B (Any 5 Experiments):

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of NA.
6. Measurement of losses for Analog Optical link.
7. Radiation Pattern Measurement of Horn Antenna.
8. Radiation pattern of Microstrip Patch antennas.

Course Title	**VLSI Design Laboratory**					**B. Tech. ECE VI SEM**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2004609	**PCC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		--	-	3	1.5	40	60	100
						End Exam Duration: 3Hrs		

Course Objectives:

The main objectives of this course are:

- Understanding basic laws and rules of designing the digital circuits.
- Analyzing the Concepts of Simulation Results, RTL Schematic

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Design and simulate basic CMOS circuits like inverter and basic logic gates.
CO 2	Design and simulate adders and subtractors.
CO 3	Realize various flip-flops and encoder & decoder.
CO 4	Generate RTL schematic for the combinational & sequential Circuits.
CO 5	Verify the logic using FPGA.

NOTE:

- The students are required to design and implement **any 12 Experiments** using Xylinx Vivado tool/Industry Equivalent Standard Software.
- The students are required to implement and verify its synthesis **of any FOUR Experiments using FPGA.**

List of Experiments:

1. Design and Implementation of a CMOS Inverter.
2. Design and Implementation of an Universal Gates
3. Design and Implementation of an XOR and XNOR Gates.
4. Design and Implementation of a Boolean expression $Y = \overline{(AB + CD + E)}$
5. Design and Implementation of Half-adder and Half-subtractor.
6. Design and Implementation of 1-bit Full Adder.
7. Design and Implementation of 4-bit Ripple Carry Adder.
8. Design and Implementation of 2-bit Binary multiplier.
9. Design and Implementation of 2*1 MUX.
10. Design and Implementation of 2 to 4 Decoder
11. Design and Implementation of RS-Latch
12. Design and Implementation of D-Flip-flop
13. Design and Implementation asynchronous counter
14. Design and Implementation of static RAM cell
15. Design and Implementation of Differential Amplifier.

Lab Requirements:

1. **Software:** Xylinx Vivado tool/Industry Equivalent Standard Software.
2. **Hardware:** Personal Computer with necessary peripherals, configuration and operating System and FPGAs.

Course Title	Advanced English Communication Skills Lab				B. Tech. VI Sem E.C.E (R20)		
Course Code	**Category**	**Hours/Week**		**Credits**	**Maximum Marks**		
20245SC	**Humanities and social sciences**	**L**	**T**	**P**	**C**	**Internal Assessment**	**External Exams**	**Total**
		1	--	3	2	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To focus on improving the student's proficiency in English at all levels.
- To train students to use language effectively to participate in group discussions,
- To help them face interviews and sharpen public speaking skills
- To enhance the confidence of the student by exposing him/her to various situations and contexts which he/she would face in his/her career.
- To make students industry-ready.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	**Describe**Speaking and listening skills
CO 2	**Understand** various kinds of reports and present them schematically
CO 3	**Analyze**Behavioural skills
CO 4	**Illustrate** various employability skills required for the employment
CO 5	**Classify** the verbal and non-verbal communication

1.Syllabus:

The following course content is prescribed for the Advanced English Communication Skills:

Functional English – Introduction -- Starting & Responding a Conversation-- Social Etiquette Conversation -- role play – Body language in conversation—departure phrases.

Technical Report Writing --- Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis

Resume' Writing --- Structure, format and style, planning, defining the career, objective, projecting one's strengths, and skills, creative self-marketing, cover letter

Group Discussion--- Communicating views and opinions, discussing, intervening.Providing solutions on any given topic across a cross-section of individuals, (keeping an eye on modulation of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

Interview Skills --- Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing.

Technical Presentations (Oral) --- Collection of data, planning, preparation, type, style and format, use of props, attracting audience, voice modulation, clarity, body language, asking queries.

2.Minimum Requirements

The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a TV, A digital stereo-audio and video system, Camcorder etc.

System Requirement (Hardware Component):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum, Hard Disk-80 GB, Headphones

Prescribed Software: Walden and K-Van Solutions.

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **Technical writing and professional communication, Huckin and Olsen** Tata McGraw-Hil 2009.
2. **Speaking about Science,** A Manual for Creating Clear Presentations **by Scott Morgan and Barrett Whitener, Cambridge University press, 2006**.
3. **Handbook for Technical Writing** by David AMcMurrey& Joanne Buckely CENGAGE Learomg 2008.
4. **Technical Communication** by Meenakshi Raman &Sangeeta Sharma, Oxford University Press 2009.
5. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010.
6. **Cambridge English for Job-Hunting** by ColmDownes, Cambridge Unicversity Press, 2008.
7. **Resume's and Interviews** by M. Ashraf Rizvi, Tata McGraw-Hill, 2008.
8. **From Campus to Corporate** by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010.
9. **English Language Communication: A Reader cum Lab Manual**DrA Ramakrishna Rao, Dr G Natanam& Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.

Course Title	Constitution of India (Mandatory Course)					B. Tech. ECE VI Sem		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
20MC509	**MC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		2	**0**	**0**	**0**	40	00	40
						End Exam Duration: -		

Course Objectives: The main objective of the course to learn

- To realize the significance of the constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
- To identify the importance of fundamental rights as well as fundamental duties.
- To understand the functioning of Union, State and Local Governments in the Indian federal system.
- To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.

Course Outcomes: On successful completion of this course, the students will be able to

CO 1	Describe the historical background of the constitution making and its importance for building a democratic India.
CO 2	Explain the functioning of three wings of the government i.e., executive, legislative and judiciary.
CO 3	Explain the value of the fundamental rights and duties for becoming good citizen of India.
CO 4	Analyze the decentralization of power between central, state and local self government.
CO5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy

Unit - 1:

Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution – Sources and constitutional history, Features –

Citizenship, Fundamental Rights and Duties, Directive Principles of State Policy.

Unit - 2:

Union Government and its Administration Structure of the Indian Union: Center-State relationship, President: Role, power and position, PM and Council of ministers, Cabinet a nd Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions.

Unit - 3:

State Government and its Administration Governor – Role and Position – CM and Council of ministers, State Secretariat: Organization, Structure and Functions.

Unit - 4:

Local Administration: District's Administration Head – Role and Importance, Municipalities – Mayor and role of Elected Representative – ZillaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy – (Different departments), Village level – Role of Elected and Appointed officials.

Unit - 5:

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissioner State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women.

Textbooks

1. M.V.Pylee, "Introduction to the Constitution of India",4th Edition, Vikas publication,2005.
2. Durga Das Basu(DD Basu) , "Introduction to the constitution of India",(Student Edition),19th edition,Prentice-Hall EEE, 2008.

Reference Books:

- Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
- Subhash Kashyap, Indian Constitution, National Book Trust
- J.A. Siwach, Dynamics of Indian Government & Politics
- D.C. Gupta, Indian Government and Politics
- H.M.Seervai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
- J.C. Johari, Indian Government andPolitics Hans
- J. Raj IndianGovernment and Politics
- M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
- Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012.

E-Resources:

- nptel.ac.in/courses/109104074/8
- nptel.ac.in/courses/109104045/

- nptel.ac.in/courses/101104065/
- www.hss.iitb.ac.in/en/lecture-details
- www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution