ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(AUTONOMOUS)

Department of Electronics and Communication Engineering
Course Structure for R19 Regulations

I Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BS	19AC12T	Applied Physics	2	1	0	3
2	BS	19AC11T	Algebra and Calculus	3	1	0	4
3	ES	19A511T	Problem Solving and C programming	3	--	0	3
4	ES	19A411T	Essentials of Electrical & Electronics Engineering	2	--	0	2
5	ES	19A312T	Engineering graphics& design	1	--	3	2.5
Lab Courses							
6	BS	19AC12L	Applied Physics lab	--	--	3	1.5
7	ES	19A313L	Engineering & IT workshop	--	--	3	1.5
8	ES	19A511L	C Programming lab	--	--	3	1.5
9	ES	19A411L	Essentials of Electrical & Electronics Engineering Lab	--	--	2	1
							20

I Year II Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	HS	19AC25T	Functional English and Life skills	3	--	--	3
2	ES	19A522T	Programming through Python	3	--	--	3
3	BS	19AC24T	Engineering Chemistry	3	--	--	3
4	BS	19AC21T	Differential Equations and vector calculus	3	1	--	4
5	PC	19A421T	Electronic Devices and Circuits	2	--	--	2
6	MC	19AC26T	Environmental Science	3	--	--	0
Lab Courses							
7	HS	19AC25L	Communicative English Lab	--	--	3	1.5
8	ES	19A522L	Programming through Python Lab	--	--	2	1
9	BS	19AC24L	Engineering Chemistry lab	--	--	3	1.5
10	PC	19A421L	Electronic Devices and Circuits Lab	--	--	2	1
							20

Department of Electronics & Communication Engineering

II Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	BS	19AC31T	Partial differential equations & Complex variables	3	--	--	3
2	PC	19A431T	Electronic Circuits	3	--	--	3
3	ES	19A237T	Electrical Circuits and Technology	3	--	--	3
4	ES	19A432T	Random Variables Theory	2	--	--	2
5	PC	19A433T	Digital Design	3	--	--	3
6	PC	19A434T	Signals and systems	3	1	--	4
Lab Courses							
7	ES	19A237L	Electrical Circuits and Technology Lab	--	--	3	1.5
8	PC	19A431L	Electronic Circuits Lab	--	--	3	1.5
9	PC	19A434L	Basic Simulation lab	--	--	3	1.5
10	MC	19AC35T	Essence of Indian tradition knowledge	3	--	--	--
							22.5

II Year II Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19A441T	Analog IC applications	3	--	--	3
2	BS	19AC42T	Numerical methods and transform techniques	3	--	--	3
3	ES	19A442T	Control Systems	2	--	--	2
4	PC	19A443T	Analog Communication Systems	3	--	--	3
5	PC	19A444T	Field Theory and Transmission Lines	3	1	--	4
6	BS	19AC44T	Life Sciences for Engineers	2	--		2
Lab Courses							
7	PC	19A441L	Analog IC applications lab	--	--	3	1.5
8	PC	19A443L	Analog Communication Systems Lab	--	--	3	1.5
9	PC	19A445L	Digital Design Lab	--	--	3	1.5
10	MC	19AC47T	Constitution of India	3	--	--	--
							21.5

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III Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19A451T	Microprocessors and Interfacing	3	--	--	3
2	PC	19A452T	Antennas & Wave Propagation	3	--	--	3
3	PC	19A453T	Digital signal processing	3	--	--	3
4	PC	19A454T	Digital Communication	3	--	--	3
5	PE	19A45AT	Electronic Measurements & Instrumentation	3	--	--	3
		19A45BT	Advanced Digital Design Concepts				
		19A45CT	Data Communication Systems				
6	OE	19A45DT	VLSI Testing & Testability	3	--		3
		19A45ET	Digital system Design				
		19A45FT	Industrial Electronics				
Lab Courses							
7	PC	19A451L	Microprocessors and Interfacing Lab	--	--	3	1.5
8	PC	19A454L	Digital Communication Lab	--	--	2	1
9	HS	19AC52L	Professional Communication skills Lab	--	--	3	1.5
							22

III Year II Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19A462T	VLSI Design	3	--	--	3
2	PC	19A463T	Microwave Engineering	3	--	--	3
3	PE	19A46AT	Digital Design Through Verilog HDL	3	-	-	3
		19A46BT	Radar Engineering				
		19A46CT	Ad-hoc Wireless Networks				
4	PE	19A46DT	Optical Fiber Communication	3	--	--	3
		19A46ET	Digital Image Processing				
		19A46FT	Cellular and Mobile Communications				
5	OE	19A46IT	OE-2-MOOCS	3	--	--	3
6	HS	19AC61L	General Aptitude	--	--	2	1
7	HS	19AC63T	UHV-II	1	1	--	2
Lab Courses							
8	PC	19A462L	VLSI Design Lab	--	--	3	1.5
9	PC	19A464L	Digital Signal Processing Lab	--	--	3	1.5
10	PW	19A464I	Internship	--	--	--	2
							23

IV Year I Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	PC	19A471T	Embedded systems	3	--	--	3
2	PE	19A47AT	DSP Processors and Architectures	3	-	-	3
		19A47BT	ASIC Design				
		19A47CT	Wireless Communication & Networks				
3	PE	19A47DT	Digital IC Design	3	-	-	3
		19A47ET	FPGA Architectures & Applications				
		19A47FT	Coding theory and Techniques				
4	OE	19A17GT	Basic Civil Engineering	3	--	--	3
		19A17HT	Water Resources and conservation				
		19A27HT	Fuzzy Logic and Neural networks				
		19A27GT	Energy Management and conservation				
		19A37JT	Introduction to Mechatronics				
		19A37KT	Fundamentals of Robotics				
		19A37LT	Non-Conventional sources of Energy				
		19A57ET	Artificial Intelligence				
		19A57FT	Cyber Security				
5	HS	19A373T	Management Science	3	--	--	3
Lab Courses							
6	PC	19A472L	Microwave Engineering Lab	--	--	2	1
7	PC	19A471L	Embedded Systems Lab	--	--	2	1
8	PW	19A473P	Project phase-1	--	--	2	2
							19

IV Year II Semester

S. No.	Category	Course Code	Course Title	Hours per week			Credits
				L	T	P	
1	OE	19A18DT	Disaster Management	3	--	--	3
		19A18ET	Building Planning and Construction				
		19A28ET	System modeling and simulation				
		19A28DT	Battery energy storage systems				
		19A38ET	Entrepreneurship development				
		19A38FT	Optimization in Engineering				
		19A38GT	Total Quality Management				
		19A58ET	Internet of things				
		19A58FT	Web Programming				
2	PE	19A48AT	Mixed Signal IC applications	3	--	--	3
		19A48BT	Satellite Communications				
		19A48CT	Nano Electronics				
Lab Courses							
3	PW	19A481P	Project phase-2	--	--	--	8
							14

Department of Electronics & Communication Engineering

OPEN ELECTIVE COURSES offered by ECE

S. No.	Category	Course Code	Course Title	Offered to
1	OE	19A46GT/19A47GT	Electronic Circuits and its applications	CE, ME & CSE/EEE
2	OE	19A46HT/19A47HT	Basics of Communication systems	CE, ME & CSE/EEE
3	OE	19A48DT	Introduction to Digital design	ALL
4	OE	19A48ET	Industrial Electronics	ALL

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, RAJAMPET
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Title of the Course	:	MICROPROCESSORS & INTERFACING
Category	:	PC
Course Code	:	19A451T
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able

- To know the basic concepts of first 16 bit general purpose Microprocessor
- To learn the Programming and Interfacing Concepts of Microprocessors

Unit 1 : **8086 ARCHITECTURE & PROGRAMMING** 13

Overview of 8085 processor architecture**,** Architecture of 8086 microprocessor, Register organization, Memory organization, Machine language instruction formats of 8086. Addressing modes of 8086, Instruction set of 8086, Assembler directives, Assembly language programs involving logical, branch and call instructions, sorting, evaluation of arithmetic expressions, string manipulation. Procedure and Macros.

Unit 2 : **MEMORY INTERFACING** 13

Pin diagram of 8086 - Minimum mode and maximum mode of operation, Timing diagrams. I/O Interfacing methods – I/O mapped I/O, Memory mapped I/O. Basic structure of SRAM and DRAM cell, Memory interfacing to 8086 (static RAM and EPROM). Need for DMA, Architecture of 8257 and interfacing with 8086.

Unit 3 : **I/O INTERFACING & PROGRAMMABLE INTERRUPT CONTROLLER (8259)** 9

Interfacing I/O ports – latches and buffers. 8255 PPI - Architecture, various modes of operation and interfacing to 8086. Seven segment Displays, Stepper motor, D/A, A/D converter interfacing.
Data transfer methods-Programmed I/O, interrupt driven I/O. Interrupt structure of 8086, Vector interrupt table. Interrupt service routines. 8259 PIC architecture and interfacing, cascading of interrupt controller. Simple programs.

Unit 4 : **PROGRAMMABLE INTERVAL TIMER/COUNTER (8253) & COMMUNICATION INTERFACE** 07

Architecture of 8253 programmable interval timer/counter, mode of operations, interfacing with 8086.
Asynchronous and synchronous data transfer schemes. Necessity of communication interfaces, 8251 USART architecture and interfacing, RS-232C. TTL to RS232C and RS232C to TTL conversion. Sample program of serial data transfer.

Unit 5 : **ADVANCED MICROPROCESSORS** 05

Introduction to 80286, salient features of 80386, Real and Protected mode Segmentation and Paging, salient features of Pentium and Pentium pro processors.

PrescribedText Books:

1. Advanced microprocessor and peripherals- A.K. Ray and K.M.Bhurchandi, 2nd edition, TMH, 2000
2. Microprocessors and Interfacing- Douglas V.Hall, 2nd edition, 2007

Reference Text books:

1. The 8086 and 8088 Microprocessors- Walter A. Triebel, Avtar Singh, PHI, 4th Edition, 2003

2. Micro computer system 8066/8088 family Architecture, programming and Design-By Liu and GA Gibson, PHI, 2nd Ed
3. Intel 8086/8088 microprocessor architecture, programming, design and interfacing, Bhupendra singh chabra, Dhanpat Rai publications

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Know the Architectural features and programming of 8086..	L1,L3
2. Be able to Interface various Intel devices with 8086.	L3
3. Understand the Interrupt structure of 8086 and servicing the interrupts using interrupt controller	L2
4. Know the Salient features of advanced microprocessors	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A451T.1	3	-	-	-	2	2	-	-	1	-	-	-	3	2	-
19A451T.2	2	3	-	-	3	-	-	-	-	-	-	-	2	3	-
19A451T.3	3	-	-	-	-	-	-	-	-	-	-	-	1	1	-
19A451T.4	3	-	-	-	2	-	-	-	-	-	-	-	2	2	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	ANTENNAS AND WAVE PROPAGATION
Category	:	PC
Course Code	:	19A452T
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	1	0	4

Course Objectives: This course will able to

- To understand the concepts of Antennas and their family
- To analyze and design different antennas for various applications.
- To understand Concepts of Various Wave Propagation methods.

Unit 1 : **INTRODUCTION** 14

Introduction, Basic Antenna Parameters ,Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity and Gain, Directivity and Resolution, Antenna Apertures, Effective Height, Fields from Oscillating dipole, Antenna Field Zones. Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Antenna Theorems – Reciprocity Theorem.

Unit 2 : **ANTENNA ARRAYS** 14

Point Source , Arrays of two isotropic point sources-Different cases, Non-isotropic point Sources, Principle of Pattern Multiplication , N element Uniform Linear, Arrays Broadside, End fire Arrays, EFA with Increased Directivity, Arrays with Parasitic Elements, Folded Dipoles & their characteristics, Yagi - Uda Arrays.

Unit 3 : **ANTENNAS AND THEIR CHARACTERISTICS** 10

Helical Antennas: Helical Geometry, Helix modes, Horn Antennas – Introduction, Optimum Horns, Rectangular Horn antenna, Reflector Antennas: Flat Sheet and Corner Reflectors. Paraboloidal Reflectors – Geometry, characteristics, Spill Over, Back Lobes, Aperture Blocking..

Unit 4 : **GROUND WAVE PROPAGATION** 9

Introduction to wave propagation-Definition and Broad Categorization, Classification of Electromagnetic waves based on Modes of propagation, Different modes of Wave Propagation. Ground Wave Propagation– Introduction, Plane earth reflection, Space wave and surface wave, Transition between surface and space wave, Reduction factor and, numerical Distance, Earth‟s Behavior at different frequencies, Electrical Properties of earth, Curved earth reflection.

Unit 5 : **SPACE WAVE PROPAGATION and SKY WAVE PROPAGATION** 12

Introduction, Effect of imperfection of Earth, Effects due to - curvature of earth, Shadowing of hills and buildings, Variation of field strength with Height, Super refraction, Scattering Phenomena, Tropospheric propagation, .Structural details of Ionosphere, Wave propagation mechanism, 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, Take-off angle.

Prescribed Text Books:

1. John D. Kraus, Ronald J. Marhefka and Ahmad S Khan – “Antennas and Wave Propagation” TMH, 4e, Special Indian Edition 2010.

2. E.C. Jordan and K.G. Balmain - Electromagnetic Waves and Radiating

Systems, PHI, 2nd ed., 2000.

Reference Text books:

1. K.D.Prasad - Antenna and wave propagation, Khanna Publications
2. Balanis- Antenna Theory.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Knowledge on different basic concepts related to antennas and different antenna parameters mathematically.	L1
2. An ability to design BSA, EFA etc., Antenna arrays. Parasitic arrays and Yagi- Uda antenna	L5
3. Ability to design and implement the utilization of Helical and VHF and UHF antennas	L5
4. An Ability to analyze the propagation of wave and different parameters and Knowledge on all the layers of atmosphere and the nature of different Propagation mechanisms	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A452T.1	3	3	3	2	-	-	-	-	-	2	-	-	3	2	1
19A452T.2	2	2	3	2	-	-	-	-	-	2	-	2	3	2	1
19A452T.3	1	1	3	3	-	1	1	-	-	-	-	1	3	2	1
19A452T.4	2	2	2	2	-	2	2	-	-	2	-	2	3	2	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	DIGITAL SIGNAL PROCESSING
Category	:	PC
Course Code	:	19A453T
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand application of Discrete Fourier series and Transforms
- To learn design techniques and applications of Digital signal processing

Unit 1 : **INTRODUCTION AND DISCRETE FOURIER SERIES** 20

Discrete time signals, LTI systems, stability and causality, Solution of linear constant coefficient difference equations. Properties of discrete Fourier series, DFS representation of periodic sequences, discrete Fourier transforms: properties of DFT, linear convolution of sequences using DFT, computation of DFT.

Unit 2 : **FAST FOURIER TRANSFORMS** 10

Fast Fourier transforms (FFT)-Radix2 decimation in time and decimation in frequency FFT algorithms, inverse FFT, FFT for composite N.

Unit 3 : **IIR AND FIR DIGITAL FILTERS** 20

Analog filter approximations-Butterworth and chebyshev, design of digital filters from analog filters, design examples: analog-digital transformations, Basics of Z-Transforms, IIR Structures- Direct form–I, Direct form-II, Transposed Structure, and Cascade form. Design of FIR digital filters using window techniques, frequency sampling technique, comparison of IIR and FIR filters.

Unit 4 : **MULTIRATE DIGITAL SIGNAL PROCESSING FUNDAMENTALS** 10

Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Filter Design and Implementation for Sampling rate conversion, Multistage implementation of Sampling rate conversion.

Unit 5 : **APPLICATIONS OF DIGITAL SIGNAL PROCESSING** 5

Spectral analysis of non-stationary Signals, Musical Sound processing, signal Compression, Oversampling A/D Converter, Oversampling D/A Converter.

Prescribed Text Books:

1. Digital signal processing, principles, Algorithms and applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 4th ed., 2007
2. Digital signal processing , A computer base approach- Sanjit K Mitra, Tata McGraw Hill, 3rd edition, 2009.

Reference Text books:

1. Digital signal processing: Andreas Antoniou, TATA McGraw Hill, 2006.

2. Discrete Time Signal Processing-A.V. Oppenheim and R.W. Schaffer, 2nd ed., PHI.
3. Digital Signal Processing- P.Ramesh Babu, 4th Ed. SciTech Publications.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the types of discrete time signals & systems and analyze using Fourier series and Fourier transforms.	L2
2. Know the basics of digital filters and design using different techniques.	L1
3. Understand the concepts of decimation and interpolation..	L2
4. know the applications in Real life	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A453T.1	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
19A453T.2	2	3	3	3	-	-	-	-	-	-	3	2	3	3	-
19A453T.3		3	3	3	2	-	-	-	-	-	3	-	3	3	-
19A453T.4			3	3	2	1	-	-	-	-	3	2	3	3	1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	DIGITAL COMMUNICATION
Category	:	PC
Course Code	:	19A454T
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Acquire basics involved in digital communication.
- Impart knowledge of digital pulse modulation techniques
- Understand and apply different digital modulation Techniques
- Design different source coding methods

Unit 1 : **PULSE DIGITAL MODULATION** 10

Elements of digital communication system, advantages of digital communication systems, Elements of PCM, Bandwidth requirements of PCM, Noise in PCM Systems, Differential PCM systems (DPCM), Delta modulation systems, Adaptive delta modulation

Unit 2 : **DIGITAL CARRIER MODULATION SCHEMES** 8

Introduction, Binary ASK Signaling Scheme-Generation and detection methods, Binary FSK Signaling Scheme-Generation and detection methods, Binary PSK Signaling Scheme-Generation and detection methods, DPSK, Introduction to M-ary Signaling.

Unit 3 : **Information Theory And Source Coding** 12

UnitofInformation, Entropy, Rate of information, Joint and conditional entropy, Mutual information, Channel capacity using Shannon –Hartley theorem, Comparison between fixed length and variable length coding, Shanon-Fano coding, Huffman coding, Lempel-Ziv Code.

Unit 4 : **ERROR CONTROL CODING-I** 14

Linear block codes: Introduction, Matrix description of Linear Block codes, encoder design for LBC, Error detection and error correction capabilities of linear block codes, Syndrome Calculation, Decoder for LBC

Unit 5 : **ERRORCONTROL CODING-II** 12

Binary cyclic codes: Algebraic structure, encoding of cyclic codes, syndrome calculation

Convolution Codes: Introduction, Encoder for convolution codes, State diagram, Tree diagram and Trellis diagram, Viterbi algorithm

PrescribedText Books:

1. K.Sam shanmugam - Digital and Analog communication Systems, Wiley, 2010
2. R.P.Singh & S.D.Sapre - Communication Systems Analog & Digital, TMH, 2008

Reference Text books:

1. Simon Haykin - Digital Communications, Wiley, 2006
2. John Proakis - Digital Communications, TMH, 1983

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Recall fundamentals of Digital communication system and Demonstrate digital pulse modulation techniques	L1
2. Analyze digital modulation schemes and discriminate them	L3
3. Design source coding techniques in communications systems	L4
4. Apply channel coding techniques for data transmission and Design Different error control Codes	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A454.1	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
19A454.2	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
19A454.3	3	3	2	2	2	-	-	1	-	3	2	2	3	3	3
19A454.4	3	3	2	2	2	-	-	1	-	3	2	2	3	3	3

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
Category	:	PE
Course Code	:	19A45AT
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will be able to

- Give the knowledge on instrument usage for a particular application.
- Explain the internal structure of all instruments that are used in measuring parameters related to electronic based systems.

Unit 1 : **MEASURING INSTRUMENTS AND MEASUREMENT ERRORS** 12

Generalized measurement system, Accuracy, Precision, Resolution. Errors in Measurement. Basics of statistical analysis, D'Arsonval galvanometer, PMMC mechanism. DC Ammeter. DC voltmeter. Series Ohmmeter, shunt Ohmmeter. Volt-Ohm-Milliammeter. Digital voltmeters (DVMs): Ramp type & dual slope integrator, Digital Multimeter.

Unit 2 : **SIGNAL GENERATORS & ANALYZERS** 11

Audio frequency signal generation, Sine-wave generator, frequency-Synthesized signal generator, frequency divider generator, signal generator modulation, Sweep frequency generator, pulse and square wave generators. Function generator. Wave analyzers, Harmonic distortion analyzers, Spectrum Analyzers. Simple Frequency counter.

Unit 3 : **OSCILLOSCOPES** 15

Oscilloscope block diagram, Cathode Ray Tube, deflection amplifiers, waveform display, oscilloscope time base, dual trace oscilloscope, and oscilloscope controls. Measurement of voltage, frequency and phase. Pulse measurements, oscilloscope probes, display of device characteristics, X-Y and Z displays, oscilloscope specifications and performance. Delayed-Time-Base oscilloscopes, Analog storage oscilloscope, Sampling oscilloscopes, digital storage oscilloscopes, DSO applications.

Unit 4 : **BRIDGES** 11

Wheatstone bridge, guarded Wheatstone bridge, Kelvin Bridge, AC bridges and their application, Maxwell's bridge, Hays Bridge. Schering Bridge. Wein Bridge. Q-meter.

Unit 5 : **TRANSDUCERS** 10

Classification of transducers, selecting a transducer, strain gauges, displacement transducers. Temperature Measurements. Data Acquisition System, strip chart recorders and X-Y recorder.

Prescribed Text Books:

1. Electronic Instrumentation and Measurements, second edition – David A. Bell, Eastern Economy Edition, PHI.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PEARSON Education.

Reference Text books:

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.

2. A course in electrical and electronic measurements and instrumentation. A.K.Sawhney., DhanpatRai & Co publishers.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. State the principles of measurements with different basic meters and calculate all the parameters related to measurements.	L1
2. Describe different types of signal generators and Signal analyzers.	L2
3. Explain the basic features of oscilloscope, its internal architecture and different types	L4
4. Design different types of bridges for signal conditioning purpose.	L4
5. Understand about different types of transducers and advancements in Instrumentation	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45AT.1	3	3	3	-	3	-	-	-	-	-	-	3	3	3	-
19A45AT.2	3	-	-	-	3	-	-	-	-	-	-	3	3	-	-
19A45AT.3	3	3	3	-	3	-	-	-	-	-	-	3	3	3	-
19A45AT.4	3	3	3	-	3	-	-	-	-	-	-	3	3	3	-
19A45AT.5	3	--	-	-	3	-	-	-	-	-	-	3	3	--	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	ADVANCED DIGITAL DESIGN CONCEPTS
Category	:	PE
Course Code	:	19A45BT
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To Understand Concept of logic families & the basics of VHDL
- To design circuits and implement their functionality using VHDL
- To have a knowledge on synchronous design methodology.

Unit 1 : **CMOS & BIPOLAR LOGIC** 12

Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic electrical behavior, CMOS logic families. Bipolar logic, Transistor-Transistor logic, TTL families, CMOS/TTL interfacing, Low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families.

Unit 2 : **VHDL ELEMENTS & STRUCTURAL MODELING** 8

Introduction to HDL, Design flow, Program structure, Basic language elements- Data Objects, Data types, Operators, Functions and procedures, Packages and Libraries. Structural design elements: Introduction, Component declaration, Component instantiation, Examples.

Unit 3 : **DATAFLOW & BEHAVIORAL MODELING** 15

Data flow design elements: Introduction, Concurrent signal assignment statement, Concurrent versus Sequential signal assignment statement, Conditional signal assignment statement and Selected signal assignment statement, Behavioral design elements: Introduction, Entity declaration, Architecture body, Process statement, Variable assignment statement, Signal assignment statement, Wait statement, If statement, Case statement, Null statement, Loop statement, Exit statement, Next statement, Assertion statement, Report statement, Delay models- Inertial delay model, Transport delay model.

Unit 4 : **COMBINATIONAL LOGIC DESIGN** 12

Decoders, Encoders, Three state devices, Multiplexers and Demultiplexers, Code Converters, EX-OR gates and Parity circuits, Comparators, Adders & subtractors, ALUs, Combinational multipliers and their VHDL models. Design examples: Barrel shifter, Comparators, Ones counter.

Unit 5 : **SEQUENTIAL LOGIC DESIGN** 12

Latches and flip-flops, Counters, Shift register and their VHDL models, Synchronous design methodology, Impediments to synchronous design.

PrescribedText Books:

1. John F. Wakerly- Digital Design Principles & Practices, PHI/ Pearson Education Asia, 3rd Ed., 2005.
2. J.Bhaskar-VHDL primer, PHI/ Pearson Education Asia, 3rd Ed., 2003.

Reference Text books:

3. Charles H. Roth Jr- Digital System Design Using VHDL, PWS Publications, 2nd edition, 2008.
1. Kenneth L Short – VHDL for Engineers, Pearson Education 2009.
2. Stephen Brown and Zvonko Vranesic- Fundamentals of Digital Logic with VHDL Design, McGraw Hill, 2nd Edition. 2005.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the theory of logic families & interfacing.	L1,L2
2. Understand the basics of VHDL & programming.	L2
3. Be able to know the concepts of VHDL design modeling	L3
4. Be able to design combinational circuits and implementation using VHDL programming.	L6
5. Be able to design Sequential circuits and implementation using VHDL programming.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45BT.1	3	3	3	1									3	2	2
19A45BT.2			2		3						3		3		1
19A45BT.3			2		3						3		3		1
19A45BT.4	1	3	3	2	3						3		3	3	3
19A45BT.5	1	3	3	2	3						3		3	3	3

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	Data Communication Systems
Category	:	PE
Course Code	:	19A45CT
Year	:	III B. Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	1	0	4

Course Objectives: The course aims to provide the student with the ability

- To have a detailed study of various analog and digital modulation and demodulation techniques
- To have a thorough knowledge of various multiplexing schemes
- To know about the standards and mechanisms of telephone systems.

Unit 1 : 10

INTRODUCTION TO DATA COMMUNICATIONS AND NETWORKING: Standards Organizations for Data Communications, Layered Network Architecture, Open Systems Interconnection, Data Communications Circuits, Serial and parallel Data Transmission, Data communications Networks, Alternate Protocol Suites.

SIGNALS, NOISE, MODULATION, AND DEMODULATION: Signal Analysis, Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems, Information Capacity, Bits, Bit Rate, Baud, and M-ary Encoding, Digital Modulation..

Unit 2 : 11

METALLIC CABLE TRANSMISSION MEDIA: Metallic Transmission Lines, Transverse Electromagnetic Waves, Characteristics of Electromagnetic Waves.

OPTICAL FIBER TRANSMISSION MEDIA: Advantages of Optical Fiber cables, Disadvantages of Optical Fiber Cables, Electromagnetic spectrum, Optical Fiber Communications System Block Diagram, Optical Fiber construction, Propagation of Light Through an Optical fiber Cable, Optical Fiber Modes and Classifications, Optical Fiber Comparison, Losses in Optical Fiber Cables, Light sources, Light Detectors, Lasers.

Unit 3 : 10

DIGITAL TRANSMISSION: Pulse Modulation, Pulse code Modulation, Dynamic Range, and Signal Voltage to-Quantization Noise Voltage Ratio, Linear Versus Nonlinear PCM Codes, Companding, PCM Line Speed, Delta Modulation PCM and Differential PCM.

MULTIPLEXING AND T CARRIERS: Time- Division Multiplexing, T1Digital Carrier System, Digital Line Encoding, T Carrier systems, Frequency- Division Multiplexing, Wavelength- Division Multiplexing, Synchronous Optical Network.

Unit 4 : 9

WIRELESS COMMUNICATIONS SYSTEMS: Electromagnetic Polarization, Electromagnetic Radiation, Optical Properties of Radio Waves, Terrestrial Propagation of Electromagnetic Waves, Skip Distance, Free-Space Path Loss, Microwave Communications Systems, Satellite Communications Systems.

Unit 5 : 10

TELEPHONE INSTRUMENTS AND SIGNALS: The Subscriber Loop, Standard Telephone Set, Basic Telephone Call Procedures, Call Progress Tones and Signals, Cordless Telephones, Caller ID, Electronic Telephones, Paging systems.

CELLULAR TELEPHONE SYSTEMS: First- Generation Analog Cellular Telephone, Personal Communications system, Second-Generation Cellular Telephone Systems, N-AMPS, Digital Cellular Telephone, Interim Standard, Global system for Mobile Communications.

Prescribed Text Books:

1. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson

Education.
2. Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.TMH.
Reference Text books:
1. Data and Computer communications, 8/e, William Stallings, PHI.
2. Computer Communications and Networking Technologies, Gallow, Second Edition Thomson
3. Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concepts of data communications and networking.	L2
2. Identify suitable transmission media for different types of communications	L2
3. Differentiate the different digital transmission techniques and multiplexing schemes	L3
4. Understand the different types of wireless communications systems	L2
5. Explain basic blocks of Telephone System and the generations of cellular telephone systems	L2

CO-PO Mapping:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45CT.1	3	3	2	3	1	2	1			3		1	3	2	
19A45CT.2	3	3	2	3	2	2	1			3		1	3	2	
19A45CT.3	3	3	2	3	2	2	2			3		1	3	2	
19A45CT.4	3	3	2	3	2					3		1	3	2	
19A45CT.5	1	1	2		2	2	2			3		1	3	2	

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	VLSI TESTING & TESTABILITY
Category	:	OE
Course Code	:	19A45DT
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To have knowledge about testing of various faults and modeling of faults
- To learn about testing algorithms and test vector generation
- To acquire knowledge on testable designs

Unit 1 : **FUNDAMENTALS OF TESTING DIGITAL SYSTEMS** 10

Modeling: Modeling Digital Circuits at Logic Level, Register Level and Structural Models. Levels of Modeling. Logic Simulation: Types of Simulation, Delay Models, Element Evaluation, Hazard Detection, Gate Level Event Driven Simulation.

Unit 2 : **FAULT MODELING** 10

Logic Fault Models, Fault Detection and Redundancy, Fault Equivalence and Fault Location. Single Stuck and Multiple Stuck – Fault Models. Fault Simulation Applications, General Techniques for Combinational Circuits

Unit 3 : **TESTING FOR SINGLE STUCK FAULTS (SSF)** 12

Automated Test Pattern Generation (ATPG/ATG) For SSFs in Combinational and Sequential Circuits, Functional Testing With Specific Fault Models, Test Pattern Generation.

Unit 4 : **DESIGN FOR TESTABILITY** 10

Testability Trade-Offs, Techniques. Scan Architectures and Testing – Controllability and Absorbability, Generic Boundary Scan, Full Integrated Scan, Storage Cells for Scan Design. Board Level and System Level DFT Approaches. Boundary Scans Standards

Unit 5 : **BUILT-IN SELF-TEST (BIST)** 08

BIST Concepts, Specific BIST Architectures – CSBL, BEST, RTS, LOCST, STUMPS, CBIST, CEBS, RTD, SST, CATS, CSTP, BILBO. Brief Ideas on Some Advanced BIST Concepts and Design for Self-Test at Board Level, ICT, JTAG Testing Features.

PrescribedText Books:

1. Miron Abramovici, Melvin A. Breur, Arthur D.Friedman, Digital Systems Testing and Testable Design, Jaico Publishing House, 2001.

2. P.K. Lala – Digital Circuit Testing and Testability – Academic press 2002

Reference Text books:

1. Alfred Crouch, Design for Test for Digital ICs & Embedded Core Systems, Prentice Hall.

2. Robert J.Feugate, Jr., Steven M.Mentyn, Introduction to VLSI Testing, Prentice Hall, Englehood Cliffs, 1998.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Detect faults in digital systems	L3
2. Model faults to simplify fault detection	L3
3. Generate test vectors to detect and diagnose the faults using various algorithms	L4
4. Design testable architecture for digital circuits	L4
5. Implement Built-In Self-Test architectures for digital circuits	L4

CO-PO Mapping:

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45DT.1	3	3	1	2									2	2	
19A45DT.2	3	3	3	2									2	2	
19A45DT.3	3	3	3	3									2	2	
19A45DT.4	2	2	3	2			1						2	2	
19A45DT.5	2	2	3	2			1						2	2	

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	DIGITAL SYSTEM DESIGN
Category	:	OE
Course Code	:	19A45ET
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To Understand Concept of digital system designs.
- To analyze the fault modeling concepts & diagnosis and different test generation algorithms.
- To design and test the digital circuits using PLAs.
- To have a knowledge on asynchronous sequential machines.

Unit 1 : **DESIGN OF DIGITAL SYSTEMS AND SEQUENTIAL CIRCUIT** 12

ASM charts, Hardware description language and control sequence method, Reduction of state tables, state assignments, design of Iterative circuits, design of sequential circuits using ROMs and PLAs.

Unit 2 : **FAULT MODELING AND TEST GENERATION ALGORITHMS** 15

Fault classes and models – Stuck at faults, bridging faults, transition and intermittent faults. Fault diagnosis of Combinational circuits by conventional methods – Path Sensitization technique, Boolean difference method, Kohavi algorithm. D – Algorithm, PODEM, Random testing, transition count testing, Signature analysis and testing for bridging faults.

Unit 3 : **FAULT DIAGNOSIS IN SEQUENTIAL CIRCUITS** 12

State identification and fault detection experiment. Machine identification, Design of fault detection experiment.

Unit 4 : **PROGRAMMING LOGIC ARRAYS & TESTING** 12

Design using PLA's, PLA minimization and PLA folding. Fault models, Test generation and Testable PLA design.

Unit 5 : **ASYNCHRONOUS SEQUENTIAL MACHINE** 9

Fundamental mode model, flow table, state reduction, minimal closed covers, races, cycles and hazards.

Prescribed Text Books:

1. Z. Kohavi – "Switching & finite Automata Theory" (TMH)
2. N. N. Biswas – "Logic Design Theory" (PHI)
3. Nolman Balabanian, Bradley Calson – "Digital Logic Design Principles" – Wiley Student Edition 2004.

Reference Text books:

1. M. Abramovici, M. A. Breues, A. D. Friedman – "Digital System Testing and Testable Design", Jaico Publications
2. Charles H. Roth Jr. – "Fundamentals of Logic Design".
3. Frederick. J. Hill & Peterson – "Computer Aided Logic Design" – Wiley 4th Edition.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concepts of digital design and able to design sequential circuit.	L1, L2 & L4
2. Understand the concepts of fault modeling and able to do diagnosis them with different algorithms.	L1, L4 & L5
3. Be able to do fault diagnosis of sequential circuits.	L4
4. Be able to design and test the circuits using PLAs	L3 & L6
5. Be able to design Asynchronous Sequential machines.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A45ET.1	1	3	3	3	2						2		3	2	2
19A45ET.2	3	3	3	3	3	1					3		3		1
19A45ET.3	3	3	3	3	3	1					2		3		1
19A45ET.4	3	3	3	3	3						3		3	3	3
19A45ET.5	3	3	3	3	2						1		3	3	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	INDUSTRIAL ELECTRONICS
Category	:	OE
Course Code	:	19A45FT
Year	:	III B.Tech.
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Power quality terminology, power quality issues, classification
- Different sources of power quality disturbances
- Harmonic distortion; Principles for controlling harmonics
- Power quality measuring equipment; Power quality monitoring standards
- Impact of distributed generation on power quality

Unit 1 : **INTRODUCTION TO POWER QUALITY** 8

Power Quality- definition, terminology, issues, evaluation procedure, responsibilities of the suppliers and users of electric power, power quality standards, CBEMA and ITI curves.

Unit 2 : **POWER QUALITY DISTURBANCES** 10

General classes of power quality problems- Impulsive and oscillatory transients. Long duration voltage variations - over voltage, under voltage, sustained interruption. Short duration voltage variations-interruption, sag, swell and outage. Sources of sags and interruptions, estimating voltage sag performance overview of mitigation methods.

Unit 3 : **FUNDAMENTALS OF HARMONICS** 10

Harmonic distortion, voltage versus current distortion, harmonics versus transients, power system quantities under non-sinusoidal conditions, harmonic indices. Harmonic sources from commercial and industrial loads. Effects of harmonic distortion. Applied harmonics - harmonic distortion evaluation, principles of controlling harmonics, and devices for controlling harmonic distortion. Harmonic filter design and standards on harmonics.

Unit 4 : **POWER QUALITY MONITORING** 9

Power quality benchmarking, monitoring considerations, choosing monitoring locations, permanent power quality monitoring equipment, historical perspective of power quality measuring instruments. Power quality measurement equipment-types of instruments, assessment of power quality measurement data, power quality monitoring standards.

Unit 5 : **DISTRIBUTED GENERATION AND GRID INTERCONNECTION** 8

Distributed generation -connection requirements and impacts on the network. Interaction and optimal location of DG-Eigen analysis and voltage interaction. Power quality in DG-Mitigation of voltage dip during motor start, harmonic effects with DG, voltage flicker and fluctuation. Islanding issues, distribution line compensation-heavy Load and Light load condition, real generation, protection issues for distributed generation, technologies for distributed generation, power quality impact from different DG types.

PrescribedText Books:

4. Roger C. Dugan, Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, Electrical Power Systems Quality, 3rd edition, TMH Education Pvt. Ltd., 2012.
5. ArindamGhosh, Gerard Ledwich, Power quality enhancement using custom power devices, Kluwer academic publishers, 2002

Reference Text books:

4. G.T. Heydt, Electric Power Quality, Stars in a circle Publications, 1991. USA.
5. Surajit Chattopadhyaya, Madhuchhanda Mitra, Samarjit Senugupta, Electrical Power Quality, Springer Dordrecht Heidelberg London New York.
6. Math H. J. Bollen, Understanding Power quality problems, IEEE Press, 2007.

Course Outcomes:

Student will be able to	Blooms Level of Learning
6. Demonstrate knowledge on sources of power quality disturbances and issues, power quality monitoring and measuring instruments, power quality standards, effect of distributed generation on power quality.	L1
7. Analyze various power quality issues.	L3
8. Design a suitable harmonic filter for commercial and industrial loads.	L4
9. Investigate various power quality issues and provide feasible solutions for improvement of power quality.	L5
10. Select and use an appropriate equipment for monitoring and measurement of power quality.	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A27CT.1	3	-	-	-	-	-	-	-	-	-	-	-	-3	-	-
19A27CT.2	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
19A27CT.3	1	2	3	-	-	-	-	-	-	-	-	-	3	-	-
19A27CT.4	3	3	-	-	3	-	-	-	-	-	-	-	-	3	-
19A27CT.5	2	2	-	-	3	-	-	-	-	-	-	-	-	3	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	MICROPROCESSORS AND INTERFACING LAB
Category	:	PC
Course Code	:	19A451L
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives: This course will able

- To learn Assembly Language programming.
- To understand programmable peripheral devices and their Interfacing.

Experiment No. 1 :- Arithmetic operations.
Experiment No. 2 :- Signed Arithmetic operations.
Experiment No. 3 :- ASCII – Arithmetic operations.
Experiment No. 4 :- Addition of two BCD numbers(4-digits each).
Experiment No. 5 :- Logical Operations

a. Code conversion.

b. Identify the parity (even/Odd) of a given byte/word.

Experiment No. 6 :- String Operations

a. Relocate a string of N words/bytes.

b. Reverse String.

c. Length of the String

d. String Insertion

e. String Deletion

f. Scanning a byte/ word.

Experiment No. 7 :- Sorting using near procedure.

Experiment No. 8 :- Interfacing with 8255 PPI

a. DAC Interfacing:

i. PWM generation in BSR mode

ii. Triangular, sinusoidal and square wave generation in I/O mode.

b. Stepper Motor Interfacing: Rotation in Clock wise and Anti-clock wise direction.

Experiment No. 9 :- 8259 – Interrupt Controller.

Experiment No. 10:- 8251 - USART Interfacing.

Course Outcomes:

Student will be	Blooms Level of Learning
1. Able to write Assembly Language programs.	L6
2. Able to understand the operations and applications of microprocessors	L2

3. Able to understand programmable peripheral devices and their Interfacing L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A451L.1	3	-	-	-	2	2	-	-	1	-	-	-	3	2	-
19A451L.2	2	3	-	-	3	-	-	-	-	-	-	-	2	3	-
19A451L.3	3	-	-	-	-	-	-	-	-	-	-	1	1	1	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	DIGITAL COMMUNICATION LAB
Category	:	PC
Course Code	:	19A454L
Year	:	III B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives: This course will able

- The course aims to provide a real time experience for different digital modulation and demodulation schemes,
- To simulate and analyse the digital modulation schemes.

Design and Simulation* of following experiments and also verify in Hardware Laboratory (minimum 6 of the following)

*** Multisim OR Matlab OR Equivalent Simulation Software.**

Experiment No. 1 :- Sampling Theorem
Experiment No. 2 :- Pulse Code Modulation and Demodulation
Experiment No. 3 :- DPCM Modulation and Demodulation
Experiment No. 4 :- Delta Modulation
Experiment No. 5 :- Time Division Multiplexing
Experiment No. 6 :- FSK Modulation and Demodulation
Experiment No. 7 :- PSK Modulation and Demodulation
Experiment No. 8 :- DPSK Modulation & Demodulation

Course Outcomes:

Student will be able	Blooms Level of Learning
1. To experience real time behaviour of different digital modulation schemes	L6
2. To understand the working principles of Modulation and demodulation.	L2
3. To simulate and analyse the digital modulation schemes	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A451L.1	2	3	3		2	2				3		3	3	2	-
19A451L.2					2	2				3		3	2	3	-
19A451L.3	2	3	3	1	2	2				3		3	1	1	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Professional Communication Skills Lab
Category	BS
Couse Code	19AC52L/62L
Year	III Year
Semester	I/II Semester
Branch	ECE, EEE /CE, ME, CSE

Lecture Hours	Tutorial Hours	Practical	Credits
-	-	3	1.5

Résumé Preparation – structure, formats and styles – planning - defining career objective - projecting one's strengths and skills - creative self-marketing–sample resumes - cover letter

Interview Skills- concept and process - pre-interview planning – preparation - body language - answering strategies – frequently asked questions

Group Discussion –communicating views and opinions – discussing – intervening – agreeing and disagreeing –asking for and giving clarification - substantiating - providing solution on any given topic across a cross-section of individuals - modulation of voice and clarity - body language – case study

Oral Presentations (Individual& Team) – collection of data from various sources –planning, preparation and practice – attention-gathering strategies - transitions – handling questions from audience

Listening Comprehension – listening for understanding - responding relevantly

Learning Resources: AECS Lab Manual prepared by Dept of HS, AITS Rajampet

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. express himself/herself fluently in social and professional contexts	L4
2. demonstrate effective presentation skills	L4
3. face interviews confidently	L3
4. participate in meetings effectively	L4
5. listen actively for better understanding	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19AC52L.1										3		3			
19AC52L.2										3		3			
19AC52L.3										3		3			
19AC52L.4										3		3			
19AC52L.5										3		3			

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	VLSI DESIGN
Category	:	PC
Course Code	:	19A462T
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To acquire knowledge of fabrication process involved in MOS Devices
- To understand the basic electrical properties of MOS devices and VLSI Circuit Design Processes
- To get the knowledge on design methods and testing techniques.

Unit 1 : **INTRODUCTION TO IC TECHNOLOGY** 15

VLSI design flow, MOS, PMOS, NMOS, CMOS and BI-CMOS fabrication processing technologies - oxidation, Photolithography, diffusion, Ion implantation, metallization, Encapsulation, probe testing, integrated resistors and capacitors. Introduction to Fin FET technology BASIC ELECTRICAL PROPERTIES OF MOS AND BICMOS CIRCUITS: Basic electrical properties of MOS and BI-CMOS circuits: Ids-Vds relationships, MOS transistor threshold voltage, gm, gds, figure of merit (ωo), pass transistor, NMOS inverter, various pull-ups, CMOS inverter analysis and design, BICMOS inverters.

Unit 2 : **VLSI CIRCUIT DESIGN PROCESSES** 12

MOS layers, stick diagrams, design rules and lay out, 2µm CMOS design rules for wires, contacts and transistors layout diagrams for NMOS and CMOS inverters, Logic gates and Other Complex Gates, scaling of MOS circuits, limitations of scaling.

Unit 3 : **GATE LEVEL DESIGN** 8

Switch logic, alternate gate circuits, basic circuit concepts, sheet resistance RS and its concept applied to MOS Transistors, area capacitance and its calculations, Inverter delays, driving large capacitive loads, wiring capacitances.

Unit 4 : **SUBSYSTEM AND SEMICONDUCTOR IC DESIGN** 14

Shifters, adders, multipliers, parity generators, comparators, zero/one detectors, counters, high density memory elements, Field Programmable Gate Arrays, Complex Programmable Logic Devices, standard cell based Designs.

Unit 5 : **DESIGN METHODS AND TESTING** 8

Design methods, design capture tools, design verification tools, Test principles, Need for testing, design strategies for test, chip level test techniques, system-level test techniques, Layout Design for Improved Testability.

PrescribedText Books:

1. Kamran Eshraghian, Eshraghian Douglas and A. pucknell - Essentials of VLSI circuits and systems, PHI, 2005 Edition.

2. Weste and Eshraghian - Principles of CMOS VLSI design, Pearson Education, 1999.

Reference Text books:

1. John P.Uyemura, John Wiley - Introduction to VLSI circuits and systems, 2003.
2. John M. Rabaey - Digital Integrated circuits, PHI, ECE, 1997. 3. Jerry G. Fossum, Vishal P. Trivedi - Fundamentals of Ultra-Thin-Body MOSFETs and FinFETs, Cambridge University Press, 2013.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand different IC technologies and their fabrication process.	L1
2. Analyze the basic electrical properties of MOS transistor and design of CMOS and Bi-CMOS inverters.	L3
3. Be able to understand the VLSI design process.	L1
4. Be able to design the gate level and sub system modules.	L5
5. Be able to knowledge on design methods and testing techniques.	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A462T.1	3	3	3		3	3	2		2		2	2	2	2	3
19A462T.2	3	3	3	1	2	2	2	1	2	2	1	2	2	2	2
19A462T.3	3	3	3	2	3			2			3	2	2	2	2
19A462T..4	2	3	3	1	2			1	2	2	2		2	2	3
19A462T.5	2	3	3					1	3				3	2	2

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	MICROWAVE ENGINEERING
Category	:	PC
Course Code	:	19A463T
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

1. To understand EM Wave theory at microwave frequencies.
2. To learn about various microwave components: microwave tubes, microwave devices along with measurements.

Unit 1 : **INTRODUCTION TO MICROWAVE ENGINEERING & WAVE GUIDES:** 9

Introduction to Microwave engineering, Microwave Spectrum and Bands, Advantages & Applications of Microwaves. Wave guides- Types, Rectangular Waveguides – TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes. Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Impossibility of TEM mode, Power Transmission and Power Losses in Rectangular Guide.

Unit 2 : **CIRCULAR WAVEGUIDES:** 9

Propagation of TE & TM waves, Nature of Fields, Characteristic Equation, TM modes, Dominant and Degenerate Modes, Attenuation, Advantages and Applications. Cavity Resonators– Introduction, Rectangular and Cylindrical Cavities, Dominant Modes and Resonant Frequencies, Q factor and Coupling Coefficients.

Unit 3 : **MICROWAVE COMPONENTS** 12

Waveguide Microwave Junctions Formulation and Properties of S-Matrix, Microwave T-Junctions-H-Plane, E-Plane, Magic Tee and its Applications. Directional Couplers-Two Hole, Wave guide Irises- Posts & Tuning screws, Coupling Probes and loops, Waveguide Terminations, Phase Shifters and Microwave attenuators, Ferrite Devices-Faraday Rotation Microwave devices-Gyrator, Isolator, Circulator.

Unit 4 : **MICROWAVE SOURCES-KLYSTRONS, TWT's, MAGNETRONS** 12

Limitations and Losses of conventional tubes, Microwave tubes– classifications, Two Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process, Expressions for output Power and Efficiency. Reflex Klystrons – Structure, Applegate Diagram and Principle of working, Mathematical Theory of Bunching, Power Output, Efficiency, Electronic Admittance. TWT"s- Construction, Principle and working Operation, Mathematical Analysis, Performance and Applications. Magnetron-Introduction, Cavity Magnetron, Mathematical Analysis, Sustained oscillations, Mode jumping, Frequency Pushing and pulling, Performance Characteristics and Applications.

Unit 5 : **MICROWAVE SOLID STATE DEVICES & MEASUREMENTS** 9

Introduction, TED‟s, Gunn Effect Diodes (GaAs), RWH Theory-
Differential Negative Resistance, Two Valley Model Theory, Modes of Operation. Avalanche Transit Time devices-Introduction, IMPATT and TRAPATT Diodes -Structure, Principle of Operation, Power output and Efficiency. Microwave Measurements-Description of Microwave Bench–Different Blocks and their Features, Precautions; Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, VSWR, Cavity Q, Impedance Measurements.

PrescribedText Books:

1. Samuel Y. Liao, PHI- Microwave Devices and Circuits, 3rd Edition, 2003.
2. Microwave and Radar Engineering, M Kulkarni– Umesh Publications, 1998.

Reference Text books:

1. R.E. Collin - Foundations for Microwave Engineering, IECE Press, John Wiley, 2nd Edition, 2002.
2. Herbert J. Reich, J.G. Skolnik, P.F. Ordung and H.L. Krauss - Microwave Principles, CBS Publishers and Distributors, New Delhi, 2004.

Course Outcomes:

Upon completion of the course, students will	Blooms Level of Learning
1. Ability to solve the wave equations.	L3
2. Learn the construction and operation of microwave devices, components, sources and detectors.	L4
3. Study about the various measurements of microwave parameters	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A463T.1	1	3	3	1	--	--	--	--	--	2	--	--	--	3	--
19A463T.2	--	3	3	--	--	--	--	--	--	2	1	--	--	3	--
19A463T.3	--	3	3	--	1	--	--	--	--	--	--	--	--	3	1

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	DIGITAL DESIGN THROUGH VERILOG HDL
Category	:	PE
Course Code	:	19A46AT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand the basics of Verilog
- To make the students renown to basics, syntax and semantics of new programming language

Unit 1 : **INTRODUCTION TO VERILOG** 10

Verilog as HDL, Levels of design description, concurrency, simulation and synthesis, functional verification, test benches.

LANGUAGE CONSTRUCTS AND CONVENTIONS: Introduction, keywords, identifiers, whitespace characters, comments, numbers, strings, logic values, strengths, data types, scalars and vectors, parameters, memory, operators, system tasks.

Unit 2 : **GATE LEVEL MODELLING&SWITCH LEVEL MODELLING** 10

Introduction, AND gate primitive, module structure, other gate primitives, illustrative examples, tristate gates, array of instances of primitives, design of Flip flops with gate primitives, delays, strengths and contention resolution, net types, design of basic circuits

Switch Level Modelling :Introduction, basic transistor switches, CMOS switch, Bidirectional gates, time delays wit switch primitives, instantiations with strengths and delays, strength contention with trireg nets

Unit 3 : **MODELLING AT DATAFLOW LEVEL&BEHAVIORAL MODELLING** 10

Introduction, continuous assignment structures, delays and continuous assignments, assignment to vectors, operators.

Data Flow Modelling: Introduction, operations and assignments, functional Bifurcation, initial construct, always construct, examples, assignments with delays, wait construct, multiple always blocks, designs at behavioral level, blocking and non-blocking assignments, the case statement, simulation flow, if and if else constructs, assign-De assign construct, repeat construct, FOR loop, the disable construct, While loop, Forever loop, parallel blocks, force-release construct, event.

Unit 4 : **FUNCTIONS, TASKS, AND USER-DEFINED PRIMITIVESSYSTEM TASKS, FUNCTIONS AND COMPILER DIRECTIVES:** 9

Introduction, Function, Tasks, User- Defined Primitives (UDP)

System Tasks, Functions And Compiler Directives: Introduction, parameters, path delays, module parameters, system tasks and

functions, file –based tasks and Functions, Compiler Directives, FSM Design (Moore and Mealy Machines).

Unit 5 : **DIGITAL DESIGN WITH SM CHARTS&DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES** 8

State Machine Charts, Derivation of SM Charts, Realization of SM Charts, Implementation of the Dice Game, Alternative realizations for SM Charts using Microprogramming, Linked State Machines, Static RAM Memory,

UART Design

DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES: Xilinx 3000 Series FPGAs, Designing with FPGAs, Using a One-Hot State Assignment, Altera Complex Programmable Logic Devices (CPLDs), Altera FLEX 10K Series CPLDs.

PrescribedText Books:

3. Design through Verilog HDL – T.R. Padmanabhan and B. Bala Tripura Sundari, WSE, IECE Press, 2004
4. A Verilog Primier – J. Bhasker, BSP, 2003
5. Digital System Design Using VHDL – Charles.H.Roth.Jr

Reference Text books:

3. Fundamentals of Logic Design with Verilog – Stephen. Brown and ZvonkoVranesic, TMH, 2005.
4. Advanced Digital Design with Verilog HDL – Michael D. Ciletti, PHI, 2005.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand, design, simulate and synthesize computer hardware using Verilog HDL	L6
2. Be able to rapidly design combinational and sequential logic	L6
3. Be able to use different Verilog programming constructs in digital system design	L4
4. gain knowledge in implementing state machines	L3
5. Gain ability to Design CPLDs & PGAs.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46AT.1	-	3	3	-	-	2	-	3	2	-	3	2	3	3	2
19A46AT.2	2	3	3	-	-	3	-	3	2	-	3	2	3	3	2
19A46AT.3	-	-	3	-	-	1	-	2	-	-	2	1	3	2	-
19A46AT.4	2	3	3	-	-	1	-	2	2	-	2	2	3	3	-
19A46AT.5	1	3	3	-	-	1	-	3	3	-	3	2	3	3	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	RADAR ENGINEERING
Category	:	PE
Course Code	:	19A46BT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To learn the fundamental operation and working principles of modern radar systems
- To understand basic concepts of modern radar systems for both civilian and defense applications
- To learn various signal detection techniques, displays and duplexers used in radar systems

Unit 1 : **RADAR PRINCIPLES** 10

Introduction, The simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies, Applications of radar, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Signal-to-noise Ratio, Integration of Radar Pulses, Radar Cross Section of Targets (sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System losses

Unit 2 : **CW AND FREQUENCY MODULATED RADAR** 9

Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Intermediate-frequency Receiver, Receiver Bandwidth , Applications of CW radar, FM-CW Radar-Range and Doppler Measurement, Block Diagram, FM-CW altimeter, Multiple Frequency CW Radar.

Unit 3 : **MTI AND PULSE DOPPLER RADAR** 10

Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, and Transversal filters, Staggered PRFs, Range Gated Doppler Filters, Limitations to MTI Performance.

Unit 4 : **TRACKING RADAR** 10

Tracking with Radar, Sequential lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one and two coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition, Comparison of Trackers

Unit 5 : **DETECTION OF RADAR SIGNALS IN NOISE** 11

Introduction, Matched-Filter Receiver, Derivation of the matched-filter characteristic, The matched filter and the Correlation Function, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise, Correlation Detection.

Radar Displays & Duplexers: Noise Figure, Noise figure of networks in cascade, Noise Temperature, Radar Displays – types, Duplexers – Branch type and Balanced type, Circulators as Duplexers.

Prescribed Text Books:

1.Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Edition, 2007

Reference Text books:

1. Radar Principles – Peebles, Jr., P.Z.Wiley, New York, 1998.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the essential principles of operation and fundamentals of radar systems	L2
2. Gain in-depth knowledge about the different types of RADARS	L1
3. Identify the various RADAR systems in existence, their applications and limitations	L3
4. Understand the need for various signal detection techniques in RADAR systems	L2
5. know the various technologies used in the design of RADAR systems such as duplexers, displays etc	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46BT. 1	1	3	3	-	-	-	-	2	-	1	2	3	2	-	-
19A46BT .2	1	3	3	-	-	2	-	2	-	-	2	3	2	2	-
19A46BT .3	1	3	3	-	-	2	-	2	-	-	3	3	1	-	1
19A46BT .4	1	3	3	-	-	2	-	2	-	-	2	3	-	1	-
19A46BT .5	1	3	3	-	1	-	1	2	-	-	2	3	1	-	-

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Ad-hoc Wireless Networks
Category	:	PE
Course Code	:	19A46CT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The students will be able to

- Understand the basics and applications of Ad -hoc Networks
- Learn various fundamental and emerging protocols of all layers in ad-hoc network.
- Study the issues pertaining to major obstacles in establishment and efficient
- Understand various security practices and protocols of Ad-hoc Networks

Unit 1 : **ADHOC NETWORKS AND MAC PROTOCOLS** 8

Ad hoc wireless networks : Introduction, Issues in Ad hoc wireless networks, Adhoc wireless internet . MAC protocols for ad hoc wireless networks: Introduction, Issues in designing a MAC protocol for ad hoc wireless networks, Design goals of a MAC protocol for Ad hoc wireless networks, Classifications of MAC protocols, Contention based protocols, Contention-based protocols with reservation mechanisms, Contention-based MAC protocols with scheduling mechanisms.

Unit 2 : **ROUTING PROTOCOLS FOR AD HOC WIRELESS NETWORKS** 12

Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks , Classifications of Routing Protocols ,Table Driven Routing Protocols ,Destination Sequenced Distance Vector (DSDV),Wireless Routing Protocol (WRP) , Cluster – Head Gateway Switch Routing Protocol , Source Initiated On Demand Approaches :Ad hoc On Demand Distance Vector Routing (AODV) , Dynamic Source Routing (DSR) , Temporally Ordered Routing Algorithm (TORA) , Signal Stability Routing (SSR) , Location Aided Routing (LAR) , Zone Routing Protocol (ZRP), Zone-Based Hierarchical Link State Routing Protocol.

Unit 3 : **MULTICAST ROUTING IN AD HOC WIRELESS NETWORKS** 8

Issues in Designing a Multicast Routing Protocol ,Operation of Multicast Routing Protocols , An Architecture Reference Model for Multicast Routing Protocols, Classifications of Multicast Routing Protocols , Tree Based Multicast Routing Protocols, Mesh Based Multicast Routing Protocols, Summary of Tree and Mesh based Protocols , Energy Efficient Multicasting , Multicasting with Quality of Service Guarantees, Application Dependent Multicast Routing.

Unit 4 : **TRANSPORT LAYER AND SECURITY** 9

Issues in Designing a Transport Layer Protocol for Adhoc Wireless Networks , Design Goals of a Transport Layer Protocol for Adhoc Wireless Networks, Classification of Transport Layer Solutions , TCP over Ad hoc Wireless Networks, Security in Ad Hoc Wireless Networks ,Network Security Requirements , Issues and Challenges in Security Provisioning , Network Security Attacks , Key Management , Secure Routing in Ad hoc Wireless Networks.

Unit 5 : **QoS and Energy Management** 8

Issues and Challenges in Providing QoS in Ad hoc Wireless Networks,
Classifications of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad hoc Wireless Networks.
Energy Management In Ad Hoc Wireless Networks : Introduction , Need for Energy Management in Ad hoc Wireless

Networks ,Classification of Energy Management Schemes , Battery Management Schemes , Transmission Power Management Schemes ,System Power Management Schemes.

PrescribedText Books:

1. C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks Architectures and Protocols”, Prentice Hall, PTR, 2004. ISBN, 013147023X.
2. K. Toh, “Ad Hoc Mobile Wireless Networks Protocols and Systems”, Prentice Hall, PTR,2001. ISBN, 0130078174.

Reference Text books:

5. Charles E. Perkins, “Ad Hoc Networking”, Addison Wesley, 2000. ISBN-13: 978-0321579072

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Explain the concepts and applications of ad-hoc networks	L2
2. Analyze the technology trends for the implementation and deployment of wireless Adhoc networks	L3
3. Analyze the challenges in designing protocol stacks for ad-hoc networks.	L3
4. Evaluate solutions to manage QoS and Energy efficiency	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46CT.1	1	2	----	2	----	----	----	----	----	----	----	----	1	1	---
19A46CT.2	3	3	----	3	----	2	----	----	1	----	----	2	2	2	---
19A46CT.3	2	3	----	2	----	2	----	----	1	----	----	2	2	2	---
19A46CT.4	2	3	----	3	----	2	----	----	1	----	----	2	2	2	---

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	OPTICAL FIBER COMMUNICATION
Category	:	PE
Course Code	:	19A46DT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand different Optical fibers with its structures and materials.
- Understand and analyze different Optical sources, detectors and their operating mechanisms.
- To understand the losses and to design different power link mechanisms of optical fibers

Unit 1 : **Optical waveguides and materials** 8

Introduction to fiber optic cables, Historical Development, The General System, Advantages of Optical Fiber Communications, Ray Theory transmission, Electromagnetic mode theory for Optical Propagation, Cylindrical Fiber. Single mode fibers, fiber materials.

Unit 2 : **Optical sources:** 10

Light Emitting Diodes (LEDs): LED Structures, Light Source Materials, Quantum efficiency and LED Power, Modulation of LED. LASER Diodes- Laser Diode Modes and Threshold Conditions, Laser Diode Rate Equations, External Quantum Efficiencies.

Unit 3 : **Optical detectors** 10

Physical principles of photo diodes, photo detector noise, detector response time, avalanche multiplication noise, structures for In GaAs APDs, temperature effect on avalanche gain, comparisons of photo detectors.

Unit 4 : **Fiber Losses and Power Coupling** 9

Attenuation, Fiber Bend Loss, Dispersion, Chromatic dispersion, Intermodal dispersion, Overall fiber dispersion, Polarization, Fiber alignment and joint loss. Source to Fiber Power Launching, Lensing schemes for Coupling Improvement, fiber-to-fiber Joints, semiconductor optical amplifiers.

Unit 5 : **Optical links** 8

Point to point links, Over-view of analog links, carrier to noise ratio, multichannel transmission techniques, RF over fiber, radio over fiber links.

WDM Concepts and components: Over-view, WDM, Necessity , Principles, Types of WDM.

Prescribed Text Books:

1. Optical fiber communications- Gerdkeiser, McGraw Hill International Edition, 3 rd Edition, 2010.
2. Optical fiber communications-John M. Senior, PHI, 3rd Edition, 2010.

Reference Text books:

6. Fiber-optic communication systems, Third edition,Govind P.Agrawal,The Institute of optics university of Rochester, Rochester, NY, WILEY Inter science, A John Wiley & sons, INC., Publication

Course Outcomes:

Student will be able to Blooms Level of Learning

1. Understand historical developments of OFC and different types of OFC L1
2. Analyze the transmission of optical signal in fibers L3
3. To design the constructional features of OFC and optical sources L4
4. To design the optical links and analyze different applications. L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46DT.1	3	--	2	--	--	--	--	--	--	1	--	--	1	--	--
19A46DT.2	3	2	1	--	--	--	--	--	--	--	--	--	2	3	--
19A46DT.3	3	2	3	--	1	--	--	--	--	--	--	--	2	3	--
19A46DT.4	3	--	3	3	3	--	--	--	--	1	--	--	3	2	--

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course : DIGITAL IMAGE PROCESSING
Category : PE
Course Code : 19A46ET
Year : III B.Tech
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

1. To understand the Digital Image Processing fundamentals
2. To acquire the knowledge of Image enhancement and restoration techniques
3. To identify the types of Image formats and their importance in Image Processing
4. To analyze various Image Segmentation and Compression methods

Unit 1 : **DIGITAL IMAGE FUNDAMENTALS** 8

Image Sensing and acquisition, Image Sampling and Quantization, Some basic Relationship between pixels. An Introduction to mathematical tools used in Image Processing, 2-D DFT, Properties. Walsh transforms, Hadamard Transform.

Unit 2 : **IMAGE ENHANCEMENT** 10

Some basic Intensity Transformation functions, Histogram Processing, Smoothing and Sharpening spatial filters, Image Smoothing and sharpening using Frequency domain filters

Unit 3 : **IMAGE RESTORATION** 10

A model of the Image degradation, Noise models, Restoration in the presence of Noise only, Estimating the degradation function, Inverse filtering, Wiener filtering.

Unit 4 : **COLOUR IMAGE PROCESSING** 9

Color Models, Pseudo Color Image Processing, Basics of Full Color Image Processing.

Unit 5 : **IMAGE SEGMENTATION & COMPRESSION** 8

Point, Line and Edge Detection, Thresholding – Global and Optimum Global, Region based segmentation, Coding Redundancy, Spatial and temporal Redundancy, Image Compression Models

PrescribedText Books:

1. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 3rd Edition.
2. Digital Image processing – R.C. Gonzalez & R.E. Woods, Addison Wesley/ Pearson education, 2nd Edition, 2002.

Reference Text books:

1. Fundamentals of Digital Image processing – A.K.Jain , PHI.
2. Digital Image processing using MAT LAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Edition, PEA, 2004.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand how images are acquired, sampled, quantized and	L2

represented in digital form and analyze images in the frequency domain using various transforms.

2. Apply various enhancement techniques to improve the Image perception L3
3. Analyze the restoration/degradation models for different applications L4
4. Describe the images in different formats such as binary, grey shade and Color with respect to different areas L1
5. Differentiate the methods related to image segmentation and compression with respect to the required applications L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46ET.1	3	3	3	2	1	1	-	-	-	3	-	3	3	3	3
19A46ET.2	3	3	3	3	2	2	-	-	-	3	-	3	3	3	3
19A46ET.3	3	3	3	3	2	2	-	-	-	2	-	3	3	3	3
19A46ET.4	3	3	3	3	2	2	-	-	-	2	-	3	3	3	3
19A46ET.5	3	3	3	3	3	3	-	-	-	2	-	3	3	3	3

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	CELLULAR AND MOBILE COMMUNICATIONS
Category	:	PE
Course Code	:	19A46FT
Year	:	III B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able

- To understand the basics of Cellular Mobile systems
- To describe interference and its classification
- To study the concepts of Cell Coverage and Mobile antennas
- To manage the frequencies of different channels and their assignments
- To differentiate handoffs &dropped calls and digital cellular systems

Unit 1 : **CELLULAR MOBILE SYSTEMS** 8

Introduction to Cellular Mobile system, *Basic Cellular System*, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

Elements of Cellular *Mobile* Radio System Design: General description of the problem, concept of frequency Reuse channels, Co-channel Interference Reduction Factor, Desired C/I from a normal case in an Omni directional Antenna system, *Handoff Mechanism*, Cell splitting, Consideration of the components of cellular system.

Unit 2 : **INTERFERENCE** 10

Introduction to Co-channel interference, Real time cochannel interference *measurement at mobile radio Transceivers*, Design of an omnidirectional and directional Antenna systems, Diversity receiver, Types of non-cochannel interference-*Measurement of* SINAD, adjacent channel interference, cross talk.

Unit 3 : **CELL COVERAGE FOR SIGNAL AND TRAFFIC** 10

Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and ground reflected path, straight line path loss slope, General formula for mobile *radio* propagation, propagation over water *or* flat open area, near-in and long distance propagation, Form of a point-to-point model.

Cell site and mobile antennas: Sum and difference patterns and their synthesis, *Antennas at cell site*-Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site *receiving* antennas, *Mobile* high-gain antennas.

Unit 4 : **FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT** 9

Numbering and grouping, set-up *channels*-access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment *Algorithms*

Unit 5 : **HANDOFFS & DROPPED CALLS** 8

Types of handoff, *Initiation of a handoff*, delaying a handoff, forced handoffs, mobile assisted handoff. Intersystem handoff, dropped call rate *and their formula*

Digital cellular *Systems:* GSM-Architecture, channels, multiplex access scheme, TDMA, CDMA

Prescribed Text Books:

1. Mobile cellular telecommunications-W .C. Y. Lee, Tata Mc-Graw Hill, 2nd Edition, 2006.
2. Wireless communications-Theodore. S. Rappaport, Pearson Education, 2nd Edn. 2002.

Reference Text books:

1. Principles of Mobile communications-Gordon L. Stuber, Springer International 2nd Edition, 2007.
2. Wireless and Mobile Communications-Lee Mc Graw Hills, 3rd Edition, 2006.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand fundamentals of cellular system design, coverage and interference	L2
2. Identify different types of non-co channel interference	L1
3. Analyze cell coverage in different traffic and their effects over different terrains	L4
4. Organize the concepts related to numbering, grouping, channels, channel sharing and borrowing	L3
5. Distinguish the concept of handoffs &dropped calls and digital cellular systems	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A46FT.1	3	3	2	2	1	2	-	-	-	3	2	3	3	3	3
19A46FT.2	3	3	3	3	2		-	-	-	3	3	3	3	3	1
19A46FT.3	3	3	3	3	2	2	-	-	-	2	2	3	3	3	2
19A46FT.4	3	2	3	2	1	2	-	3	-	3	3	3	3	3	3
19A46FT.5	3	2	3	1	3	1	-	3	-	3	3	3	3	2	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	General Aptitude
Category	HS
Couse Code	19AC61L
Year	III B. Tech
Semester	II Semester
Branch	EEE & ECE

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives:

- To equip students with aptitude and reasoning skills in order to help them succeed in competitive exams.
- To help students improve their knowledge of quantitative and reasoning skills, which in turn helps them comprehend and solve various mathematical problems in professional life.
- To equip students with English verbal and reasoning skills in order to help them succeed in exams like GRE, TOEFL and help them to do well in placement drives.
- To help students improve their knowledge of grammar, vocabulary and reasoning skills pertain to English.

Quantitative Aptitude:

Number Systems - HCF and LCM - Averages - Problems on ages– Percentages - Profit and loss - Simplification - Ratio and Proportion - Time and Work - Time and Distance - Simple interest and Compound interest –Calendar - Clocks – Mensuration: Area, Volume and Surface Areas - Data Interpretation: Tabulation, Line Graphs, Bar Graphs, Pie charts.

Reasoning:

Directions - Blood Relations - Series and Sequences - Odd man out - Coding and Decoding - Data Sufficiency-Logical deductions.

English for Competitive Examinations

Synonyms – Antonyms – Analogy – Words often confused, One-word substitutions – Idioms and Phrases – Homonyms – Spellings, Reading comprehension – Cloze tests

Articles – Prepositions – Tenses – Voice – Error spotting and correcting – Sentence improvement.

Rearrangement of jumbled words and jumbled sentences – word pairs – sentence completion

Prescribed Textbooks:

1. R.S. Agarwal, Quantitative Aptitude, S. Chand Publishers, New Delhi, 2005.
2. R. S. Agarwal, Verbal and Non-Verbal Reasoning, S. Chand Publishers, New Delhi, 1998.
3. Hari Prasad, "Objective English for Competitive Exams", TMH
4. R. S. Agarwal, "Objective English", S. Chand Publishers

Reference Books

1. Shakuntala Devi, Puzzles to Puzzle you, Orient Paper Backs Publishers (OPB), New Delhi, 2005.
2. Arun Sharma, How to Prepare for Quantitative Aptitude, TMH Publishers, New Delhi, 2003.
3. Sharon Weiner-Green, IrnK.Wolf, Barron's GRE, Galgotia Publications, New Delhi, 2006.
4. Shakuntala Devi, More Puzzles, OPB, New Delhi, 2006.
5. Ravi Narula, Brain Teasers, Jaico Publishing House, New Delhi, 2005.
6. George J Summers, Puzzles and Teasers, Jaico Publishing House, Mumbai, 2005

Course Outcomes:

Student will be able to — Blooms Level of Learning

- demonstrate various principles involved in solving mathematical problems pertain to Quantitative functions.
- decode information from charts and interpret their logical thinking in the aspects.
- interrelate English vocabulary with the knowledge of synonyms, antonyms, idiomatic expressions and, accuracy in English spelling
- apply knowledge of articles, prepositions, tenses and voice to correct errors or to improve sentences

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC61L.1	3											3
19AC51L.2	3											3
19AC61L.3										3		3
19AC61L.4										3		3

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	Universal Human Values - II
Category	HS
Couse Code	19AC63T
Year	III B. Tech
Semester	II Semester
Branch	ECE, EEE

Lecture Hours	Tutorial Hours	Practical	Credits
1	1	-	2

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection
- Development of commitment and courage to act

Unit 1 Course Introduction - Need, Basic Guidelines, Content and Process for Value Education 6

- Purpose and motivation for the course, recapitulation from Universal Human Values-I
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and
- Experiential Validation- as the process for self-exploration
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for
- fulfilment of aspirations of every human being with their correct priority
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

Unit 2 Understanding Harmony in the Human Being - Harmony in Myself! 6

- Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health; correct
- appraisal of Physical needs, meaning of Prosperity in detail

- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

Unit 3	Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship	6

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

Unit 4	Understanding Harmony in the Nature and Existence -Whole existence as Coexistence	6

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature recyclability
- and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

Unit 5	Implications of the above Holistic Understanding of Harmony on Professional Ethics	6

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual:

as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations

- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Prescribed Text Books

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Slow is Beautiful –Cecile Andrews
7. J C Kumarappa "Economy of Permanence"
8. Pandit Sunderlal "Bharat Mein Angreji Raj"
9. Dharampal, "Rediscovering India"
10. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
11. India Wins Freedom - Maulana Abdul Kalam Azad
12. Vivekananda - Romain Rolland(English)
13. Gandhi - Romain Rolland (English)

Course Outcomes:

	Blooms Level of Learning
• Students are expected to become more aware of themselves, and their surroundings (family, society, nature)	L2
• They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.	L2
• They would have better critical ability.	L2
• They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).	L2
• It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19AC53T.1/63T.1												3
19AC53T.2/63T.2												3
19AC53T.3/63T.3												3
19AC53T.4/63T.4												3
19AC53T.5/63T.5												3

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Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course : VLSI DESIGN LAB
Category : PC
Course Code : 19A462L
Year : III B.Tech
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives: This course will able to

- To Understand and develop the test bench code for combinational circuits and sequential circuits
- To make the students Design combinational and sequential circuits
- To Learn the simulation with truth table through EDA tool

Experiment No. 1:- Design of Logic gates using VHDL\Verilog.

Experiment No. 2:- Design Full Adder,Ripple Carry Adder using VHDL\Verilog.

Experiment No. 3:- Design Encoders and Decoders using VHDL\Verilog.

Experiment No. 4:- Design Multiplexer using VHDL\Verilog.

Experiment No. 5:- Design of ALU using Verilog.

Experiment No. 6:- Design of Flip-Flops using VHDL\Verilog.

Experiment No. 7:- Design of a decade counter using VHDL\Verilog.

Experiment No. 8:-Design of a CMOS NAND, NOR & XNOR using Verilog.

Implementation of Expt. 2, Expt. 3 and Expt.4 using FPGA kit.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Develop the test bench code for combinational circuits and sequential circuits	L6
2. Be able to use different Verilog/VHDL programming constructs in the design combinational and sequential circuits	L3
3. Simulate various combinational and sequential logic circuits and verify the simulation with truth table through EDA tool	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A462L.1	2	2	-	2	-	2	-	-	2	-	-	2	2	3	-
19A462L.2	1	2	-	2	-	2	-	-	1	-	-	2	-	2	-
19A462L.3	2	2	-	2	-	-	1	-	1	-	-	2	2	2	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course : DIGITAL SIGNAL PROCESSING LAB
Category : PC
Course Code : 19A464L
Year : III B.Tech
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	3	1.5

Course Objectives: This course will able to

- The course aims to enable the students to learn and design the concepts of MATLAB in signal processing applications.

1. To verify the stability and causality of LTI Systems.
2. To Identify Fourier series & Fourier transform of Continuous and Discrete signals.
3. To verify linear convolution.
4. To verify the circular convolution.
5. N-point FFT algorithm
6. MATLAB program to find frequency response of analog LP/HP filters.
7. To Design Butterworth (LP/HP)
8. To Design IIR filter by Impulse Invariant/Bi-Linear Transformation
9. To design FIR filter (LP/HP) using windowing technique a) Using rectangular window b) Using triangular window c) Using Kaiser window
10. To compute power density spectrum of a sequence.
11. Decimation by a factor D
12. Interpolation by a Factor L

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Able to write MATLAB programs.	L1
2. Able to understand the operations on signals.	L2
3. Able to understand and design different filters	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A464L.1	-	-	-	1	3	-	2	-	-	-	-	3	-	3	-
19A464L.2	2	2	-	-	3	-	2	-	-	-	-	3	2	3	-
19A464L.3	2	2	-	-	3	-	-	-	-	-	-	3	2	3	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	EMBEDDED SYSTEMS
Category	:	PC
Course Code	:	19A471T
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
2	0	0	2

Course Objectives: This course will able to

- To understand concepts of embedded systems.
- To apply the knowledge acquired on the design considerations

Unit 1 : **MICROCONTROLLER & INTERFACING 8051** 25

Introduction, Architecture, Register Organization, Internal and External Memory, Pin diagram, I/O port structure, Addressing modes, Instruction Set, simple programs. On-Chip Peripherals-8051 Interrupt Structure, Timer/Counter features, modes and programming. MSP 430 Low power Micro Controller (A Quantitative study only).Applications- Interfacing with switches, display – LED, seven segment display, LCD. Keyboard interfacing, D/A and A/D interfacing, Stepper motor interfacing, Handling External Interrupts, serial communications.

Unit 2 : **INTRODUCTION TO EMBEDDED SYSTEMS** 8

Embedded System – Definition, Application Areas, and Categories. Overview of embedded system architecture, specialities: reliability, performance, power consumption cost, size, user interface, software upgradation capability, recent trends: processor, power, memory, operating system, communication interface, programming languages, development tools, programmable hardware.

Unit 3 : **ARCHITECTURE OF EMBEDDED SYSTEMS** 14

Hardware Architecture – CPU, Memory, Clock Circuitry, Watch dog Timer/Reset Circuitry, chip select, I/O devices, Debug Port, Communication Interfaces, Power supply Unit. Software Architecture – Services provided by an operating System, Architecture and categories of Embedded Operating Systems, Application Software, Communication software, Process of generating Executable image, Development/Testing tools.

Unit 4 : **COMMUNICATION INTERFACES** 11

Need for Communication interface, RS232/UART, RS 422/RS 485, USB, Infrared, IECE 1394 fire wire, IECE 802.11, Blue tooth, I2C and CAN Bus.

Unit 5 : **REAL TIME OPERATING SYSTEM** 17

Architecture of Kernel, Tasks and Task Scheduler, Interrupt Service Routines, Inter process Communication– Semaphores, mutex, message queues, mailboxes, pipes, signals, event registers and timers. Priority Inversion Problem. Off the Shelf Operating Systems, Embedded Operating Systems, Real Time Operating Systems, And Handheld Operating Systems.

Prescribed Text Books:

1. Embedded/ Real Time Systems, K.V.K.K. Prasad, Dream tech press

2. The 8051 Microcontroller, Kenneth J Ayala, 3rd edition, Thomson Press.

Reference Text books:

1. Computers and Components, Wayne Wolf, Elsevier.
2. Embedded Systems, Raj Kamal, TMH. 2nd edition.2008.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand basic concepts to design embedded applications.	L2
2. Understand different programming models and their suitable application areas	L2
3. Analyze the operation of I/O ports and different communication protocols.	L4
4. Design different embedded applications.	L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
19A471T.1	3	2	1	2			1		2		1	2	3		
19A471T.2	3						2		1			2	2		
19A471T.3	2	3	2	1		2	1		2		2	1		2	
19A471T.4	2	3	3	2	2	1		1	2			1			3

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	DSP PROCESSORS AND ARCHITECTURES
Category	:	PE
Course Code	:	19A47AT
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able

- To get sufficient exposure to the architecture and Computational implementations of Programmable DSP devices.
- To study the basic DSP algorithms and implementation on filters.
- To obtain knowledge on interfacing memory and I/O devices with programmable DSP devices.

Unit 1 : **DSP FUNDAMENTALS** 10

Introduction to Digital Signal Processing: Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation,

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors.

Unit 2 : **ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES** 10

Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Unit 3 : **PROGRAMMABLE DIGITAL SIGNAL PROCESSORS** 10

Architecture of TMS320C54XX DSP- Bus structure, CPU, Memory, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors. .

Unit 4 : **IMPLEMENTATIONS OF DSP ALGORITHMS**: 12

The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

Unit 5 : **INTERFACING WITH PROGRAMMABLE DSP DEVICES** 10

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). Synchronous Serial Interface, a Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

PrescribedText Books:

1. Avtar Singh and S. Srinivasan, Digital Signal Processing, Thomson Publications, 2004
2. B. Venkata Ramani and M. Bhaskar, Digital Signal Processors, Architecture, Programming and Applications, TMH, 2004.

Reference Text books:

1. Jonathan Stein, Digital Signal Processing, John Wiley, 2005.
2. Lapsley et al. S. Chand & Co, DSP Processor Fundamentals, Architectures & Features, 2000.
3. Math H. J. Bollen, Understanding Power quality problems, IEEE Press, 2007.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand concepts of DSP systems and implementation methods	L1
2. Have the knowledge of programmable DSP architectures.	L1
3. Design and formulate the implementations of algorithms on TMS320C54XX processor.	L6
4. Obtain knowledge on architecture of TMS320C54XX processor and its interfacing.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47AT.2	3	2	2	-	-	-	-	-	-	-	-	-	2	2	-
19A47AT.1	3	-	-	-	-	-	-	-	-	-	-	-	2	2	-
19A47AT.3	3	3	3	-	-	-	-	-	-	-	-	-	2	2	-
19A47AT.4	3	2	2	-	-	-	-	-	-	-	-	-	2	2	

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course : ASIC DESIGN
Category : PE
Course Code : 19A47BT
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To understand ASIC Design flow, ASICs Design styles and Issues, ASICs Design Techniques and ASIC Construction.
- To analyze the Performance of ASICs.
- To apply appropriate techniques, resources and tools to engineering activities for appropriate Solution to develop ASICs

Unit 1 : **ASIC DESIGN STYLES** 15

Introduction – categories-Gate arrays-Standard cells-Cell based ASICs-Mixed mode and analogue ASICs – PLDs.

Unit 2 : **ASICS – PROGRAMMABLE LOGIC DEVICES** 12

Overview – PAL –based PLDs: Structures; PAL Characteristics – FPGAs: Introduction, selected families – design outline.
ASICS –DESIGN ISSUES: Design methodologies and design tools – design for testability – economies

Unit 3 : **ASICS- CHARACTERISTICS AND PERFORMANCE** 8

design styles, gate arrays, standard cell -based ASICs, Mixed mode and analogue ASICs.

Unit 4 : **ASICS-DESIGN TECHNIQUES** 14

Overview- Design flow and methodology-Hardware description languages-simulation and checking-commercial design tools- FPGA Design tools: XILINX, ALTERA
LOGIC SYNTHESIS, SIMULATION AND TESTING: Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation- automatic test pattern generation.

Unit 5 : **ASIC CONSTRUCTION** 8

Floor planning, placement and routing system partition.
FPGA PARTITIONING: Partitioning Methods-Floor Planning- Placement-Physical Design Flow-Global Routing-Detailed Routing –Special Routing-Circuit Extraction-DRC.

PrescribedText Books:

3. L.J.Herbst,"Integrated circuit engineering", OXFORD SCIENCE Publications, 1996.

Reference Text books:

1. M.J.S.Smith,"Application - Specific integrated circuits", Addison-Wesley Longman Inc 1997.

Course Outcomes:
Student will be able to Blooms Level of Learning

1. Demonstrate in-depth knowledge in ASIC Design flow, ASICs Design styles and Issues, ASICs Design Techniques. ASIC Construction L1
2. Analyze the characteristics and Performance of ASICs and judge independently the best suited device for conducting research in ASIC design. L3
3. Solve problems of Design issues, simulation and Testing of ASICs. L1
4. Apply appropriate techniques, resources and tools to engineering activities for appropriate Solution to develop ASICs. L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A462T.1	2		2							1		1	2	2	
19A462T.2	3	3	3							2		1	2	2	
19A462T.3	2		2							2		1	2	2	
19A462T.4	3	3	3							2		1	2	2	

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	WIRELESS COMMUNICATION & NETWORKS
Category	:	PE
Course Code	:	19A47CT
Year	:	IV B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: The course aims to provide the student with the ability

- To Gain knowledge and experience with regard to wireless communication engineering including multiple access techniques.
- To Identify and understand wireless communication network and their evaluation.

Unit 1 : **Introduction To Wireless Communications And Multiple Access Techniques** 8

Evolution of mobile radio communications, examples of Wireless Communication systems, comparison of common Wireless Communication systems, Multiple access techniques: Introduction, FDMA, TDMA, Spread Spectrum, Multiple Access, SDMA, Packet radio, Packet radio protocols, CSMA protocols, Reservation protocols.

Unit 2 : **Wireless Networking And Data Services:** 10

Wireless Networking: Difference between wireless and fixed telephone networks, Development of wireless networks, Traffic routing in wireless networks. Data Services: Data services, CCS, BISDN and ATM, SiganalingSystemNo7

Unit 3 : **Mobile IP and Wireless Access Protocol** 11

Mobile IP: Mobile IP Operation of mobile IP, Co-located address, Registration, Tunneling. WAP: WAP Architecture, overview, WML scripts, WAP service, WAP session protocol.

Unit 4 : **Wireless LAN Technology And Bluetooth** 9

Wireless LAN: Infrared LANs, Spread spectrum LANs, Narrow bank microwave LANs, IEEE802.11 Protocol architecture and services. Bluetooth: Overview, Radio specification, Base band specification, Links manager specification, Logical link control and adaptation protocol.

Unit 5 : **Mobile Data Networks And HIPER LAN** 8

Mobile Data Networks: GPRS and higher data rates, Short messaging service in GSM, HIPER LAN: HIPERLAN-1

Prescribed Text Books:

1. Wireless Communications, Principles, Practice – Theodore S. Rappaport, PHI, 2 nd Ed., 2002.
2. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, Pearson Education, 2002.
3. Wireless Communication and Networking – William Stallings, PHI, 2003.

Reference Text books:

1. Wireless Digital Communications – Kamilo Feher, PHI, 1999.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the effective bandwidth utilization to accommodate large number	L2

of mobile users by using various accessing techniques

2. Analyze networking considerations, practical networking approaches with mobile data services. L3
3. Analyze the protocols used in wireless LAN technologies. L3
4. be able to identify mobile data and advanced wireless networks and their applications in real time. L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47CT.1	1	--	--	--	--	--	--	--	--	--	--	2	--	--	--
19A47CT.2	1	2	2	2	--	1	--	--	--	1	--	2	1	2	--
19A47CT.3	1	2	2	2	--	1	--	--	--	1	--	2	1	2	--
19A47CT.4	1	2	--	--	--	--	--	--	--	1	--	2	--	--	--

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course : DIGITAL IC DESIGN
Category : PE
Course Code : 19A47DT
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able

- To study about different CMOS characteristics and it's design.
- Verify different methods to reduce the size and power consumption of CMOS IC.
- To understand the design of subsystems and layout of CMOS chip

Unit 1 : **CMOS Characteristics** 8

CMOS inverters -static and dynamic characteristics.

Unit 2 : **CMOS Circuits Design** 10

Static and Dynamic CMOS design- Domino and NORA logic – Alternative gate circuits of CMOS.

Unit 3 : **CMOS Gates Behavior** 10

Method of Logical Effort for transistor sizing -power consumption in CMOS gates- Low power CMOS design

Unit 4 : **LAYOUT DESIGN RULES** 9

Need for Design Rules, NMOS and CMOS Based Design Rules, Simple Layout Examples, Sheet Resistance, Area Capacitance, Wiring Capacitances, Drive Large Capacitive Load**.**

Unit 5 : **SUBSYSTEM DESIGN PROCESS** 8

Arithmetic circuits in CMOS VLSI - Adders- multipliers- shifter -CMOS memory design - SRAM and DRAM, modified Booth's algorithm for multipliers, Design of ALU subsystem, and Implementing ALU functions with an adder

PrescribedText Books:

1. Sung-Mo Kang & Yusuf Leblebici, "CMOS Digital Integrated Circuits - Analysis & Design", MGH, Second Ed., 1999 .
2. Jan M Rabaey, "Digital Integrated Circuits - A Design Perspective", Prentice Hall, 1997
3. Eugene D Fabricus, "Introduction to VLSI Design,"McGraw Hill International Edition.1990.

Reference Text books:

1. Ken Martin, "Digital Integrated Circuit Design", Oxford University Press, 2000
2. Neil H E West and Kamran Eshranghian, "Principles of CMOS VLSI Design: A System Perspective", Addision-Wesley 2nd Edition, 2002.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Illustrate the different characteristics of CMOS ICs.	L2

2. Understand the design aspects of CMOS. L2
3. Formulate the logical size and power efficiency of CMOS design. L4
4. Acquire the knowledge about to design the subsystems of CMOS. L4
5. Analyze the design of CMOS layout. L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47DT.1	2	1	2	-	-	2	-	3	2	-	3	2	3	3	2
19A47DT.2	2	2	3	-	-	3	-	3	2	-	3	2	3	3	2
19A47DT.3	2		2	-	-	1	-	2	-	-	2	1	3	2	-
19A47DT.4	1	1	3	-	-	1	-	2	2	-	2	2	3	3	-
19A47DT.5	2	2	2	-	-	1	-	3	3	-	3	2	3	3	2

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	FPGA ARCHITECTURES AND APPLICATIONS
Category	:	PE
Course Code	:	19A47ET
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Introduction to ROM, PLA, PAL, PLD, PGA, FPGA
- To understand the complexities of commercial grade FPGAs, programming and implementing complex applications
- Usage of tools for state machine design and implementation on FPGA.

Unit 1 : **PROGRAMMABLE LOGIC** 9

ROM, PLA, PAL, PLD, PGA – Features, Programming and Applications using Complex Programmable Logic Devices Altera Series – Max 5000/7000 Series and Altera FLEX Logic – 10000 Series CPLD, AMD's – CPLD (Mach 1 To 5); Cypres FLASH 370 Device Technology, Lattice Plsi's Architectures – 3000 Series – Speed Performance and in System Programmability

Unit 2 : **FPGAs** 5

Field Programmable Gate Arrays – Programming technologies, Logic Blocks, Routing Architecture, Design Flow, Technology Mapping for Fpgas.

Unit 3 : **COMMERCIAL FPGA'S** 9

Xilinx XC4000 & ALTERA's FLEX 8000/10000 FPGAs: AT & T – ORCA's (Optimized Reconfigurable Cell Array): ACTEL's – ACT-1,2,3 and Their Speed Performance

Unit 4 : **REALIZATION OF STATE MACHINE** 9

Top Down Design – State Transition Table, State Assignments for FPGAs. Problem of Initial State Assignment for One Hot Encoding. Charts with a PAL. Alternative Realization for State Machine Chart using Microprogramming. Linked State Machines. One – Hot State Machine, Petrinets for State Machines – Basic Concepts, Properties. Extended Petrinets for Parallel Controllers. Finite State Machine – Ex: Traffic Light Controller, Implementation of Petrinet Description.

Unit 5 : **FSM ARCHITECTURES AND SYSTEM LEVEL DESIGN** 9

Architectures Centered Around Non-Registered PLDs. State Machine Designs Centered Around Shift Registers. One – Hot Design Method. Use of ASMs in One – Hot Design. Application of One – Hot Method. System Level Design – Controller, Data Path and Functional Partition.

PrescribedText Books:

1. P.K.Chan & S. Mourad, Digital Design Using Field Programmable Gate Array, jPrentice Hall (Pte), 1994.
2. S.Trimberger, Edr., Field Programmable Gate Array Technology, Kluwer Academic Publicatgions,1994.
3. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, Newyork, 1995..

Reference Text books:

1. S.Brown, R.Francis, J.Rose, Z.Vransic, Field Programmable Gate Array, Kluwer Pubin, 1992.
2. Richard F. Tinder, Engineering Digital Design, Second Edition, Academic Press.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Analyse the problems and find the suitable digital device like PLA,PAL,PLD, PGA or LSI, MSI,VLSI devices	L4
2. Map the applications to the FPGA architectures using tools.	L4
3. Use of microprogramming, bottom up, top down design and other techniques for digital circuit implementation	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47ET.1	2	1	2	-	-	2	-	3	2	-	3	2	3	3	2
19A47ET.2	2	2	3	-	-	3	-	3	2	-	3	2	3	3	2
19A47ET.3	2	-	2	-	-	1	-	2	-	-	2	1	3	2	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES :: RAJAMPET
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Title of the Course	:	CODING THEORY AND TECHNIQUES
Category	:	PE
Course Code	:	19A47FT
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	1	0	3

Course Objectives: This course will able to

- Focus on transferring data without error from source to destination by means of coding.
- Emphasize the generation of various coding Techniques.

Unit 1 : **Digital Transmission Coding's** **12**

Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system.

Unit 2 : **Cyclic Codes** **10**

Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

Unit 3 : **Convolutional Codes** **10**

Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority -logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

Unit 4 : **Galois Fields** **8**

Groups, fields and Vector spaces –Elementary properties of Galois fields –Primitive polynomials and Galois fields of order p^m - Zech's algorithms.

Unit 5 : **Polynomials over Galois Fields** **8**

Euclidean domains and Euclid's algorithm –Minimal polynomials and Conjugate elements –Factoring $x^n - 1$ - Ideals in the Ring $\frac{GF(q)[x]}{X^n-1}$

Prescribed Text Books:

1. Error Control Coding- Fundamentals and Applications – Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory - Man Young Rhee- 1989, McGraw-Hill.
3. Error control systems for Digital communication and storage - Stephen B. Wicker, Prentice Hall, Upper Saddle River, NJ, 1995.

Reference Text books:

1. Error Correcting Coding Theory-Man Young Rhee-1989,McGraw Hill Publishing.
2. Digital Communications-Fundamental and Application - Bernard Sklar, Pearson Education.
3. Digital Communications- John G. Proakis, 5th ed., 2008, Mcgrawhill education.
4. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Error Correction Coding – Mathematical Methods and Algorithms – Todd K. Moon, 2006, Wiley India.
6. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, Mcgrawhill education
7. Digital Communication - Simon Haykin, John Wiley and Sons, 1988.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Knowledge about measuring information and errors occurred	L3
2. Familiar in designing various coding techniques like block codes, cyclic codes, convolution codes, turbo codes and space codes.	L6
3. Understand Galois field arithmetic and its implementation in coding theory.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A47FT.1	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
19A47FT.2	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3
19A47FT.3	3	3	2	2	2	-	-	-	-	3	2	2	3	3	3

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ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course: Basic Civil Engineering
Category : OE
Course Code : 19A17GT
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- To give an understanding to the students of the vast breadth and numerous areas of engagement available in the overall field of Civil Engineering.
- To motivate the student to pursue a career in one of the many areas of Civil Engineering with deep interest and keenness.
- To expose the students to the various avenues available for doing creative and innovative work in this field by showcasing the many monuments and inspiring projects of public utility.

Unit 1 : (8hrs)

Basic Understanding: What is Civil Engineering/ Infrastructure? Basics of Engineering and Civil Engineering; Broad disciplines of Civil Engineering; Importance of Civil Engineering, Possible scopes for a career.
History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction; Works of Eminent civil engineers

Unit 2 : (10hrs)

Overview of National Planning for Construction and Infrastructure Development; Position of construction industry vis-à-vis other industries, five year plan outlays for construction; current budgets for infrastructure works;
Fundamentals of Building Materials: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes.

Unit 3 : (10hrs)

Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction;
Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunnelling.

Unit 4 : (8hrs)

Hydraulics &Water Resources Engineering: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multi-purpose reservoir projects.
Surveying & Geomatics: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR;

Unit 5 : (8hrs)

Computational Methods, IT, IoT in Civil Engineering: Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highway design (MX), Building Information Modelling; Highlighting typical available software systems (STAAD, ETAB & AUTOCAD)

PrescribedText Books:

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.),R. Butterworth-Heinemann
2. Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
3. Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.
4. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil and Environmental Engineering) by V.N.S. Murthy
5. Building Planning & Drawing by Dr N. Kumaraswamy and A.Kameswara Rao, Charitor Publications
6. Manoj, K. Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011.

Reference Text books:

1. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc.corresponding to materialsused for Civil Engineering applications
2. An Introduction to Geotechnical Engineering, by Holtz R.D. and Kovacs, W.D., Prentice Hall, NJ
3. K Subramanya, Water Resources Engineering through Objective Questions, Tata Mc-Graw Hill.
4. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.

Course Outcomes:

Student will be able to	Blooms Level of Learning
CO1: Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering.	L3
CO2: Showcasing the many monuments, heritage structures, nationally important infrastructure, and impressive projects to serve as sources of inspiration.	L1
CO3: Highlighting the depth of engagement possible within each of these areas.	L3
CO4: Providing a foundation for the student to launch off upon an inspired academic pursuit into this branch of engineering.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A16GT.1						3			2			1	1	2	
19A16GT.2						3			2			1	1	2	
19A16GT.3						3			2			1	1	2	
19A16GT.4						3			2			1	1	2	

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course: Water Resources and Conservation
Category : OE
Course Code : 19A17HT
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- To impart knowledge about the planning and management of water resources.
- To introduce the concepts of watershed management, integrated water resources management, environmental interaction of water resources and policies/framework related to water resources.
- To enable the students to understand the different components of water resources and water conservation techniques.

Unit 1 : (8hrs)

Historical profile on world water resources development; Global water resources, Hydrologic cycle, Watershed zoning, Interrelation of water resources with other natural resources and the environment, Water quantity and water budget, Water allocation and water scheduling; Water resources availability and demand.

Unit 2 : (10hrs)

Hydrologic Processes – evaporation, transpiration and precipitation; Water quality parameters, Water pollution – causes, effects and measures; Rainfall-Runoff analysis, Floods measurement, frequency analysis, design of peak flood and routing, Reservoir operation and design.

Unit 3 : (10hrs)

Water resource planning – concept, preliminary study, feasibility study, detailed planning, Design of water distribution system, Irrigation scheduling and techniques;
Water use sectors – Domestic, Industries and Agriculture, Sustainable water resources development, Integrated Water Resources Management (IWRM), Socio-economic aspects of water resources management, Rainwater Harvesting Watershed management.

Unit 4 : (9hrs)

Global Efforts on Water conservation, Think Globally Act Locally on water resources, Local water organizations, National Water Policy, World water organizations - WUGs, WUAs, UN, WWP, WWC, etc. Environmental discourse on dam Construction.

Unit 5 : (8hrs)

Water conservation Techniques: Protection of Water from Pollution, Redistribution of Water, Rational Use of Groundwater, Renovation of Traditional Water Sources, Use of Modern Irrigation Methods, Increasing Forest Cover, Change in Crop Pattern, Flood Management, Conserving Water in Industries, Conservation of water by Municipal authorities, Use rainwater effectively, Make effective use of soil water reserves, Take measures to avoid run off, Avoid wasting water through evaporation, Reduce water losses through drainage, Plan your irrigation, Contour Farming& Contour Ploughing

PrescribedText Books:

1. Global Water Partnership (GWP), Integrated Water Resources Management, Background Papers No. 4, Technical Advisory Committee (TAC)..
2. Water Resources Systems Planning and Management, Vol. 51 by Jain, S.K. and V.P. Singh, Elsevier Science
3. Hierarchical Analyses of Water Resources Systems: Modeling and Optimization of Largescale systems by Haimes, McGraw-Hill, New York.
4. Water Resources Systems Planning and Management by Loucks D.P. and van Beek E., UNESCO Publishing, The Netherlands.

Reference Text books:

1. Water Resources Systems Planning and Analysis by Loucks, D.P., J.R. Stedinger, and D.A. Haith, Prentice-Hall, N.J.
2. Hydrosystems Engineering and Management by Mays, L.W. and K. Tung, McGraw-Hill Inc., New York.

Course Outcomes:

Student will be able to	Blooms Level of Learning
CO1: Identify different problems related to water resources planning, management and development.	L3
CO2: Describe problems like water balance, rainfall-runoff analysis, water distribution networks, flood routing, irrigation scheduling, water pollution and other water related concerns	L2
CO3: Apply principles and guidelines to solve above mentioned problems.	L4
CO4: Understand different water conservation techniques, in order to save water for future	L2

CO-PO Mapping:

OE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A16HT.1						2	3		2				1		3
19A16HT.2						2	3		2				1		3
19A16HT.3						2	3		2				1		3
19A16HT.4						2	3		2						3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

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Title of the Course	Energy Management and Conservation
Category	OE
Course Code	19A27GT
Year	IV B.Tech
Semester	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course objective:

1. To impart basic knowledge to the students about current energy scenario, energy conservation and management.
2. To inculcate among the students systematic knowledge and skill about assessing the energy efficiency and energy management**.**

UNIT-I Principles of energy management 8

Organizing an energy management program – Initiating and managing an energy management program - Planning - Leading – Controlling – Promoting – Monitoring and reporting.

UNIT-II Electrical energy management 9

Energy efficient motors – Power factor improvement – Lighting and lighting system control – Energy saving opportunities.

Qualities and functions of energy managers – Qualities and functions of an energy manager – questionnaire - Check list for top management.

UNIT-III 10

Energy Scenario Commercial and Non-commercial energy, primary energy resources, commercial energy Production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, energy efficiency and its need ,restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change.

UNIT-IV Energy Conservation 10

Definition, Principles of Energy Conservation. energy conservation opportunities Assessments of technical merits of energy conservation methods and techniques in specific applications, energy saving methods, energy strategy, industrial energy applications Energy Conservation Act 2001 and its feature, Electricity Act -2003 and features, The Energy Conservation (Amendment) Act,2010 and its importance. Prominent organizations at Centre and state level responsible for its implementation.

UNIT-V 9

Basics of Energy, pricing and its uses in buildings Electricity tariff, load management and maximum demand control, power factor Improvement, selection & location of capacitors. Estimation of Energy use in buildings: Estimation of Energy use in a building, Heat gain and Thermal Performance of building envelope- steady and Non-Steady heat transfer through the glazed window and the wall-standard for thermal performance of building envelope, Evaluation of the overall Thermal Transfer.

Text Books :

1. "Energy Management" - W.R.Murphy&G.MckeyButterworths.
2. "Energy Management Hand Book" - W.C.Turner, John Wiley and Sons.
3. "Energy Management Principles" – Craig B Smith – Pergamon press
4. "Energy Conservation" - Pa ulO'Callagan - Pergamon press.
5. S.C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991.
6. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

Course Outcomes:

Student will be able to

	Blooms Level of Learning
1. To understand the Principles and organization of energy management.	L2 &L4
2. To acquaintance with electrical energy management like energy saving opportunities and Power factor improvement.	L3
3. .Analyze the current energy scenario and its importance in energy conservation	L4
4. Understand the concepts of Energy conservation and its features.	L2
5. Understand the estimation of Energy use in buildings.	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A27GT.1	3	3	-	-	-	2	3	-	-	-	-	3
19A27GT.2	3	3	-	-	-	3	3	-	-	-	-	3
19A27GT.3	3	3	-	-	-	2	2	2	-	-	-	3
19A27GT.4	3	3	-	-	-	2	2	2	-	-	-	2
19A27GT.5	3	3	-	-	-	2	2	2	-	-	-	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES RAJAMPET
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Title of the course : Fuzzy Logic and Neural Networks
Category : OE
Course code : 19A27HT
Year : IV B. Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical Hours	Credits
3	-	-	3

Course Objectives

- To understand the fundamental concepts of Artificial Neural network
- To Understand the concepts of different types Neural network architectures and training algorithms
- To understand the concepts of classical sets Fuzzy sets
- To understand the concepts Fuzzy logic controllers
- To gain knowledge in neuro- fuzzy control and its applications in power systems

Unit1 Introduction to Artificial Neural Networks 12

Introduction, Biological Neuron, Biological Artificial Neuron model , Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of neural networks , Historical developments, Neural network architectures, McCulloch-Pitts Model, Types of neuron activation functions, Learning methods(supervised, unsupervised, Reinforcement), Applications of Neural Networks.

Unit-2 Single layer and multi layer feed forward neural networks 12

Perceptron Models: Discrete, Continuous (concepts only), Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications, ADALINE, MADALINE, Back Propagation Network, BP Learning Rule, Input Layer, Hidden Layer and output Layer computations, Radial Basis function network, Hetero associative memory neural and Auto associative memory net, applications.

Unit-3 Classical and Fuzzy sets 08

Introduction to classical sets, Fuzzy sets – Properties, Operations and Relations, Membership, Uncertainty, Fuzzy Relations, Cardinalities and Membership Functions.

Unit-4 Fuzzy Logic system and components 10

Fuzzification, Membership Value assignment, Development of Rule Base, Defuzzification to crisp sets, Defuzzification methods

Unit 5 Neural network and fuzzy logic applications to Power system 10

ANN Based Short Term Load Forecasting, Load Flow Studies, Fault diagnosis and Fuzzy Logic based Unit Commitment and load frequency control.

Text Books:

1. S.N.Sivanadam, S.N.Deepa *Principles of Soft Computing Techniques* , Wiley India publication.
2. JacekM.Zurada *Introduction to Artificial Neural Systems*, Jaico Publishing House, 1997.

Reference Books:

1. N. Yadaiah and S. BapiRaju, *Neural and Fuzzy Systems*: *Foundation, Architectures and Applications*, Pearson Education

2. James A Freeman and Davis S kapura, *Neural Networks* ,Pearson, 2002
3. Brok Kosko, *Neural Networks and Fuzzy Logic System* , , PHI Publications
4. Rajasekharan and Rai, *Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications* - PHI Publication.

Course Outcomes: By the end of this course, students will be able to

1. Able to analyze and form Neural Networks For Different Problems
2. Able to Get the knowledge of Different Types of Neural Networks
3. Understand fuzzy concepts and fuzzy logic components
4. Able to apply Neural Networks for Electrical Systems.
5. Able to apply Fuzzy Logic for Electrical Systems

CO-PO Mapping

Course Outcomes	Program Outcomes												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
19A27HT .1	1	1	1	1	1	-	-	-	1	1	1	1	1	1	1	1
19A27HT .2	2	3	2	2	3	-	-	-	2	2	2	2	2	2	2	2
19A27HT .3	-	2	-	-	-	-	-	-	-	-	2	-	-	-	-	2
19A27HT .4	-	-	-	3	-	-	-	-	-	-	-	3	-	-	2	-
19A27HT .5	2	3	2	2	2	-	-	-	2	2	2	2	2	2	2	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Introduction to Mechatronics
Category	:	OEC
Course Code	:	19A37JT
Year	:	IV Year
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives: This course will

- Familiarize the technologies behind modern mechatronic systems.
- Explain fundamentals for the development of fully automated system.
- Develop a robotic or automated systems focusing on the hardware and software integration.
- Demonstrate the development of mechatronic system and MEMS.

Unit 1 Introduction 09

Definition of Mechatronics, Need for Mechatronics in Industry, Objectives of mechatronics, mechatronics design process, Mechatronics key elements, mechatronics applications–Computer numerical control(CNC) machines, Tool monitoring systems, Flexible manufacturing system(FMS), Industrial Robots, Automatic packaging systems, Automatic inspection systems.

Unit 2 : Signal Conditioning 09

Introduction, hardware digital I/O, analog input – ADC resolution, speed channels filtering noise using passive components – resistors, capacitors – amplifying signals using OP amps – software – digital signal processing – low pass, high pass, notch filtering.

Unit 3 Sensors & Actuators 09

Sensors: Static characteristics & sensors, displacement, position and proximity sensors. Force and torque sensors, pressure sensors, flow sensors, temperature sensors, acceleration sensors, level sensors, selection criteria for sensors.

Actuators: Mechanical, electrical, hydraulic & pneumatic actuation systems characteristics and their limitations. Design of hydraulic & pneumatic circuits.

Unit 4 Microprocessors, Micro controllers and Programmable Logic Controllers 09

Architecture of of Microprocessor, Micro controller and Programmable Logic Controller, PLC Programming using ladder diagrams, logics, latching, sequencing, timers relays and counters, data handling, Analog input/output, selection of controllers.

Unit 5 Micro Electro Mechanical Systems(MEMS) 09

History, Effect of scaling, Fabrication Techniques: Oxidation, Physical Vapor disposition, Chemical Vapor Deposition, Lithography, Etching, Wafer bonding, LIGA, DRIE, and Applications: Labon chip.

Prescribed Text Books:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, WBolton, 3/e Pearson Education Press, 2018. ISBN: 9781292250977
2. Devadas Shetty and Richard A Kolk, Mechatronic System Design, 2/e, Cengage learning, 2010. ISBN: ISBN-13 : 978-1439061985
3. Clarence W. de Silva, Mechatronics an Integrated Approach, CRC Press, 2005. ISBN: 0203611640, 9780203611647

Reference Books:

1. James J Allen, Micro Electro Mechanical Systems Design, CRC Press, Taylor & Francis group, 2005. ISBN-10 : 9780824758240
2. Ganesh S Hedge, Mechatronics, Jones & Bartlett Learning, 2010. ISBN, 1934015296, 978193401529

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Explain to role of mechatronics in industry and applications of mechatronics in automation industry.	L3
2. Understand signal conditioning and its application.	L4
3. Know the different types of sensors and actuators in industry.	L4
4. Understand the architecture of microprocessors, microcontrollers and PLC	L1
5. Illustrate the application of MEMS in industry.	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A37DT.1	3	3	-	-	-	-	-	-	3	-	3	-	-	-	-
19A37DT.2	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
19A37DT.3	-	-	-	-	2	-	-	-	2	-	-	-	-	-	-
19A37DT.4	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
19A37DT.5	-	2	-	-	2	-	-	-	-	-	-	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course : Fundamentals of Robotics
Category : OE
Course Code : 19A37KT
Year : IV Year
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course Objectives:

- To acquire the knowledge on Robotics and its performance
- To develop the ability of kinematics and dynamics of Robots
- To acquire the knowledge on trajectory planning and manipulator
- To develop the ability on various sensor integration on robot
- To develop the ability to use the programming and tools for operation of robot

Unit 1 Introduction to Robotics 11

Types and components of a robot, Classification of robots - Robotics, Robots-Anatomy, Structure and classification, Robot performance parameters – resolution, accuracy and repeatability, Arm and wrist configuration - Social issues and safety

Unit 2 Robot Kinematics and Dynamics 11

Description of links and joints, Kinematic modeling of manipulator, Translation and Rotation Representation, Coordinate transformation, Denavit - Hartenberg (DH) notation, Examples of DH notation, Jacobian, Singularity, and Statics.

Unit 3 Trajectory Planning and Manipulator 08

Control Terminology, Steps in trajectory planning, Joint space techniques, path description, Use of polynomials as interpolating function, various trajectories, Introduction to Cartesian space techniques.

Unit 4 End effectors, sensors and vision system 08

Tools as end effectors, Robot Grippers - Types of Grippers, Design aspect for gripper, Force analysis for various basic gripper system. Sensors for Robots - Characteristics of sensing devices, Classification, applications and selection of sensors. Robotic vision system, image acquisition, spatial and amplitude digitization, image processing and analysis.

Unit 5 Robot programming and applications 10

Robot applications in material handling, machine loading/unloading, assembly, inspection and processing. Robot Programming – Methods, Lead through methods, Robot Programming-Language overview, commands for elementary operations

Prescribed Text Books:

1. Saha, S.K., “Introduction to Robotics, 2nd Edition, McGraw-Hill Higher Education, New Delhi, 2014. , ISBN - 0070140014
2. Ghosal, A., “Robotics”, Oxford, New Delhi, 2006. ISBN - 9780195673913
3. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI, New Delhi. 2001. ISBN - 0130613096

Reference Books:

1. Tsuneo Yoshikawa, Foundations of Robotics, MIT Press. Roy. 2010. ISBN - 0262514583
2. Mittal R.K. and Nagrath I.J., "Robotics and Control", Tata McGraw Hill. 2017, ISBN - 9780070482937
3. Mukherjee S., "Robotics and Automation", Khanna Publishing House, Delhi. 2017. 2017, ISBN - 9386173751

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concept of Robots, Structure and its specifications.	L2
2. Solve robot forward and inverse kinematic problems.	L5
3. Carry out trajectory planning and joint modeling for the simple robotic system.	L4
4. Identify appropriate end effectors and sensors for particular application	L4
5. Execute various steps robot programming and Knowledge will be gained on application of Robotics used in various sectors.	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A36FT.1	3	3	3	-	-	3	3	3	-	-	-	-	-	-	-
19A36FT.2	2	2	2	-	-	2	-	2	-	-	-	-	-	-	-
19A36FT.3	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
19A36FT.4	1	1	1	-	-	-	-	1	-	-	-	-	-	-	-
19A36FT.5	2	-	2	-	-	2	-	2	-	2	-	-	-	-	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
(An Autonomous Institution)

Title of the Course	:	Non-conventional sources of energy
Category	:	OE
Course Code	:	19A37LT
Year	:	IV Year
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives:

- To grasp the role and potential of new and renewable source
- To recognize the principle, storage and applications of solar energy
- To understand the sources and potentials of wind energy and also to comprehend the Principles of Bio-Conversion of bio-mass and bio-gas uses.
- To explain the principle, working procedure and types of geothermal energy, ocean energy and tidal & wave energy.
- To know the knowledge on direct energy conversion.

Unit 1 Principles Of Solar Radiation 09

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation , potential in India

Unit 2 Solar Energy Collectors 09

Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors. Solar Energy Storage And Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion, potential in India.

Unit 3 Wind Energy 08

Sources and potential in India, horizontal and vertical axis wind mills, performance characteristics, Betz criteria. Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, and economic aspects, potential in India

Unit 4 Geothermal Energy 08

Resources, types of wells, methods of harnessing the energy, potential in India.
Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics, potential in India.

Unit 5 Direct Energy Conversion 09

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions

Prescribed Text Books:

4. Tiwari and MK.Ghosal, Renewable energy resources: Basic principles and applications, Narosa publications 2005, ISBN 10: 1842651250 ISBN 13: 9781842651254
5. G.D. Rai, Non-Conventional Energy Sources, khanna publications, 2011, ISBN 10: 8174090738, ISBN 13: 9788174090737

Reference Books:

4. Twidell & Weir, Renewable Energy Sources, Routledge , 3rd Ed.2015,ISBN 9780367200756
5. Non Conventional Energy Resources, B.H.Khan, McGrawHIll, 2015, ISBN 1259081397, 9781259081392

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Create awareness on role and potential of new and renewable source and basics of solar energy.	L2
2. acquire the knowledge on different types of collectors and storage systems of solar energy and their applications.	L2
3. Able to achieve sufficient knowledge on Wind energy and Bio-mass energy.	L2
4. Familiarize the student with the Geothermal and Ocean energy concepts and their potentiality	L2
5. Gain the knowledge on direct energy conversion	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A37ET.1	3	2	-	-	-	3	3	-	-	-	-	3	-	-	-
19A37ET.2	3	3	-	1	3	3	-	-	-	-	-	3	-	-	-
19A37ET.3	3	2	3	-	-	3	3	-	-	-	-	3	-	-	-
19A37ET.4	3	3	-	-	3	3	-	-	-	-	-	3	-	-	-
19A37ET.5	3	3	-	-	3	3	-	-	-	-	-	3	-	-	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET

(An Autonomous Institution)

Title of the Course	:	Artificial Intelligence
Category	:	OE
Course Code	:	19A57ET
Year	:	IV Year
Semester	:	I Semester (Offered to EEE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will

- To comprehend the building blocks of AI in terms of intelligent agents.
- To understand the main approaches of artificial intelligence such as heuristic search, game search and logical inference.
- To know how decision theory and planning is processed on the agents.
- To verify the different types of objects in uncertain world for an agent
- To identify the solution in uncertain knowledge with reasoning.

Unit 1 : *Introduction to Artificial Intelligence* 9

Introduction to AI, History of AI, Emergence of Intelligent Agents, Intelligent Agents: PEAS- Representation for an Agent, Types of Agents, Types of Agent Environments, Concept of Rational Agent, Structure of Intelligent agents, Defining the Problem as a State Space Search, Problem Characteristics.

Unit 2 : *Problem Solving* 12

Solving problems by searching, Problem Formulation, Uninformed Search Techniques- DFS, BFS, Iterative Deepening, Comparing Different Techniques, Informed search methods – heuristic Functions, Hill Climbing, Simulated Annealing, A*, Performance Evaluation. Constrained Satisfaction Problems: Constraint Satisfaction Problems like – map Coloring, Crypt Arithmetic, Backtracking for CSP, Local Search.

Unit 3 : *Knowledge and Reasoning* 9

A knowledge Based Agent, Introduction To Logic, Propositional Logic, Reasoning in Propositional logic, First Order Logic: Syntax and Semantics, Extensions and Notational Variation, Inference in First Order Logic, Unification, Forward and Backward chaining, Resolution.

Unit 4 : *Knowledge Engineering and Planning* 11

Knowledge Engineering: Ontology, Categories and Objects, Mental Events and Objects.
Planning: Planning problem, Planning with State Space Search, Partial Order Planning, Hierarchical Planning, Conditional Planning.

Unit 5 : *Uncertain Knowledge and Reasoning* 10

Uncertain Knowledge and Reasoning: Uncertainty, Acting Under Uncertainty, Basic Probability Notation, The Axioms of Probability, Inference Using Full Joint Distributions, Independence, Bayes' Rule and Its Use, Belief Networks, Simple Inference in Belief Networks,Fuzzy Logic.

Prescribed Text Books:

6. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, 2nd Edition, Pearson Publication.
7. Rich, E. and Knight, K., "Artificial Intelligence", Tata McGraw-Hill.

Reference Books:

6. George Lugar, "AI-Structures and Strategies for Complex Problem Solving", 4/e, 2002, Pearson Education.
7. Robert J. Schalkolf, Artificial Intelligence: an Engineering approach, McGraw Hill, 1990.

8. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the importance of artificial Intelligence in real world environment	L2
2. Apply the artificial intelligence algorithms for problem solving	L3
3. Analyze the various reasoning and knowledge representation techniques	L4
4. Solve the problems using classification and planning techniques	L3
5. Apply knowledge and reasoning techniques in uncertain environment for obtaining solution	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A57ET.1	3	3				3			3	2		2
19A57ET.2	3	3	3	3		3	2		3			2
19A57ET.3	3	3	3	3		3			3	2		
19A57ET.4	3	3	3	3	1	3	2		3			
19A57ET.5	3	3	3	3		3			3			

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Cyber Security
Category	:	OE
Course Code	:	19A57FT
Year	:	IV B.Tech (EEE, ECE)
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Remember Cyber Security architecture principles
- Compare different classes of attacks
- Understand about cybercrime with mobile and wireless devices
- Apply tools and methods used in cybercrime
- Understand about cyber security and social media marketing.

Unit 1 : INTRODUCTION: 10

Cybercrime:

Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals?, Classifications of Cybercrimes, The Legal Perspectives, Indian Perspectives, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens

Cyber offenses:

Introduction of Criminal Planning and Criminal Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

Unit 2 : CYBERCRIME MOBILE AND WIRELESS DEVICES: 10

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Unit 3 : TOOLS AND METHODS USED IN CYBERCRIME: 9

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft: Introduction, Phishing, Identity Theft(ID Theft)

Unit 4 : CYBERCRIMES AND CYBER SECURITY: 9

Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

Unit 5 : UNDERSTANDING COMPUTER FORENSICS: 10

Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics

Prescribed Text Books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole, Sunit Belapure, Wiley.
2. Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

Reference Text Books:

1. Information Security, Mark Rhodes, Ousley, MGH.
2. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press

Web References:

1.https://www.tutorialspoint.com/fundamentals_of_science_and_technology/cyber_crime_and_cyber_security.htm

Course Outcomes

Student will be able to	Blooms Level of Learning
1. Remember Cyber Security architecture principles	L1
2. Compare different classes of attacks	L2
3. Understand about cybercrime with mobile and wireless devices	L2
4. Apply tools and methods used in cybercrime	L3
5. Understand about cyber security and social media marketing	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A57FT.1	3	3	3	-	3	-	-	3	-	-	3	-
19A57FT.2	-	3	-	3	-	3	-	-	3	-	-	3
19A57FT.3	3	-	-	3	-	-	3	3	-	3	-	3
19A57FT.4	3	3	3	-	3	-	-	-	-	-	3	3
19A57FT.5	-	-	3	3	3	-	-	-	3	-	3	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Management Science
Category	:	HS
Course Code	:	19A373T
Year	:	IV B.Tech
Semester	:	I Semester (Common to CSE & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives:

- To understand the basic concepts of management and organization structures, types, merits and demerits.
- To give a clear idea about the plant layout and methods of production and understand the basic concepts of marketing and product life cycle.
- To understand the function of HR manager & industrial relations.
- To understand the concepts of Financial Management. Understand the concepts of PERT, CPM and how to draw the network diagram.
- To understand the concepts of MIS, TQM, JIT etc. Understand the importance of ethics in an organization.

Unit 1 Management and Organization Structure 10

Meaning, Nature, Importance Elements Of Management; Planning, Organizing, Staffing, Directing, Coordinating, Reporting, Budgeting- Systems Approach To Management Evolution Of Scientific Management, Modern Management. Principles Need Of Organization Structure- Types Of Organization Structure Line, Line And Staff, Functional And Matrix Organizations.

Unit 2 Operations Management & Marketing Management 10

Plant Location And Layout Methods Of Production (Job, Batch And Mass Production) Objectives Of Inventory Management- Need For Inventory Control- Method Of Inventory Management: EOQ, ABC Analysis **-** Core Concepts Of Marketing. Need, Want, Demand, Product, Value, Satisfaction, Marketing Mix- Product, Price, Place, Promotion, Product Levels – Product Life Cycle, – Channels Of Distribution.

Unit 3 Human Resources Management (Hrm) 10

Significance Of HRM, Basic Functions Of HR manager, HR planning Job evaluation and Recruitment Selection and Placement, Induction and Training. Performance Appraisal. Compensation. Industrial Relations.

Unit 4 Financial Management, Project Management (PERT/CPM): 10

Objectives, Scope, Techniques Of Investment Analysis, Pay Back Period, Accounting Rate Of Return, And Working Capital Cost Of Capital. Sources Of Financing**.** Network Drawing - Program me Evaluation And Review Technique (PERT) – Critical Path Method (CPM) – Probability Of Completing the project within given time Project Crashing (Simple Problems).

Unit 5 Advances in Management Practices 10

Basic Concepts And Overview Of Management Information System (MIS), Enterprise Resource Planning (ERP), Value Analysis, Just –In-Time (JIT), Total Quality Management (TQM) And Supply Chain Management. Overview Of Ethics-Nature And Objectives Of Ethics - Relationship Between Ethics And An Organization.

Prescribed Text Books:

1. Industrial Management by O.P.Khanna, 17 Edition, ISBN: 9788189928353, 9788189928353
2. Management Science by Aryasri, McGraw Hill Education India, ISBN: 9780070090279, 9780070090279
3. Manufacturing Organization and Management, 6th Edition, Pearson Education India, ISBN: 9788177582758, 9788177582758

Reference Books:

1. Stoner, Freeman, Gilbert, Management, Pearson Edu., 2005, 6th Ed. ISBN: 9788131707043, 8131707040
2. Panneer Selvam, Production and Operations Management. PHI, 2004. ISBN, 8120324528, 9788120324527

Course Outcomes:

Student will be able to	Blooms Level of Learning
6. Understand the basic concepts of management and organization. structures, types, merits and demerits	L1
7. Give a clear idea about the plant layout and methods of production. Understand the basic concepts of marketing and product life cycle.	L1
8. Understand the function of HR manager & industrial relations.	L1
9. Understand the concepts of Financial Management. Understand the concepts of PERT, CPM and how to draw the network diagram.	L3
10. Understand the concepts of MIS, TQM, JIT etc. and the importance of ethics in an organization	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A373T.1	3	3	3	-	3	-	-	-	3	-	3	-	2	-	-
19A373T.2	3	3	3	-	3	-	-	-	3	-	3	-	2	-	-
19A373T.3	3	3	3	-	-	-	-	-	3	-	3	-	2	-	-
19A373T.4	3	3	3	1	3	-	-	-	3	-	3	-	2	2	-
19A373T.5	-	3	3	-	3	1	1	-	3	1	3	-	2	2	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course : MICROWAVE ENGINEERING LAB
Category : PC
Course Code : 19A472L
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives: This course will able

- To analyze the characteristics of various microwave components using microwave test bench.
- To enable the students to know about optical fiber communication and its applications.

Experiment No. 1:- Reflex Klystron Characteristics.

Experiment No. 2:- Gunn Diode Characteristics.

Experiment No. 3:- Attenuation Measurement.

Experiment No. 4:-Directional Coupler Characteristics

Experiment No. 5:- VSWR Measurement.

Experiment No. 6:- Impedance Measurement.

Experiment No. 7:- Waveguide parameters measurement.

Experiment No. 8:-Scattering parameters of Directional Coupler.

Experiment No. 9 :-.Scattering parameters of Magic Tee.

Experiment No. 10:-Characterization of LED.

Experiment No. 11:-Characterization of Laser Diode.

Experiment No. 12:-Measurement of NA.

Course Outcomes:

Student will be	Blooms Level of Learning
1. To understand applications and testing of microwave components	L1
2. To understand the connections regarding various microwave components	L3
3. To acquire knowledge on the various applications of optical Fiber communications	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A472L.1	2	2	3	-	1	-	3	-	-	2	-		2	3	-
19A472L.2	2	2	3			-	3	-	-	-	-	-	2	3	-
19A472L.3			3			-	3	-	-	2	-	-		3	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	EMBEDDED SYSTEMS LAB
Category	:	PC
Course Code	:	19A471L
Year	:	IV B.Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
0	0	2	1

Course Objectives:

- To learn the interfacing concepts of embedded systems.
- To develop Embedded Applications.

Minimum Eight Experiments to be conducted

1. Switch and LED Interfacing
2. LCD Interfacing
3. Serial Transmission
4. Serial Reception
5. Key Pad Interfacing
6. Analog Interfacing
7. Sorting RTOS
8. Elevator Interfacing
9. Seven segment Display
10. Door Sensor Buzzer
11. GSM Interfacing.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. To design real time Embedded systems	L5
2. To understand the applications of embedded Systems through experimentations.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PS03
19A471L.1		1	3	2	2				2		1	2		2	
19A471L.2	3	2	2	3	2		2	1	2		2	2	3		2

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course: DISASTER MANAGEMENT
Category : OPEN ELECTIVE (OE)
Course Code : 19A18DT
Year : IV Year
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course Objectives:

- The course is intended to provide a general concept in the dimensions of disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.

Unit 1 : (9hrs)
INTRODUCTION - Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, prevention, mitigation).

Unit 2 : (9hrs)
DISASTERS - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, arthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Unit 3 : (9hrs)
DISASTER IMPACTS - Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and National disaster trends; climate-change and urban disasters.

Unit 4 : (9hrs)
DISASTER RISK REDUCTION (DRR) - Disaster management cycle–its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Unit 5 : (9hrs)
Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

Prescribed Text Books:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.
5. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

Reference Books:

1. http://ndma.gov.in/ (Home page of National Disaster Management Authority).
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
3. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
4. Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.
5. Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation

Course Outcomes:

Student will be able to	Blooms Level of Learning
• The students increase the knowledge and understanding of the disaster phenomenon and, its factors.	L1
• The students must learn various classification of disasters hazard and vulnerability profile of India.	L4
• The students will learn impacts, global and national disaster trends	L2
• The students will learn disaster management cycle and its phases and DRR programmes in India and activities of national disaster management academy.	L3
• The students should be able to analyze factors affecting vulnerability of developmental projects and environmental modifications for sustainable development.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A18DT.1	-	-	-	-	2	1	-	2	2	2	-	-	-	-	-
19A18DT.2	1	-	-	-	-	-	-	2	3	3	-	2	-	-	-
19A18DT.3	1	-	-	-	-	3	-	3	2	2	-	-	-	-	-
19A18DT.4	-	-	-	-	-	-	-	3	3	3	-	2	-	-	-
19A18DT.5	1	-	-	-	-	-	2	3	-	-	-	3	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course: Building Planning and Construction
Category : OE
Course Code : 19A18ET
Year : IV B.Tech
Semester : I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives:

- Teach to supervision of different types of masonry
- Illustrate the methodology in selection of materials, design and supervision of suitable type of floor and roof
- To ensure the student to be aware of building byelaws.
- To make the student to understand about principles of planning, standards and requirements of Residential building and Public building

Unit 1 : Building Byelaws and Regulations (8hrs)

Introduction –Terminology –Objectives of building byelaws –Floor area ratio (FAR) –Floor space Index (FSI) –Principles underlying building byelaws –classification of buildings –Open space requirements –built up area limitations –Height of Buildings –Wall thickness –lighting and ventilation requirement.

Unit 2 : *Planning of Residential buildings* (10hrs)

Minimum standards for various parts of buildings –requirements of different rooms and their grouping –characteristics of various types of residential buildings. Principles of planning- architectural principle, Aspects of planning within and with respect to surroundings, Modular planning concept.

Unit 3 : *Planning of* Public buildings (10hrs)

Planning of Educational institutions, hospitals, dispensaries, Office buildings, banks, industrial buildings, hotels and motels, buildings for recreation. Elements of Perspective Drawing: Definition, concept and single and two point perspective

Unit 4 : Building components *& foundations* (9hrs)

Building components: Lintels, Arches, and stair cases – Types. Different types of floors-Concrete, Mosaic, Terrazo floors, Pitched, flat and curved Roofs. Lean-to-Roof, Coupled Roofs, Trussed roofs- King and Queen Post Trusses. RCC Roofs.
Foundations: Shallow foundations – Spread, combined, strap and mat foundations.

Unit 5 : (8hrs)

Masonry: Types of masonry, English and Flemish bonds, Rubble and Ashlar masonry, cavity and partition walls.
Finishings: Damp proofing- materials used. Plastering, pointing, white washing and distempering – Painting – Constituents of a paint – Types of paints – Painting of new/old Wood – Varnish – Form work and scaffolding.

PrescribedText Books:

1. Building Planning & Drawing by Dr N. Kumaraswamy and A.Kameswara Rao, Charitor Publications.
2. Planning and Designing and Scheduling- Gurucharan Singh and Jagadish Singh – Standard Publishers.
3. Planning and Designing of Buildings – Y.S.Sane.
4. Building Construction by P.C. Varghese, Prentice-Hall of India private Ltd, New Delhi.
5. Building Construction by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.
6. National Building Code of India.

Reference Text books:

1. Sikka, V.B. (2013), A Course in Civil Engineering Drawing, S. K. Kataria & Sons
2. R.Chudly "Construction Technology "– Volumes I and II" 2nd Edition, Longman, UK, 1987.

Course Outcomes:

Student will be able to	Blooms Level of Learning
CO1: Understand Building Byelaws & regulations.	L2
CO2: Understand principles of planning, standards and requirements for residential building.	L2
CO3: Understand principles of planning, standards and requirements for public building.	L2
CO4: Summarize different types of masonry and foundations	L3
CO5: Understand different types of building components and finishing works	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A18ET.1	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3
19A18ET.2	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3
19A18ET.3	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3
19A18ET.4	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3
19A18ET.5	-	-	-	-	-	3	1	-	2	-	-	-	-	2	3

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES RAJAMPET
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Title of the Course	Battery Energy Storage Systems
Category	OE
Course Code	19A28DT
Year	IV B. Tech
Semester	II Semester

Lecture Hours	Tutorial Hours	Practical
3	1	-

Course Objectives:

1. To enable the student to understand the need for Energy Storage.
2. To learn sufficient knowledge about various Energy Storage Technologies.
3. To deal with grid connected Battery Energy Storage System.
4. To study the Challenges, Risk and Policy of Battery Energy Storage System.

Unit I Introduction to Energy Storage for Power Systems

Emerging needs for Electrical Energy Storage -Role of Energy Storage Systems-Applications. Overview of energy storage technologies: Thermal, Mechanical, Chemical, Electrochemical, Electrical-Efficiency of Energy Storage Systems.

Unit II Energy Storage Technologies

Storage Types - Components of a Battery Energy Storage System (BESS) - Energy Storage System Components -Grid Connection for Utility-Scale BESS Projects -Battery Chemistry Types -Lead–Acid (PBA) Battery - Nickel–Cadmium (Ni–Cd) Battery-Lithium-Ion (Li-Ion) Battery.

Unit III Grid Applications of Battery Energy Storage Systems

Scoping of BESS Use Cases - General Grid Applications of BESS -Technical Requirements -Round-Trip Efficiency - Response Time - Lifetime and Cycling - Sizing - Operation and Maintenance.

Unit IV Challenges and Risks

Grid Tariff Applications and Licensing Issues -Battery Safety - Challenges of Reducing Carbon Emissions - Battery Recycling and Reuse Risks -Examples of Battery Reuse and Recycling - Reuse of Electric Vehicle Batteries for Energy Storage - Recycling Process.

UNIT V Policy Recommendations

Frequency Regulation - Renewable Integration -Distribution Grids -Transmission Grids - Peak Shaving and Load Leveling - Microgrids

Text Books:

1. YongpingZhai. *Handbook on Battery Energy Storage System*Asian Development Bank.2018.
2. James M. Eyer, Joseph J.Iannucci and Garth P. Corey .*Energy Storage Benefits and Market Analysis*, Sandia National Laboratories, 2004.
3. Jim Eyer, Garth Corey", *Energy Storage for the Electricity Grid*: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

Reference Books:

1. Doughty, D. H., and E. Peter Roth. 2012. A General Discussion of Li Ion Battery Safety. Electrochemical Society Interface 21 (2): 37–44. DOI: 10.1149/2.F03122if.
2. Electric Power Research Institute (EPRI). 2010. Electricity Energy Storage Technology Options: A White Paper Primer on Applications, Costs, and Benefits. Palo Alto, California, US. http://large. stanford.edu/courses/2012/ph240/doshay1/docs/EPRI.pdf
3. Enel Green Power. 2016. Integrating Renewable Power Plants with Energy Storage. 7 June. http://www.iefe.unibocconi.it/wps/wcm/connect/29b685e1-8c34-4942-8da3-6ab5e701792b/ Slides+Lanuzza+7+giugno+2016.pdf?MOD=AJPERES&CVID=lle7w78.
4. Initial Operating Experience of the La Ola 1.2-MW Photovoltaic System. Sandia National Laboratories Report SAND2011-8848. Kane, Mark. 2015.
5. Bosch Cooperates With BMW And Vattenfall In Second Life Battery Project. Inside EVs 9 February. https://insideevs.com/bosch-cooperates-with-bmw-and-vattenfall-in-second-lifebattery-project/

Course outcomes: At the end of the course the student will be able to

1. Understanding the needof the Energy Storage Systems.
2. Study and Analyse the function of each storage Technology, its Types.
3. Explore the Battery Energy Storage applications in Renewable energy systems and in Smart grid.
4. Study the Challenges, Risk and Policy recommendation of Battery Energy Storage Systems.

CO-PO Mapping

Course Outcomes	Program Outcomes												PSOs	
	1	2	3	4	5	6	7	8	9	10	11	12	2	1
19A28DT .1	2	-	-	1	-	-	1	-	1	-	-	-	1	-
19A28DT .2	2	2	1	1	-	-	1	-	-	-	-	-	1	-
19A28DT .3	2	1	1	1	-	-	1	-	2	-	-	-	1	1
19A28DT .4	2	1	1	1	-	-	2	-	1	-	-	-	2	1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES RAJAMPET

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Title of the course: System modeling and Simulation
Category : OE
Course code : 19A28ET
Year : IV B.Tech
Semester : II Semester

Lecture Hours	Tutorial Hours	Practical Hours	Credits
3	-	-	3

Course Objectives

- To understand the basic system concepts and definitions of system.
- Techniques to model and to simulate various systems.
- To analyze a system and to make use of the information to improve the performance

Unit 1: Introduction to simulation models 10

Basic Simulation Modeling, Systems, Advantages and disadvantages of simulation, Models and Simulation, Discrete Event Simulation, Simulation of Single Server Queuing System, Simulation of Inventory System, Alternative approach to Modeling and Simulation

Unit-2: Simulation software 10

Comparison of Simulation Packages with Programming Languages, Classification of Software, Desirable Software Features, General Purpose Simulation Packages – Arena, Extend and Others, Object Oriented Simulation, Examples of Application Oriented Simulation Packages.

Unit-3 Building simulation models and time driven simulation models 08

Guidelines for Determining Levels of Model Detail, Techniques for Increasing Model Validity and Credibility, Modeling Time Driven Systems: Modeling Input Signals, Delays, System Integration, Linear Systems, Motion Control Models, Numerical Experimentation.

Unit-4 Exogenous signals and events and markov Process 12

Disturbance Signals, State Machines, Petri Nets & Analysis, System Encapsulation, MARKOV Process: Probabilistic Systems, Discrete Time Markov Processes, Random Walks, Poisson Processes, the Exponential Distribution, Simulating a Poison Process, Continuous-Time Markov Processes.

Unit 5 Event driven models and system optimization 10

Simulation Diagrams, Queuing Theory, characteristics of queuing system, Simulating Queuing Systems, Types of Queues, Multiple Servers, System Identification, Searches, Multidimensional Optimization, Modeling and Simulation Mythology.

Text Books:

1. System Modeling & Simulation, an Introduction – Frank L. Severance, John Wiley & Sons, 2001.
2. Simulation Modeling and Analysis – Averill M. Law, W. David Kelton, TMH, 3rdEdition, 2003.

Reference Book:

1. Systems Simulation – Geoffrey Gordon, PHI, 1978.

Course Outcomes:

1. Define basic concepts in Modeling and Simulation.
2. Understand the fundamental logic, structure, components and management of simulation modeling& demonstrate knowledge of how to use arena
3. Classify various simulation models and give practical examples for each category
4. Generate and test random number varieties and apply them to develop simulation models

5. Analyze output data produced by a model and test validity of the model.
6. Perform statistical analysis of output from terminating simulation.

CO-PO Mapping

Course Outcomes	Program Outcomes											
	1	2	3	4	5	6	7	8	9	10	11	12
19A28ET .1	3	3	3	3	3	3	3	3	3	3	3	-
19A28ET .2	3	3	3	3	3	3	3	3	3	3	1	-
19A28ET .3	3	3	3	3	3	3	3	3	3	3	3	-
19A28ET .4	3	3	3	3	3	3	3	3	3	3	3	-
19A28ET .5	3	3	3	3	3	3	3	3	3	3	3	-
19A28ET .6	3	3	3	3	3	2	-	2	2	2	2	2

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Entrepreneurship Development
Category	:	OEC
Course Code	:	19A38ET
Year	:	IV Year
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	-	3

Course Objectives:

- To develop and strengthen entrepreneurial quality and motivation in students
- To impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

Unit 1 **Entrepreneurship** 09

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

Unit 2 Motivation 09

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self-Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

Unit 3 **Business** 10

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

Unit 4 **Financing And Accounting** 09

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

Unit 5 **Support To Entrepreneurs** 09

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures

- Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting

Prescribed Text Books:

1. Khanka. S.S., "Entrepreneurial Development" S.Chand& Co. Ltd., Ram Nagar, New Delhi, 2013. ISBN : 81-219-1801-4
2. Donald F Kuratko, "Entreprenuership – Theory, Process and Practice", 9th Edition, Cengage Learning, 2014. ISBN-10: 1285051750

Reference Books:

1. Hisrich R D, Peters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013. ISBN 1843769964
2. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2nd Edition Dream tech, 2005. ISBN 81-297-0260-6
3. Rajeev Roy, "Entrepreneurship" 2nd Edition, Oxford University Press, 2011. ISBN 10: 0198072635
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986. ISBN 0-07-026694-8

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the basic concepts of entrepreneurship	L2
2. Understand the importance of motivation for entrepreneur	L2 & L3
3. Gain knowledge and skills needed to run a business successfully.	L3, L4 & L5
4. Learn the concepts of financing and accounting	L3
5. Understand the basic concepts of various supporting process	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A35KT.1	3	-	-	-	-	-	-	-	3	3	-	2	-	-	-
19A35KT.2	3	-	-	-	-	-	-	-	-	3	-	-	-	-	-
19A35KT.3	3	-	-	-	-	2	-	2	2	3	-	3	-	-	-
19A35KT.4	3	3	-	-	-	-	-	-	3	3	-	-	-	-	-
19A35KT.5	3	-	-	-	-	-	-	-	3	3	-	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Optimization in Engineering
Category	:	OEC
Course Code	:	19A38FT
Year	:	IV Year
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives:

- To enable the students to the nature and scope of various decision making situations within business contexts, understand and apply operations research techniques to industrial applications.
- To learn the fundamental techniques of Operations Research and to choose a suitable OR technique to solve problem

Unit 1 12

Linear Programming: Problem Formulation, Graphical solution, Simplex method, Artificial variables techniques - Two–phase method, Big-M method – Duality Principle

Unit 2 12

Transportation Mode: Formulation, Optimal solution, unbalanced transportation problem, Degeneracy.

Assignment Model: Formulation, Optimal solution, Variants of Assignment Problem, Travelling Salesman problem.

Unit 3 09

Theory of Games: Introduction – minimax - maximin – Criterion and optimal strategy – Solution of games with saddle points – Rectangular games without saddle points – 2 X 2 games – m X 2, 2 X n & m x n games - Graphical method, Dominance principle

Unit 4 : 07

Waiting Lines: Introduction – single channel – Poisson arrivals – exponential service times – with infinite queue length models.

Simulation: Definition – Types of simulation models – phases of simulation– applications of simulation – Queuing problems – advantages and disadvantages – Simulation languages.

Unit 5 : 08

Inventory: Introduction – Single item – Deterministic models – Purchase inventory models with one price break and multiple price breaks

Dynamic Programming: Introduction – Bellman's Principle of optimality – Applications of dynamic programming- shortest path problem – linear programming problem

Prescribed Text Books:

1. PS Gupta, DS Hira, Operations Research, S Chand Publications, 10th Edition, 2016, ISBN-13978-8121902816
2. S.D. Sharma, Operations Research, Kedarnath and Ramnath Publications, 2012, ISBN-135551234001596

Reference Books:

1. Taha, *Introduction to Operations Research*. PHI, 10 th edition, 2016, ISBN-13978-0134444017
2. R. Panneerselvam, *Operations Research.* PHI Publ, 2nd edition, 2004, ISBN: 9788120319233

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Develop mathematical models of the real life situations and capable of solving them for obtaining best solutions	L3
2. Solve the special cases of LPP like Transportation problems, Assignment and Travelling salesmen problems	L3
3. Choose the best strategy out of the available strategies in the competition or game	L3
4. Apply the fundamentals of waiting lines in real life situations and can Simulate queuing models	L3
5. Understand and will apply the fundamentals of inventory in real life situations and can apply Dynamic Programming technique to solve the complex problems by breaking them into a series of sub-problems	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A38FT.1	3	2	-	2	-	-	-	-	-	-	-	-	-	-	-
19A38FT.2	3	2	2	-	-	-	2	-	-	-	-	-	-	-	-
19A38FT.3	3	2	2	-	-	-	2	-	-	-	-	-	-	-	-
19A38FT.4	3	2	2	-	-	2	2	-	-	-	-	-	-	-	-
19A38FT.5	3	2	-	-	-	2	2	-	-	-	-	-	-	-	-

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Total Quality Management
Category	:	OEC
Course Code	:	19A38GT
Year	:	IV Year
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	-	0	3

Course Objectives:

- To introduce the students, the basic concepts of Total Quality Management.
- To expose with various quality issues in Inspection.
- To gain Knowledge on quality control and its applications to real time.
- To know the extent of customer satisfaction by the application of various quality concepts.
- To understand the importance of Quality standards in Production.

Unit 1 Introduction 10

Definition of Quality, Dimensions of Quality, Definition of Total quality management, Quality Planning, Quality costs – Analysis, Techniques for Quality costs, Basic concepts of Total Quality Management.

Unit 2 Historical Review 09

Quality council, Quality statements, Strategic Planning, Deming Philosophy, Barriers of TQM Implementation, Benefits of TQM, Characteristics of successful quality leader, Contributions of Gurus of TQM, Case studies.

Unit 3 TQM Principles 08

Customer Satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment teams, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure Case studies

Unit 4 TQM Tools 09

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA, The seven tools of quality, Process capability, Concept of Six Sigma, New Seven management tools, Case studies.

Unit 5 Quality Systems 08

Need for ISO 9000 and Other Quality Systems, ISO 9000: 2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits, Case Studies.

Prescribed Text Books:

4. Dale H Besterfield, Total Quality Management, Fourth Edition, Pearson Education, 2018, ISBN: 9789332534452
5. Subburaj Ramaswamy, Total Quality Management, Tata Mcgraw Hill Education., 2012, ISBN: 1259001415, 9781259001413
6. Joel E.Ross , Total Quality Management, Third Eition, CRC Press, 2017, ISBN: 9781351407786

Reference Books:

3. Narayana V and Sreenivasan N.S, Quality Management – Concepts and Tasks, NewAge International, 1996,

ISBN-10: 8122416802.
4. Robert L.Flood, Beyond TQM, First Edition, John Wiley & Sons Ltd, 1993, ISBN: 9780471939672.
5. Richard S. Leavenworth & Eugene Lodewick Grant, Statistical Quality Control, Seventh Edition, Tata Mcgraw Hill, 2015, ISBN, 0070241147, 9780070241145.
6. Samuel Ho , TQM – An Integrated Approach, Kogan Page Ltd, USA, 1995, ISBN: 9780749415617.

Course Outcomes:

Student will be able to	Blooms Level of Learning
11. Develop an understanding on quality Management philosophies and frameworks.	L2
12. Adopt TQM methodologies for continuous improvement of quality.	L3
13. Measure the cost of poor quality, process effectiveness and efficiency to identify areas for improvement.	L4
14. Apply benchmarking and business process reengineering to improve management processes.	L3
15. Determine the set of indications to evaluate performance excellence of an organization.	L3

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A37GT.1	2	-	-	-	-	2	2	-	-	-	2	1	-	-	-
19A37GT 2	2	2	-	2	-	2	-	-	-	1	2	1	-	-	-
19A37GT 3	1	2	-	2	-	-	-	1	1	1	2	1	-	-	-
19A37GT 4	1	-	-	-	-	1	-	-	-	-	2	1	-	-	-
19A37GT 5	1	-	-	-	-	-	-	-	-	-	2	2	-	-	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	Internet of Things
Category	:	OE
Course Code	:	19A58ET
Year	:	IV B.Tech
Semester	:	II Semester (Offered to CE, EEE, ME & ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand the terminology, technology and its applications of IoT.
- To know the concept of M2M (machine to machine) with necessary protocols.
- To memorize the software platforms which are used for developing the applications.
- To learn the concepts of python programming language which is used to develop the IoT projects.
- To know the hardware platforms which is necessary to develop the IoT applications.

Unit 1 : Introduction to Internet of Things 8

Introduction to Internet of Things, History of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Templates, Applications of IoT.

Unit 2 : IoT and M2M & IoT Platforms Design Methodology 7

IoT and M2M: Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT.
IoT Platforms Design Methodology: Introduction, IoT Design Methodology.

Unit 3 : The Wireless Embedded Internet 8

Introduction to 6LoWPAN,The 6LoWPAN Architecture ,The Basic 6LoWPAN Format, Addressing MQ telemetry transport for sensor networks (MQTT-S), ZigBee compact application protocol, Contiki and uIPv6, Wireless RFID Infrastructure.

Unit 4 : IoT Systems-Logical Design Using Python 8

Introduction, Installing Python, Python Data Types and Data Structures, Control Flow, Functions, Modules, Packages and File Handling.

Unit 5 : IoT Physical Devices and Endpoints 8

What is an IoT Device, Exemplary Device: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Other IoT Devices.

Prescribed Text Books:

4. Internet of Things, A Hands-On Approach, Arshdeep Bahga, Vijay Madisetti, University Press,2015.
5. 6LoWPAN: The WirelessEmbedded Internet, Zach Shelby and Carsten Bormann,Wiley publications, first edition,2009.(Unit III).

Reference Text books:

1. The Internet of Things Connecting Objects to the Web, Hakima Chaouchi,Wiley publications,2010.
2. Designing the Internet of Things, Adrian McEwen, Hakim Cassimally, Wiley 2014.
3. Enterprise IoT, A Definitive Handbook by Naveen Balani.

Course Outcomes:

Student will be able to	Blooms Level of Learning
• Understand the vision of IoT from a global context.	L1
• Identify the difference between IoT and M2M communication.	L3
• Determine the usage of 6LoWPAN and select the appropriate network protocols for IoT project.	L4
• Create the IoT experiments with the help of Python programs.	L5
• Design the IoT applications using Raspberry Pi kit.	L6

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
19A58ET .1	-	-	-	3	3	3	1	1	-	-	-	1
19A58ET .2	-	-			3	-	-	-	-	1	-	-
19A58ET 3	-	-	3	3	3	-	-	-	-	-	-	-
19A58ET 4	-	-	3	3	-	-	-	-	-	-	-	-
19A58ET 5	1	1	3	3	3	3	-	-	-	-	-	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES::RAJAMPET
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Title of the Course	Web Programming
Category	OE
Course Code	19A58FT
Year	IV B. Tech
Semester	II Semester (Common to CE, EEE, ME, ECE)

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will make the students

- Interpret and use HTML concepts in developing the web pages
- Use the CSS to design web pages.
- Interpret the JavaScript programming language
- Interpret the JavaScript framework using JQuery

Unit 1 : 9

Structuring Documents for the Web-A Web of Structured Documents, Introducing HTML5, Tags and Elements, Attribute Groups Core Attributes, Internationalization, Core Elements ,Basic Text Formatting, Understanding Block and Inline Elements, Grouping Content, Working with Lists, Text Processing tags, Links and Navigation :Basic Links, Understanding Directories and Directory Structures, Understanding URLs, Creating In-Page Links with the <a> Element.

Unit 2 : Images, Audio, and Video, Tables, Forms 9

Images, Audio, and Video -Adding Images Using the <img> Element, Using Images as Links Adding Flash, Video, and Audio to Your Web Pages Tables: Introducing Tables, Basic Table Elements and Attributes, adding a Caption to a Table, Grouping Sections of a Table, Nested Tables, Accessible Tables. Forms: Introducing Forms, creating a Form with the <form> Element, Form Controls, Creating Labels for Controls and the <label> Element, Structuring Your Forms with <fieldset> and <legend> Elements, Focus, Disabled and Read-Only Controls, Sending Form Data to the Server, Creating More Usable Form Fields.

Unit 3 : Cascading Style Sheets, Introduction to XML 9

Cascading Style Sheets: Introducing CSS, Where You Can Add CSS Rules, CSS Properties Controlling Text, Text Formatting, Text Pseudo-Classes, Styling Text, Selectors Lengths, Introducing the Box Model, An Example Illustrating the Box Model, Links, Backgrounds, Lists, Tables, And Miscellaneous Properties.
Introduction to XML: Difference between HTML and XML, Basic structure and Syntax of XML Document, DTD, sample examples.

Unit 4 : Learning JavaScript 9

Learning JavaScript-Introduction to JavaScript, How to Add a Script to Your Pages, comments in JavaScript, Create an External JavaScript ,The Document Object Model, JavaScript Programming console, General Programming Concepts, Variables, Operators, String Operators (Using + with Strings), Functions, Conditional Statements, Looping, Events, Built-in Objects.

Unit 5 : Working with jQuery 9

Working with jQuery: introduction to jQuery, adding jQuery to Your Page, jQuery Basics, jQuery and the DOM, Managing Events with jQuery, Ajax with jQuery, jQuery UI.

Prescribed Text Books:

1. Beginning HTML and CSS Rob Larsen, Wrox Programmer to Programmer.

Reference Books:

1. JavaScript and JQuery: Interactive Front-End Web Development, Jon Duckett, Wiley Publications
2. Web Design with HTML, CSS, JavaScript and jQuery Set, Jon Duckett, Wiley Publications
3. jQuery in Action, Bear Bibeault, Yehuda Katz, and Aurelio De Rosa, Third Edition, Manning Publications
4. https://www.w3schools.com/

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Interpret and Use the fundamental HTML markups when designing web pages.	L2, L3, L5
2. Use and design the web pages with images, audio, videos, tables and form controls.	L3, L5
3. Use cascading style sheets and XML concepts to design web pages	L3, L5
4. Interpret and use JavaScript concepts in designing web pages	L2, L3, L5
5. Interpret and use JQuery concepts in designing web pages.	L2, L3, L5

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A534T.1	3	-	3	3	3	-	-	-	-	-	-	3	-	-	-
19A534T.2	-	-	3	3	3	-	-	-	-	-	-	3	-	-	-
19A534T.3	-	-	3	3	3	-	-	-	-	-	-	3	-	-	-
19A534T.4	3	-	3	3	3	-	-	-	-	-	-	3	-	-	-
19A534T.5	3	-	3	3	3	-	-	-	-	-	-	3	-	-	-

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	MIXED SIGNAL IC APPLICATIONS
Category	:	PE
Course Code	:	19A48AT
Year	:	IV B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- Understand the concepts of Switched capacitors Circuits.
- Know the concepts of PLLS & it's applications.
- Learn the concepts of A/D & D/A Converters.
- Understand concepts of the Oversampling Converters and Continuous-Time Filters.

Unit 1 : **Switched Capacitor Circuits** 8

Introduction to Switched Capacitor circuits basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing.

Unit 2 : **Phased Lock Loop (PLL)** 10

DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters.

Unit 3 : **D/A Converters** 10

Harmonic distortion, voltage versus current distortion, harmonics versus transients, power system quantities under non-sinusoidal conditions, harmonic indices. Harmonic sources from commercial and industrial loads. Effects of harmonic distortion. Applied harmonics - harmonic distortion evaluation, principles of controlling harmonics, and devices for controlling harmonic distortion. Harmonic filter design and standards on harmonics.

Unit 4 : **A/D Converters** 9

Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

Unit 5 : **Oversampling Converters & Continuous Time Filters** 8

Noise shaping modulators, Decimating filters and Interpolating filters, Higher order modulators, Delta sigma modulators with multi-bit quantizers, Delta sigma D/A, Introduction to Gm-C Filters, Bipolar Trans conductors , CMOS trans conductors Using Triode and Active Transistors.

Prescribed Text Books:

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. Analog Integrated Circuit Design- David A. Johns,Ken Martin, Wiley Student Edition, 2013

Reference Text books:

1. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009.

2. CMOS Analog Circuit Design –Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand the concepts of Switched capacitors Circuits.	L2
2. Remember the concepts of PLLS & it's applications	L1
3. Design and analysis of A/D & D/A Converters.	L4
4. Understand concepts of the Oversampling Converters and Continuous-Time Filters	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A48AT.1	3	-	2	-	-	2	-	-	-	-	-	2	3	3	3
19A48AT 2	3	-	3	-	-	3	-	-	-	-	-	3	3	3	2
19A48AT.3	3	2	3	-	-	3	-	-	-	-	-	3	3	3	2
19A48AT.4	3	3	1	-	-	2	-	-	-	-	-	1	3	3	3

Department of Electronics & Communication Engineering

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	SATELLITE COMMUNICATIONS
Category	:	PE
Course Code	:	19A48BT
Year	:	IV B. Tech
Semester	:	I Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To understand concepts of Satellite Engineering and applications
- To design basic Satellite links and solve the problems of budgeting, speed, modulation and multiple access schemes.

Unit 1 : **INTRODUCTION & ORBITAL MECHANICS** 10

Origin of satellite communications, Historical background, basic concepts of satellite communications, frequency allocations for satellite services, applications, future trends of satellite communications. Orbital Mechanics look angle determination, orbital perturbations, orbit determination, launches and launch vehicles, orbital effects in communication systems performance.

Unit 2 : **SATELLITE SUBSYSTEMS** 8

Attitude and orbital control system, Telemetry, Tracking, command and monitoring, power systems, communication subsystems, satellite antenna equipment reliability and space qualification.

Unit 3 : **SATELLITE LINK DESIGN** 10

Basic transmission theory, system noise temperature and G/T ratio, design of down links, uplink design, design of satellite links for specified C/N, system design example. Basic concepts of Multiple access, Time Division multiple access (TDMA) frame structure, examples. Satellite switched TDMA onboard processing,

Unit 4 : **EARTH STATION TECHNOLOGY, LEO AND GEOSTATIONARY SATELLITE SYSTEMS** 9

Introduction, transmitters, receivers, Antennas, tracking systems, terrestrial interface, primary power test methods. Orbit consideration, coverage and frequency considerations, delay and throughput considerations, system considerations, operational NGSO constellation designs.

Unit 5 : **SATELLITE NAVIGATION & THE GLOBAL POSITIONING SYSTEM INTERCONNECTION** 9

Radio and satellite navigation, GPS position location principles, GPS receivers and codes, satellite signal acquisition, GPS navigation message, GPS signal levels, GPS receiver operation, GPS C/A code accuracy, Differential GPS.

Prescribed Text Books:

1. Satellite communications-Timothi Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley publications, 2nd Edition, 2003.
2. Satellite communications Engineering-Wilbur L.Prichard, Robert A.Nelson & Henry G.Suyderhoud, 2nd Edition, Pearson Publications,2003.

Reference Text books:

1. Satellite communications: Design principles-M. Richharia, BS publications, 2ndEdition, 2003.

2. Satellite communications-D.C.Agarwal, Khanna publications, 5 Ed
3. Fundamentals of Satellite communications-K.N.Rajarao, PHI, 2004.
4. Satellite communications-Dennis Roddy, McGraw Hill, 2nd Edition,1996.

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Understand basics of Satellite Communications	L1
2. Understand and Analyze the satellite subsystems	L3
3. Design the basic satellite links by means of .multiple access	L4
4. Investigate various Earth station techniques for different satellite systems	L5
5. Able to learn the satellite Navigation & Global Positioning system	L2

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A48BT.1	3	2	2	-	-	-	-	-	-	-	-	-	3	2	1
19A48BT.2	3	2	3	2	-	2	-	-	-	-	-	-	3	2	1
19A48BT.3	3	3	3	3	-	-	-	-	-	-	-	-	3	2	1
19A48BT.4	3	2	2	2	3	2	-	-	-	-	-	-	3	1	1
19A48BT.5	3	1	1	2	3	-	-	-	-	-	-	-	3	1	1

ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES RAJAMPET
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Title of the Course	:	NANO ELECTRONICS
Category	:	PE
Course Code	:	19A48CT
Year	:	IV B.Tech
Semester	:	II Semester

Lecture Hours	Tutorial Hours	Practical	Credits
3	0	0	3

Course Objectives: This course will able to

- To learn the fundamentals of Nano electronics.
- To understand the applications and limitation of ICs.

Unit 1 : **INTRODUCTION** 8

Nano- The beginning – Electron Microscopies –Scanning probe Microscopies – Optical Microscopies for Nano science and technology – Other kinds of microscopies. Synthesis and purification of nanotubes - transport, mechanical properties and applications.

Unit 2 : **MODELS OF SEMICONDUCTOR QUANTUMWELLS,QUANTUMWIRES, AND QUANTUM DOTS** 9

Semiconductor Hetero structures and quantum wells – Quantum wires and nano wires – Quantum dots and Nano particles – Fabrication Techniques for Nanostructures: Lithography, Nano imprint lithography – split-gate technology, self-assembly

Unit 3 : **QUANTUM ELECTRONICS** 10

Quantum Electronic Devices – Short channel MOS Transistor, split-gate transistor, Electron-wave transistor, Electron-spin transistor, quantum cellular automata, quantum dot array..

Unit 4 : **TUNNELING DEVICES** 9

Tunneling effect and Tunneling diode, three terminal RTDs Technology of RTD. Digital circuit design based on RTDS, basic logic circuits, Principle of SET – Coulomb blockade, performance of Single Electron Transistor(SET),SET circuit design – wiring and drivers, logic and memory circuits, SET Adder. Comparison between FET and SET circuit design.

Unit 5 : **LIMITS OF INTEGRATED ELECTRONICS** 8

Energy supply and heat dissipation – Parameter spread as limiting effect – Limits due to thermal particle motion – The Debye length – Reliability as limiting factor – Physical limits. Nano systems as information processing machines – system design and its interfaces – Evolutionary Hardware – Requirements of Nano systems..

PrescribedText Books:

1. T. Pradeep, „Nano: The Essentials”, TMH Edition (2008)
2. K. Goser, P. Glosekotter, J. Dienstuhl, „Nano electronics and Nano systems", Springer Edition (2004).

Reference Text books:

1. George W. Hanson, Fundamentals of Nano electronics", Pearson Education(2009).

Course Outcomes:

Student will be able to	Blooms Level of Learning
1. Learn the basics of microscopy's and applications	L1,L2
2. Knows the fundamentals of Quantum electronics	L2
3. Understands the basics of Tunneling devices and SETs	L2
4. Acquire the knowledge on limitations of ICs.	L1

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
19A48CT.1	1	1	2	2	3	1	1	2	2	1	3	2	3	3	-
19A48CT.2	2	2	2	1	3	2	2	3	3	3	3	2	3	3	
19A48CT.3	2	2	3	3	3	2	2	2	2	1	3	1	3	-	3
19A48CT.4	2	3	3	3	3	3	2	3	3	3	3	3	3		3