SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(Accredited by NBA)

B.Tech R23 - COURSE STRUCTURE AND SYLLABI

Semester V (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE351T	Analog and Digital IC Applications	3	-	-	3	30	70	100
2	23ECE352T	Antennas & Wave Propagation	3	-	-	3	30	70	100
3	23ECE354T	Microprocessors and Microcontrollers	3	-	-	3	30	70	100
4	PE I	Professional Elective – I	3	-	-	3	30	70	100
5	OE I	Open Elective – I	3	-	-	3	30	70	100
6	23ESC351T	Introduction to Quantum Technology and Applications	3	-	-	3	30	70	100
7	23ECE356L	Analog & Digital IC Applications Lab	-	-	3	1.5	30	70	100
8	23ECE358L	Microprocessors and Microcontrollers Lab	-	-	3	1.5	30	70	100
9	23ECE359L	PCB Design and Prototype development (Skill Oriented Course – III)	-	1	2	2	30	70	100
10	23ESC352L	Tinkering Lab	-	-	2	1	30	70	100
11	23ECE351P	Evaluation of Community Service Project	-	-	-	2	-	100	100
Contact Hours per week			18	01	10	-	-	-	-
Total Hours per week			29			-	-	-	-
Total credits						26	-	-	-
Total Marks							300	800	1100

Semester VI (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE361T	Digital Signal Processing	3	-	-	3	30	70	100
2	23ECE362T	Microwave and Optical Communications	3	-	-	3	30	70	100
3	23ECE363T	VLSI Design	3	-	-	3	30	70	100
4	PE II	Professional Elective – II	3	-	-	3	30	70	100
5	PE III	Professional Elective – III	3	-	-	3	30	70	100
6	OE II	Open Elective – II	3	-	-	3	30	70	100
7	23ECE367L	Microwave and Optical Communications Lab	-	-	3	1.5	30	70	100
8	23ECE368L	VLSI Design Lab	-	-	3	1.5	30	70	100
9	23ECE366L	Machine Learning and DSP (Skill Oriented Course -IV)	-	1	2	2	30	70	100
10	23MAC351U	Technical Paper Writing & IPR	2	-	-	-	30	-	P
Contact Hours per week			20	01	08	-	-	-	-
Total Hours per week			29			-	-	-	-
Total credits						23	-	-	-
Total Marks							300	630	900

B.Tech R23 - COURSE STRUCTURE AND SYLLABI

Semester VII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE471T	Data Communications and Networking	3	-	-	3	30	70	100
2	ME	Management Elective II	2	-	-	2	30	70	100
3	PE IV	Professional Elective – IV	3	-	-	3	30	70	100
4	PE V	Professional Elective – V	3	-	-	3	30	70	100
5	OE III	Open Elective – III	3	-	-	3	30	70	100
6	OE IV	Open Elective – IV	3	-	-	3	30	70	100
7	23ECE474L 23ECE475L	Industrial IOT & Automation (OR) RF System Design tools (Skill Oriented Course – V)	-	1	2	2	30	70	100
8	23MAC471U	Gender Sensitization	2	-	-	-	30	-	P
9	23ECE471P	Evaluation Industry Internship	-	-	-	2	-	100	100
Contact Hours per week			19	01	02	-	-	-	-
Total Hours per week			22			-	-	-	-
Total credits						21	-	-	-
Total Marks							240	590	800

Semester VIII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE481P	Internship	-	-	24	4	30	70	100
2	23ECE482P	Project Work	-	-	-	8	30	70	100
Contact Hours per week			-	-	24	12	-	-	-
Total Hours per week			24			-	-	-	-
Total credits						12	-	-	-
Total Marks							60	140	200

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Professional Elective – I - Semester V (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE355A	Computer Architecture & Organization	3	-	-	3	30	70	100
2	23ECE355B	Detection and Estimation Theory	3	-	-	3	30	70	100
3	23ECE355C	Fundamentals of Nano Electronics	3	-	-	3	30	70	100
4	23ECE355D	Information theory and coding	3	-	-	3	30	70	100

Professional Elective – II - Semester VI (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE364A	Electronic Measurements and Instrumentation	3	-	-	3	30	70	100
2	23ECE364B	Embedded systems & IOT	3	-	-	3	30	70	100
3	23ECE364D	FPGA Design	3	-	-	3	30	70	100
4	23ECE364E	Speech Processing	3	-	-	3	30	70	100

Professional Elective – III - Semester VI (Third Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23CSM364A	Artificial Intelligence & Machine learning	3	-	-	3	30	70	100
2	23ECE365B	Digital Image Processing	3	-	-	3	30	70	100
3	23ECE365C	Satellite Communications	3	-	-	3	30	70	100
4	23ECE365D	Television Engineering	3	-	-	3	30	70	100

Professional Elective – IV - Semester VII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE472A	Cellular & Mobile Communications	3	-	-	3	30	70	100
2	23ECE472C	DSP Processors & Architectures	3	-	-	3	30	70	100
3	23ECE472D	Micro Electro Mechanical Systems	3	-	-	3	30	70	100
4	23ECE472E	Radar Engineering	3	-	-	3	30	70	100

Professional Elective – V - Semester VII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23ECE473A	5G Communications	3	-	-	3	30	70	100
2	23ECE473B	Low Power VLSI Design	3	-	-	3	30	70	100
3	23ECE473C	Medical Electronics	3	-	-	3	30	70	100
4	23ECE473D	Wireless Sensor Networks	3	-	-	3	30	70	100

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Management Course-II Elective – Semester VII (Fourth Year)

S.No	Course Code	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
			L	T	P	C	I	E	Total
1	23HSM471A	Business Ethics and Corporate Governance	3	-	-	3	30	70	100
2	23HSM471B	E-Business	3	-	-	3	30	70	100
3	23HSM471C	Management Science	3	-	-	3	30	70	100

Open Elective – I - Semester V (Third Year)

S.No	Course Code	Offered Department	Course Title	Scheme of Instructios Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	I	E	Total
1	23OCE351A	CE	Green Buildings	3	-	-	3	30	70	100
2	23OCE351B		Construction Technology and Management	3	-	-	3	30	70	100
3	23OEE351A	EEE	Electrical Safety Practices and Standards	3	-	-	3	30	70	100
4	23OCS351A	CSE & Allied	Java Programming	3	-	-	3	30	70	100
5	23OAI351A		Fundamentals of Artificial Intelligence	3	-	-	3	30	70	100
6	23OME351A	ME	Sustainable Energy Technologies	3	-	-	3	30	70	100
7	23OSH351A	Mathematics	Mathematics for Machine Learning and AI	3	-	-	3	30	70	100
8	23OSH351B	Physics	Materials Characterization Techniques	3	-	-	3	30	70	100
9	23OSH351C	Chemistry	Chemistry of Energy Systems	3	-	-	3	30	70	100
10	23OSH351D	Humanities	English for Competitive Examinations	3	-	-	3	30	70	100
11	23OSH351E		Entrepreneurship and New Venture Creation	3	-	-	3	30	70	100
12	23OPEN351	OPEN	Quantum Technologies and Applications	3	-	-	3	30	70	100

Open Elective – II - Semester VI (Third Year)

S.No	CourseCode	Offered Department	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	I	E	Total
1	23OCE361A	CE	Disaster Management	3	-	-	3	30	70	100
2	23OCE361B		Sustainability In Engineering Practices	3	-	-	3	30	70	100
3	23OEE361A	EEE	Renewable Energy Sources	3	-	-	3	30	70	100
4	23OCS361A	CSE & Allied	Principles of Operating Systems	3	-	-	3	30	70	100
5	23OML361A		Introduction of Machine Learning	3	-	-	3	30	70	100
6	23OME361A	ME	Principles of Automation and Robotics	3	-	-	3	30	70	100
7	23OSH361A	Mathematics	Optimization Techniques for Engineers	3	-	-	3	30	70	100
8	23OSH361B		Mathematical Foundation of Quantum Technologies	3	-	-	3	30	70	100
9	23OSH361C	Physics	Physics of Electronic Materials and Devices	3	-	-	3	30	70	100

10	23OSH361D	Chemistry	Chemistry of Polymers and Applications	3	-	-	3	30	70	100
11	23OSH361E	Humanitie	Academic Writing and Public Speaking	3	-	-	3	30	70	100

Open Elective – III - Semester VII (Fourth Year)

S.No	Course Code	Offered Department	Course Title	Scheme of Instructios Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	I	E	Total
1	23OCE471A	CE	Building Materials and Services	3	-	-	3	30	70	100
2	23OCE471B		Environmental Impact Assessment	3	-	-	3	30	70	100
3	23OEE471A	EEE	Smart Grid Technologies	3	-	-	3	30	70	100
4	23OCS471A	CSE & Allied	Fundamentals of Database Systems	3	-	-	3	30	70	100
5	23OCS471B		Fundamentals of Cyber Security	3	-	-	3	30	70	100
6	23OME471A	ME	3D Printing Technologies	3	-	-	3	30	70	100
7	23OSH471A	Mathematics	Wavelet transforms and its applications	3	-	-	3	30	70	100
8	23OSH471B	Physics	Smart Materials and Devices	3	-	-	3	30	70	100
9	23OSH471C		Introduction to Quantum Mechanics	3	-	-	3	30	70	100
10	23OSH471D	Chemistry	Green Chemistry and Catalysis for Sustainable Environment	3	-	-	3	30	70	100
11	23OSH471E	Humanities	Employability Skills	3	-	-	3	30	70	100

Open Elective – IV - Semester VII (Fourth Year)

S.No	CourseCode	Offered Department	Course Title	Scheme of Instructions Hours per Week				Scheme of Examination Maximum Marks		
				L	T	P	C	I	E	Total
1	23OCE472A	CE	Geo-Spatial Technologies	3	-	-	3	30	70	100
2	23OCE472B		Solid Waste Management	3	-	-	3	30	70	100
3	23OEE472A	EEE	Electric Vehicles	3	-	-	3	30	70	100
4	23OCS472A	CSE & Allied	Computer Networks	3	-	-	3	30	70	100
5	23OCS472B		IoT Concepts and Applications	3	-	-	3	30	70	100
6	23OME472A	ME	Fundamentals of Quality Management	3	-	-	3	30	70	100
7	23OSH472A	Mathematics	Financial Mathematics	3	-	-	3	30	70	100
8	23OSH472B	Physics	Sensors And Actuators For Engineering Applications	3	-	-	3	30	70	100
9	23OSH472C	Chemistry	Chemistry Of Nanomaterial's and Applications	3	-	-	3	30	70	100
10	23OSH472D	Humanities	Literary Vibes	3	-	-	3	30	70	100
11	23OPEN472	Open	Introduction to Quantum Computing	3	-	-	3	30	70	100

III B.TECH. - V SEMESTER

23ECE351T **ANALOG AND DIGITAL IC APPLICATIONS** **L T P C**
3 - - 3

PRE-REQUISITES: Electronic Devices and Circuits

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce the classification of Integrated Circuits, internal blocks and characteristics of Op-Amp.
2. To analyse linear and non-linear applications of Op-Amp.
3. To gain knowledge on active filters, timers and phased locked loops.
4. To understand the working of Voltage Regulators and Converters.
5. To study about different types of Digital ICs and their applications.

UNIT –1: ICs AND OP- AMPS (9)

Integrated Circuits and Operational Amplifier: Introduction, Classification of IC's, IC chip size and circuit complexity, basic information of Op-Amp IC741 and its features, the ideal Operational amplifier, Op-Amp internal circuit, Op-Amp characteristics - DC and AC, Features of 741 Op-Amp.

UNIT –2: APPLICATIONS OF OP- AMP (9)

Linear Applications of Op-Amp: Inverting, non-inverting, Differential amplifiers, adder, subtractor, Instrumentation amplifier, AC amplifier, V to I and I to V converters, Integrator and differentiator.

Non-Linear Applications of Op-Amp: Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger, Multi vibrators, Triangular and Square waveform generators, Oscillators.

UNIT –3: ACTIVE FILTERS AND OTHER ICs (9)

Active Filters: Introduction, Butterworth filters – 1^{st} order, 2^{nd} order low pass and high pass filters, band pass, band reject and all pass filters.

Timer and Phase Locked Loops: Introduction to IC 555 timer, description of functional diagram, monostable and a stable operations and applications, Schmitt trigger, PLL - introduction, basic principle, phase detector/comparator, voltage controlled oscillator (IC 566), low pass filter, monolithic PLL and applications of PLL.

UNIT –4: VOLTAGE REGULATORS AND CONVERTERS (9)

Voltage Regulator: Introduction, Series Op-Amp regulator, IC Voltage Regulators, IC 723 general purpose regulators, Switching Regulator.

D to A and A to D Converters: Introduction, basic DAC techniques - weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A to D converters - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

UNIT –5: DIGITAL ICs (9)

CMOS Logic: CMOS logic levels, MOS transistors, Basic CMOS Inverter, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using CMOS logic.

CPLD: Complex Programmable Logic Devices - Xilinx XC9500 CPLD Architecture Block, I/O block

FPGA: Xilinx XC4000 FPGA Family – CLB, I/O Block and Programmable Interconnect

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the classification of Integrated Circuits, internal blocks and characteristics of Op-Amp.	PO1, PO2
CO2	Analyse linear and non-linear applications of Op-Amp.	PO1, PO2, PO3
CO3	Gain knowledge on active filters, timers and phased locked loops.	PO1, PO2, PO3
CO4	Understand the working of Voltage Regulators and Converters.	PO1, PO2
CO5	Know about different types of Digital ICs and their applications.	PO1, PO2

TEXT BOOKS:

1. D. Roy Choudhury, Shail B. Jain, —Linear Integrated Circuit‖, 4th edition (2012), New Age International Pvt.Ltd., New Delhi, India
2. Floyd, Jain, —Digital Fundamentals‖, 8th edition (2009), Pearson Education, New Delhi.

REFERENCE BOOKS:

1. Ramakant A. Gayakwad, —OP-AMP and Linear Integrated Circuits‖, 4th edition (2012), Prentice Hall / Pearson Education, New Delhi.
2. Sergio Franco (1997), Design with operational amplifiers and analog integrated circuits, McGraw Hill, New Delhi.
3. Gray, Meyer (1995), Analysis and Design of Analog Integrated Circuits, Wiley International, New Delhi.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/108/108/108108111/
2. https://onlinecourses.nptel.ac.in/noc24_ee73/preview
3. https://onlinecourses.nptel.ac.in/noc20_ee13/preview

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	-	-	-	-	-	-	-	-	-
CO.3	3	3	2	-	-	-	-	-	-	-	-	-
CO.4	3	3	-	-	-	-	-	-	-	-	-	-
CO.5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	3	2.8	2	-	-	-	-	-	-	-	-	-

III B.TECH. - V SEMESTER

23ECE352T **ANTENNAS & WAVE PROPAGATION** **L T P C**
3 0 0 3

PRE-REQUISITES: EMTL

COURSE EDUCATIONAL OBJECTIVES:

1.To learn the antennas basic terminology, radiation mechanism of antennas and dipole antennas.
2. To gain knowledge on HF, VHF & UHF antennas, their operation and applications.
3. Analyze the working and applications of Microwave antennas.
4. Understand different techniques involved in the design of antenna arrays and antenna parameter measurements.
5. To study the various types of radio wave propagation methods.

UNIT -I : ANTENNA BASICS & DIPOLE ANTENNAS:

Antenna Basics & Dipole antennas: Definition of antenna, Radiation Mechanism – single wire, two wire, dipoles, Antenna Parameters - Radiation Patterns, Main Lobe and Side Lobes, Beam widths, Beam Area, Radiation Intensity, Beam Efficiency, Directivity, Gain and Resolution, Aperture Efficiency, Effective Height and length, Reciprocal Theorem. Radiation- Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Illustrative problems.

UNIT- II: HF, VHF AND UHF ANTENNAS:

HF, VHF and UHF Antennas: Loop Antennas - Introduction, Small Loop, Arrays with Parasitic Elements - Yagi - Uda Arrays, Folded Dipoles & their characteristics. Log periodic Antenna, Helical Antennas-Helical Geometry, Helix modes, Helical Antenna in Axial and Normal Modes. Horn Antennas- Types, Fermat's Principle, Illustrative Problems.

UNIT – III: MICROWAVE ANTENNAS:

Microwave Antennas : Microstrip Antennas- Introduction, features, advantages and limitations, Rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics, reflector antennas - Introduction, , parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features, Lens Antennas - Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications, Illustrative Problems.

UNIT- IV: ANTENNA ARRAYS:

Antenna Arrays: Point sources - Definition, Patterns, arrays of 2 Isotropic sources- Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End-fire Arrays, BSAa with Non-uniform Amplitude Distributions - General considerations and Bionomial Arrays, Illustrative problems. Antenna Measurements: Introduction, Sources of errors, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

UNIT – V: WAVE PROPAGATION:

Wave Propagation: Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts, Ground wave propagation (Qualitative treatment) - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections, Space wave propagation - Introduction, field strength variation with distance and height, effect of earth's curvature, absorption and duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations, Sky wave propagation - Introduction,

structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Illustrative problems.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the antennas basic terminology and radiation mechanism of antennas.	PO1,PO2
CO2	Gain knowledge on VHF and UHF antennas, their operation and applications.	PO1, PO2
CO3	Design and analyze the working and applications of Microwave antennas.	PO1, PO2,PO3
CO4	Analyze different techniques involved in the design of antenna arrays and antenna parameter measurements.	PO1, PO2
CO5	Gain a comprehensive knowledge about the types of radio wave propagation methods. Trade for Exercises:	PO1, PO2

TEXT BOOKS:

1.John D. Kraus, Ronald J. Marhefka and Ahmad S.Khan, —Antennas and wave propagation‖, TMH, New Delhi, 4th Ed., 2010.
2. C.A. Balanis, —Antenna Theory- Analysis and Design‖, John Wiley & Sons, 2nd Edn., 2001.
3. K.D. Prasad and Satya Prakashan, —Antennas and Wave Propagation‖, New Delhi, Tech. India Publications, 2001.

REFERENCE BOOKS:

1.E.C. Jordan and K.G. Balmain, —Electromagnetic Waves and Radiating Systems‖, 2nd Edition, PHI, 2000.
2. G.S.N Raju, —Antenna and Wave Propagation‖, Pearson Education India, 3rd Edition 2009.
3. R K Shevgaonkar,‖ Electromagnetic Waves‖. Tata McGraw-Hill, 2006

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/108/101/108101092/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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III B.TECH.-V SEMESTER

23ECE354T MICROPROCESSORS AND MICROCONTROLLERS

L	T	P	C
3	0	0	3

PRE-REQUISITES: Nil

COURSE OBJECTIVES:

1. To learn the fundamental architectural concepts of microprocessors.
2. To gain knowledge about assembly language programming concepts.
3. To get familiar about 8086 interfacing.
4. To understand the fundamentals of the 8051 Microcontroller.
5. To learn interfacing with the 8051 Microcontroller.

UNIT I - 8086 ARCHITECTURE (9)

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT II - 8086 PROGRAMMING (9)

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT III - 8086 INTERFACING (9)

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT IV - MICROCONTROLLER (9)

Microcontroller: Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V - INTERFACING MICROCONTROLLER (9)

Interfacing Microcontroller: Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Learn the fundamental architectural concepts of microprocessors.	PO1
CO2	Gain knowledge about assembly language programming concepts.	PO1, PO2
CO3	Understand the concepts of 8086 interfacing.	PO1, PO2
CO4	Learn the fundamentals of the 8051 Microcontroller.	PO1, PO2
CO5	Know the interfacing with the 8051 Microcontroller.	PO1

TEXT BOOKS:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

REFERENCE BOOKS:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

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

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III B.TECH. - V SEMESTER

		L	T	P	C
23ECE356L	**ANALOG & DIGITAL IC APPLICATIONS LAB (Common to All Branches)**	-	-	3	1.5

-REQUISITES: Nil.

COURSE EDUCATIONAL OBJECTIVES:

1. To design an Inverting and Non-inverting Amplifier using an Op Amp.
2. To demonstrate the Linear and Non-Linear Applications using IC 741.
3. To design Astable and Monostable Multivibrator using timer ICs.
4. To analyse the DAC and ADC converter.
5. To design Counters and Registers using digital ICs.

List of Experiments: (At least 8 Linear and 4 Digital IC experiments shall be performed).

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op Amp and draw the comparison results of A=B, A>B, A<B
4. Design a Integrator and Differentiator Circuits using IC741 and derive the required condition practically.
5. Design a Active LPF, HPF cutoff frequency of 2 KHZ and find the roll off of it.
6. Design a Circuit using IC741 to generate sine/square/triangular wave with period of 1KHZ and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC555 and draw its output waveform.
8. Construct Astable Multivibrator using IC555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Voltage Regulator usingIC723, IC 7805/7809/7912 and find its load regulation factor.
11. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
12. Design Parallel comparator type/ counter type/ successive approximation ADC and find its efficiency.
13. Design a 8x1 multiplexer using digital ICs.
14. Design a 4-bit Adder/Subtractor using digital ICs
15. Design a Decade counter and verify its truth table and draw respective waveforms.
16. Design a Up/down counter usingIC74163 and draw read/write waveforms.
17. Design a Universal shift register using IC 74194/195 and verify its shifting operation.
18. Design a 8x3 encoder/3x8 decoder and verify its truth table.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the basic principles of analog and Digital Integrated circuits	PO1
CO2	Analyze the functioning performance of linear and digital ICs	PO2
CO3	Gain practical knowledge to design an electronic circuit using integrated chips	PO3
CO4	Conduct investigation for analyzing the integrated circuits performance in various applications	PO4
CO5	Follow ethical principles in analyzing and designing the circuits	PO8
CO6	Do experiments effectively as an individual and as a member in a group	PO9
CO7	Communicate verbally and in written form, the understandings about the circuits	PO10
CO8	Continue updating their skill and apply during their life time	PO12

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	3	-	-	-	-
CO6	-	-	-	-	-	-	-	-	3	-	-	-
CO7	-	-	-	-	-	-	-	-	-	3	-	-
CO8	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

III B.TECH.-V SEMESTER

23ECE358L MICROPROCESSORS AND MICROCONTROLLERS LAB

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

1. To become skilled in 8086 Assembly Language programming.
2. To understand the detailed software and hardware structure of the microprocessor.
3. Train their practical knowledge through laboratory experiments.
4. To understand and learn 8051 Microcontroller.
5. To acquire knowledge on microprocessors and microcontrollers, interfacing various peripherals, and configuring.

LIST OF EXPERIMENTS:
(ANY TEN OF THE EXPERIMENTS ARE TO BE CONDUCTED)

1. Programs for 16 Bit Arithmetic Operations (Using various addressing modes)
   a) Write an ALP to Perform Addition and Subtraction of Multi precision numbers.
   b) Write an ALP to Perform Multiplication and division of signed and unsigned Hexadecimal numbers.
   c) Write an ALP to find square, cube and factorial of a given number.
2. Programs Involving Bit Manipulation Instructions
   a) Write an ALP to find the given data is positive or negative.
   b) Write an ALP to find the given data is odd or even.
   c) Write an ALP to find Logical ones and zeros in a given data.
3. Programs on Arrays for 8086
   a) Write an ALP to find Addition/subtraction of N no_s.
   b) Write an ALP for finding largest/smallest no.
   c) Write an ALP to sort given array in Ascending/descending order.
4. Programs on String Manipulations for 8086
   a) Write an ALP to find String length.
   b) Write an ALP for Displaying the given String.
   c) Write an ALP for Comparing two Strings.
   d) Write an ALP to reverse String and Checking for palindrome.
5. Programs for Digital Clock Design Using 8086
   a) Write an ALP for Designing clock using INT 21H Interrupt.
   b) Write an ALP for Designing clock using DOS Interrupt Functions.
   c) Write an ALP for Designing clock by reading system time.
6. Interfacing Stepper Motor with 8086
   a) Write an ALP to 8086 processor to Interface a stepper motor and operate it in clockwise by choosing variable step-size.
   b) Write an ALP to 8086 processor to Interface a stepper motor and operate it in Anti-clockwise by choosing variable step-size.
7. Interfacing ADC/DAC with 8086
   a) Write an ALP to 8086 processor to Interface ADC.
   b) Write an ALP to 8086 processor to Interface DAC and generate Square Wave/Triangular Wave/Step signal.
8. Communication between Two Microprocessors
   a) Write an ALP to have Parallel communication between two microprocessors using 8255
   b) Write an ALP to have Serial communication between two microprocessor kits using 8251.
9. Programs using Arithmetic and Logical Instructions for 8051
   a) Write an ALP to 8051 Microcontroller to perform Arithmetic operations like addition, subtraction,
   b) Multiplication and Division.
   c) Write an ALP to 8051 Microcontroller to perform Logical operations like AND, OR and XOR. Programs related to Register Banks.

10. Programs to Verify Timers/Counters of 8051
    a) Write a program to create a delay of 25msec using Timer0 in mode 1 and blink all the Pins of P0.
    b) Write a program to create a delay of 50 µsec using Timer1 in mode 0 and blink all the Pins of P2.
    c) Write a program to create a delay of 75msec using counter0 in mode 2 and blink all the Pins of P1.
    d) Write a program to create a delay of 80 µsec using counter1 in mode 1 and blink all the Pins of P3.
11. UART Operation in 8051
    a) Write a program to transfer a character serially with a baud rate of 9600 using UART.
    b) Write a program to transfer a character serially with a baud rate of 4800 using UART.
    c) Write a program to transfer a character serially with a baud rate of 2400 using UART.
12. Interfacing LCD with 8051
    a) Develop and execute the program to interface16*2 LCD to 8051.
    b) Develop and execute the program to interface LCD to 8051 in 4-bit or 8-bit mode.

REFERENCE BOOKS:

1. 1.Kenneth.J.Ayala. The 8051 microcontroller, 3rd edition, Cengage learning,2010.
2. Advanced microprocessors and peripherals-A.K ray and K.M.Bhurchandani, TMH, 2nd edition2006. The 8051 Microcontroller and Embedded Systems: Using Assembly and C by Muhammad AliMazidi, Janice GillispieMazidi, Second Edition.

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos**
CO1	Develop testing and experimental procedures on 8086 microprocessor and analyze the operation under different cases.	**PO1**
CO2	Setup programming strategies and select proper mnemonics and run the program on the training boards.	**PO2**
CO3	Able to understand and work with microprocessor real time interfaces including digital to analog converters, stepper motors, analog to digital converters	**P03**
CO4	Design and implement programs on 8051 and PIC microcontrollers	**PO4**
CO5	Able to interfacing circuits with RTOS development boards and understand the concept related to I/O devices.	**PO5**
CO6	Follow ethical principles in designing, simulating and implementing various circuits.	**PO8**
CO7	Do experiments effectively as an individual and as a member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understandings about the experiments.	**PO10**
CO9	Continue updating their skill related to semiconductors implementation for various application during their life time	**PO12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	-	3	-	-	-	-	-	-	-	-	-	-
CO.3	-	-	3	-	-	-	-	-	-	-	-	-
CO.4	-	-	-	3	-	-	-	-	-	-	-	-
CO.5	-	-	-	-	3	-	-	-	-	-	-	-
CO.6	-	-	-	-	-	-	-	3	-	-	-	-
CO.7	-	-	-	-	-	-	-	-	3	-	-	-
CO.8	-	-	-	-	-	-	-	-	-	3	-	-
CO.9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

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III B.TECH. - V SEMESTER

23ECE359L	PCB DESIGN AND PROTOTYPE DEVELOPMENT (SKILL ORIENTED COURSE)	L	T	P	C
		-	2	1	2

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Identifying Electronic Components Symbols & Footprints.
2. To analyse the capability to produce PCBs of their circuit.
3. To effectively use the design rules & interfacing between schematic & PCB.

UNIT –1: FUNDAMENTAL OF BASIC ELECTRONICS

Fundamental of basic electronics: Component identification, Component symbols & their footprints, understand schematic, Creating new PCB, Browsing footprints libraries, Setting up the PCB layers, Design rule checking, Track width selection, Component selection, Routing and completion of the design.

UNIT –2: INTRODUCTION TO PCB

Introduction to PCB: Definition and Need/Relevance of PCB, Background and History of PCB, Types of PCB, Classes of PCB Design, Terminology in PCB Design, Different Electronic design automation (EDA)tools and comparison.

UNIT –3: PCB DESIGN PROCESS

PCB Design Process: PCB Design Flow, Placement and routing, Steps involved in layout design, Artwork generation Methods - manual and CAD, General design factors for digital and analogue circuits, Layout and Artwork making for Single-side, double-side and Multilayer Boards, Design for manufacturability, Design-specification standards

Practice Exercises: Any twelve experiments are to be done

Practice following PCB Design steps

1. Schematic Design: Familiarization of the Schematic Editor, Schematic creation, Annotation, Netlist generation.
   Layout Design: Familiarization of Footprint Editor, Mapping of components, Creation of PCB layout Schematic.
   Create new schematic components.
   Create new component footprints.
2. Regulator circuit using 7805
3. Inverting Amplifier or Summing Amplifier using op-amp
4. Full-wave Rectifier
5. Astable multivibrator using IC555
6. Monostable multivibrator using IC555
7. RCPhase-shifter oscillator using transistor.
8. Wein-bridge Oscillator using op- amp
9. Full-Adder using half-adders.
10. 4-bit binary /MOD N counter using D-Flip flops.
11. One open-ended (analog/ digital/mixed circuit) experiments of similar nature and magnitude to the above are to be assigned by the teacher
    (Student is expected to solve and execute/simulate independently).
12. Design an 8051 Development board having Power section consisting of IC7805, capacitor, resistor, headers, LED.
13. Design an 8051 Development board having Serial communication section consisting of MAX 232, Capacitors, DB9 connector, Jumper, LEDs

14. Design an 8051 Development board having Reset & Input/output sections consisting of 89C51 Microcontroller, Electrolytic Capacitor, Resistor, Jumper, Crystal Oscillator, Capacitors
15. Fabricate a single-sided PCB, mount the components and assemble them in a cabinet for any one of the circuits mentioned in the above exercises.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Demonstrated and applied the knowledge of the design a schematic of their circuit	PO1
CO2	Analyze the schematic of their circuit	PO2
CO3	Find and analyse the schematic of their circuit.	PO3
CO4	Analyze and design PCB layout of their design.	PO4
CO5	Simulate PCB designing using simulation tool.	PO5
CO6	Follow ethical principles in designing, simulating and implementing various circuits.	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to semiconductors implementation for various application during their life time	PO12

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	-	3	-	-	-	-	-	-	-	-	-	-
CO.3	-	-	3	-	-	-	-	-	-	-	-	-
CO.4	-	-	-	3	-	-	-	-	-	-	-	-
CO.5	-	-	-	-	3	-	-	-	-	-	-	-
CO.6	-	-	-	-	-	-	-	3	-	-	-	-
CO.7	-	-	-	-	-	-	-	-	3	-	-	-
CO.8	-	-	-	-	-	-	-	-	-	3	-	-
CO.9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	3	3	3	3	3	-	-	3	3	3	-	3

REFERENCES:

1. Jon Varteresian, Fabricating Printed Circuit Boards, z, 2002
2. R. Tummala, Fundamentals of Microsystems Packaging, McGraw-Hill 2001
3. C. Robertson. PCB Designer´s Reference. Prentice Hall, 2003
4. Open-source EDA Tool KiCad Tutorial: http://kicad-pcb.org/help/tutorials/
13. PCB Fabrication

user guide page:
http://www.wikihow.com/Create-Printed-Circuit-Boards
http://www.siongboon.com/projects/2005-09-07_home_pcb_fabrication/
http://reprap.org/wiki/MakePCBInstructions#Making_PCBs_yourself
PCB Fabrication at home (video): https://www.youtube.com/watch?v=mv7Y0A9YeUc,
https://www.youtube.com/watch?v=imQTCW1yWkg

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III B.TECH.-V SEMESTER

23ESC52L	TINKERING LAB	L T P C 0 0 2 1

COURSE OBJECTIVES:

1. Encourage Innovation and Creativity
2. Provide Hands-on Learning and Impart Skill Development
3. Foster Collaboration and Teamwork
4. Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
5. Impart Problem-Solving mind-set

LIST OF EXPERIMENTS: (Any nine experiments shall be done)

1. Make your own parallel and series circuits using breadboard for any application of your choice.
2. Design and 3D print a Walking Robot
3. Design and 3D Print a Rocket.
4. Temperature & Humidity Monitoring System (DHT11 + LCD)
5. Water Level Detection and Alert System
6. Automatic Plant Watering System
7. Bluetooth-Based Door Lock System
8. Smart Dustbin Using Ultrasonic Sensor
9. Fire Detection and Alarm System
10. RFID-Based Attendance System
11. Voice-Controlled Devices via Google Assistant
12. Heart Rate Monitoring Using Pulse Sensor
13. Soil Moisture-Based Irrigation
14. Smart Helmet for Accident Detection
15. Milk Adulteration Detection System
16. Water Purification via Activated Carbon
17. Solar Dehydrator for Food Drying
18. Temperature-Controlled Chemical Reactor
19. Ethanol Mini-Plant Using Biomass
20. Smart Fluid Flow Control (Solenoid + pH Sensor)
21. Portable Water Quality Tester
22. AI Crop Disease Detection
23. AI-based Smart Irrigation
24. ECG Signal Acquisition and Plotting
25. AI-Powered Traffic Flow Prediction
26. Smart Grid Simulation with Load Monitoring
27. Smart Campus Indoor Navigator
28. Weather Station Prototype
29. Firefighting Robot with Sensor Guidance
30. Facial Recognition Dustbin
31. Barcode-Based Lab Inventory System
32. Growth Chamber for Plants
33. Biomedical Waste Alert System
34. Soil Classification with AI
35. Smart Railway Gate
36. Smart Bin Locator via GPS and Load Sensors
37. Algae-Based Water Purifier
38. Contactless Attendance via Face Recognition

Note: The students can also design and implement their own ideas, apart from the list of experiments mentioned above.

Note: A minimum of 8 to 10 experiments must be completed by the students.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos**
CO1	Design electronic circuits for variety of applications using series and parallel connections	**PO1**
CO2	Analyze and solve real time problems using Arduino boards	**PO2**
CO3	Design and analyze a real time circuit using Tinkercad	**P03**
CO4	Simulate and interface actuators using Arduino boards	**PO4**
CO5	Able to use modern simulation tools for interfacing the hardware components.	**PO5**
CO6	Follow ethical principles in designing, simulating and implementing various circuits.	**PO8**
CO7	Do experiments effectively as an individual and as a member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understandings about the experiments.	**PO10**
CO9	Continue updating their skill related to semiconductors implementation for various application during their life time	**PO12**

CO\PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	-	3	-	-	-	-	-	-	-	-	-	-
CO.3	-	-	3	-	-	-	-	-	-	-	-	-
CO.4	-	-	-	3	-	-	-	-	-	-	-	-
CO.5	-	-	-	-	3	-	-	-	-	-	-	-
CO.6	-	-	-	-	-	-	-	3	-	-	-	-
CO.7	-	-	-	-	-	-	-	-	3	-	-	-
CO.8	-	-	-	-	-	-	-	-	-	3	-	-
CO.9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

III B.TECH. - V SEMESTER

23ESC351T	INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. Introduce fundamental quantum concepts like superposition and entanglement.
2. Understand theoretical structure of qubits and quantum information.
3. Explore conceptual challenges in building quantum computers.
4. Explain principles of quantum communication and computing.
5. Examine real-world applications and the future of quantum technologies.

UNIT I Introduction to Quantum Theory and Technologies (9)

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China

UNIT II Theoretical Structure of Quantum Information Systems (9)

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view),Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role

UNIT III Building a Quantum Computer – Theoretical Challenges and Requirements (9)

What is required to build a quantum computer (conceptual overview)?,Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers:
Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison), Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what's working and what remains elusive, The role of quantum software in managing theoretical complexities

UNIT IV Quantum Communication and Computing – Theoretical Perspective (9)

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD),Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once),Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential

UNIT V Applications, Use Cases, and the Quantum Future (9)

Real-world application domains: Healthcare (drug discovery),Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Explain core quantum principles in a non-mathematical manner.	PO1
CO2	Compare classical and quantum information systems	PO1,PO2
CO3	Identify theoretical issues in building quantum computers.	PO1, PO2
CO4	Discuss quantum communication and computing concepts.	PO1, PO2
CO5	Recognize applications, industry trends, and career paths in quantum technology.	PO1

TEXT BOOKS:

1. Michael A. Nielsen, Isaac L. Chuang, Quantum Computation and Quantum Information, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
3. Chris Bernhardt, Quantum Computing for Everyone, MIT Press, 2019.

REFERENCE BOOKS:

1. David McMahon, Quantum Computing Explained, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, An Introduction to Quantum Computing, Oxford University Press, 2007.
3. Scott Aaronson, Quantum Computing Since Democritus, Cambridge University Press, 2013.
4. Alastair I.M. Rae, Quantum Physics: A Beginner's Guide, Oneworld Publications, Revised Edition, 2005.
5. Eleanor G. Rieffel, Wolfgang H. Polak, Quantum Computing: A Gentle Introduction, MIT Press, 2011.
6. Leonard Susskind, Art Friedman, Quantum Mechanics: The Theoretical Minimum, Basic Books, 2014.
7. Bruce Rosenblum, Fred Kuttner, Quantum Enigma: Physics Encounters Consciousness, Oxford University Press, 2nd Edition, 2011.
8. GiulianoBenenti, GiulioCasati, GiulianoStrini, Principles of Quantum Computation and Information, Volume I: Basic Concepts, World Scientific Publishing, 2004.
9. K.B. Whaley et al., Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document, Quantum Flagship, European Commission, 2020.
10. Department of Science & Technology (DST), Government of India, National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers, MeitY/DST Publications, 2020 onward.

REFERENCE WEBSITE:

- **IBM Quantum Experience and Qiskit Tutorials**
- **Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley**
- **edX – The Quantum Internet and Quantum Computers**
- **YouTube – Quantum Computing for the Determined by Michael Nielsen**
- **Qiskit Textbook – IBM Quantum**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.TECH.-VI SEMESTER

23ECE361T **DIGITAL SIGNAL PROCESSING** **L T P C**
3 0 0 3

COURSE OBJECTIVES:

1. To get familiar with the properties of discrete time signals, systems and z-transform.
2. To learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.
3. To understand the implementations of digital filter structures.
4. To analyse the FIR filter design using Fourier series and windowing methods.
5. To gain the knowledge on Programmable DSP Devices.

UNIT I - DISCRETE TIME SIGNALS AND SYSTEMS & Z- TRANSFORM (9)

Introduction to digital signal processing, Review of discrete-time signals and systems, Analysis of discrete-time linear time invariant systems, frequency domain representation of discrete time signals and systems
Definition, ROC, Properties, Poles and Zeros in Z-plane, the inverse Z Transform, System analysis, Transfer function.

UNIT II - DISCRETE FOURIER TRANSFORM & FAST FOURIER TRANSFORM (9)

Introduction, Discrete Fourier Series, properties of DFS, Discrete Fourier Transform, Inverse DFT, properties of DFT, Linear and Circular convolution, convolution using DFT, sampling, Quantization effects.
Introduction, Fast Fourier Transform, Radix-2 Decimation in time and Decimation in frequency FFT, Inverse FFT (Radix-2).

UNIT III – IIR FILTERS (9)

Introduction to digital filters, Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters by Impulse invariant and bilinear transformation methods, Frequency transformations, Basic structures of IIR Filters - Direct form I, Direct form-II, Cascade form and Parallel form realizations.

UNIT IV – FIR FILTERS (9)

Introduction, Characteristics of FIR filters with linear phase, Frequency response of linear phase FIR filters, Design of FIR filters using Fourier series and windowing methods (Rectangular, Triangular, Raised Cosine, Hanging, Hamming, Blackman), Comparison of IIR & FIR filters, Basic structures of FIR Filters – Direct form, Cascade form, Linear phase realizations.

UNIT V – ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES (9)

Architecture of TMS320C5X: Introduction, Bus Structure, Central Arithmetic Logic Unit, Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit, Memory mapped registers, program controller, some flags in the status registers, On- chip memory, On-chip peripherals.

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Familiar with the properties of discrete time signals, systems and z-transform.	PO1, PO2
CO2	Learn the importance of FFT algorithm for computation of Discrete Fourier Transform and Fast Fourier Transform with decimations.	PO1, PO2, PO3
CO3	Understand the implementations of digital filter structures.	PO1, PO2
CO4	Analyse the FIR filter design using Fourier series and windowing methods.	PO1, PO2, PO3
CO5	Gain the knowledge on Programmable DSP Devices.	PO1, PO2

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education, 2007.
2. A.V.Oppenheim and R.W. Schaffer, Discrete Time Signal Processing, PHI.

REFERENCE BOOKS:

1. S.K.Mitra, Digital Signal Processing – A practical approach, 2nd Edition, Pearson Education, New Delhi, 2004.
2. MH Hayes, Digital Signal Processing, Schaum's Outline series, TATA Mc-Graw Hill, 2007.
3. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab, Thomson, 2007.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	3	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	2	-	-	-	-	-	-	-	-	-
CO.3	3	3	-	-	-	-	-	-	-	-	-	-
CO.4	3	3	3	-	-	-	-	-	-	-	-	-
CO.5	3	3	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.TECH. - VI SEMESTER

23ECE362T MICROWAVE AND OPTICAL COMMUNICATIONS

L	T	P	C
3	0	0	3

PRE-REQUISITES: Electromagnetic Waves and Transmission Lines, antenna wave propagation

COURSE EDUCATIONAL OBJECTIVES:

1. To analyse different modes of operation in rectangular wave guides, circular wave guides and resonators.
2. To study and analyse various microwave components and microwave sources.
3. To gain knowledge on different microwave semiconductor devices and microwave measurements procedures.
4. To analyse different optical fiber modes and to study different types of distortions and losses in optical communication.
5. To study various optical sources, optical detectors and to analyze various optical links.

UNIT I - WAVEGUIDES (9)

Waveguides: Introduction, Rectangular waveguides, Field expressions for TE and TM modes, Wave propagation in the guide, Phase and group velocities, Power transmission and attenuation, Waveguide current and mode excitation, Circular waveguide – TE and TM modes (**Qualitative treatment only**), Wave propagation, Cavity resonators (**Qualitative treatment only**).

UNIT II - MICROWAVE DEVICES, AMPLIFIERS AND OSCILLATORS (9)

Passive Microwave Devices: Introduction to scattering parameters and their properties, Terminations, Variable short circuit, Attenuators, Phase shifters, Hybrid Tees (H-plane, E-plane, Magic Tees), Directional Couplers – Bethe hole and Two hole Couplers, Deriving Scattering matrix for Microwave passive devices. Microwave propagation in Ferrites, Gyrator, Isolator, Circulator.

Microwave Amplifiers and Oscillators: Microwave Tubes: Linear Beam Tubes – Two cavity Klystron amplifier -velocity modulation, bunching process, output power, Reflex Klystron oscillator, power output and efficiency, Travelling Wave Tube (TWT) – Bunching process and amplification process (**Qualitative treatment only**).Crossed Field Tubes – Magnetron oscillator, pi-mode operation, power output and efficiency, Har tree Condition.

UNIT III - MICROWAVE SEMICONDUCTOR DEVICES, AND MEASUREMENTS (9)

Microwave Semiconductor Devices: Gunn Oscillator – Principle of operation, Characteristics, Two valley model, IMPATT, TRAPATT diodes.

Microwave Measurements: Description of Microwave bench-different blocks and their features, errors and precautions, Microwave power measurements, Measurement of attenuation, frequency, VSWR (low, medium, high), Measurement of Q` of a cavity, Impedance measurements.

UNIT IV - OPTICAL FIBERS AND TRANSMISSION CHARACTERISTICS (9)

Introduction to Optical Fibers and Transmission Characteristics - The propagation of light in optical waveguides – Classification of optical fibers – Numerical aperture, Step index and Graded index fiber – Modes in cylindrical fiber – Linearly polarized modes, Attenuation: Absorption, Scattering, Bending losses. Modal dispersion and chromatic dispersion – Single mode fiber - waveguide dispersion– MFD – PMD

UNIT V - OPTICAL TRANSMITTERS, RECEIVERS AND LINK DESIGN (9)

Optical Transmitters and Receivers : Optical Sources: - Light source materials – LED homo and hetero structures–surface and edge emitters–Quantum efficiency– Injection Laser Diode – Modes and threshold condition – Structures and Radiation Pattern. Optical detectors: – Physical principles – PIN and APD diodes – Photo detector noise
Optical Link Design: Point-to-point links–System considerations – Link Power budget – Rise time budget.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Analyze different modes of operation in rectangular wave guides, circular wave guides and resonators	**PO1, PO2**
CO2	Understand and analyze various microwave components and microwave sources	**PO1, PO2, PO3**
CO3	Gain knowledge on different microwave semiconductor devices and microwave measurements procedures.	**PO1, PO2**
CO4	Analyze different optical fiber modes and to study different types of distortions and losses in optical communication.	**PO1, PO2**
CO5	Understand study various optical sources, optical detectors and to analyze various optical links.	**PO1, PO2, PO3**

TEXTBOOKS:

1. David M. Pozar, Microwave Engineering ǁJohn Wiley & Sons, Inc. 4thedition,2012
2. Samuel Y.Liao, Microwave Devices and Circuits, PHI publications, Third Edition, 1997.
3. Ger Keiser, Optical Fiber Communications ,McGrawHill, Third Edition,2000.

REFERENCES:

1. R.E.Collin, Foundations for Microwave Engineering, Wiley Student Edition, Second Edition, 2009.
2. Om.P.Gandhi, Microwave: Engineering and applications, KaiFa Book Company, 1981.
3. ReichH.J.,etal, Microwave Principlesǁ, MIT Press, 1972.
4. FETerman, Electronic and Radio Engineering, McGrawHill, 4th Edition, 1984

REFERENCE WEBSITE:

1.https://nptel.ac.in/courses/117/101/117101054/
2.https://nptel.ac.in/courses/108/103/108103141/

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

III B.TECH. - VI SEMESTER

23ECE363T **VLSI DESIGN** **L T P C**
3 0 0 3

PRE-REQUISITES: -

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the steps involved in fabrication of ICs using MOS transistor technology.
2. To learn about the VLSI design processes, Stick diagrams and Layouts.
3. To gain knowledge on the Gate Level Design concepts.
4. To learn the design of various subsystems with different VLSI Design styles.
5. To get familiar with CMOS testing techniques.

UNIT 1 - INTRODUCTION TO IC TECHNOLOGY & ELECTRICAL PROPERTIES (9)

Introduction: Brief Introduction to IC technology MOS, PMOS, NMOS, CMOS & BiCMOS Technologies.

Basic Electrical Properties of MOS and BiCMOS Circuits: IDS - VDS relationships, MOS transistor Threshold Voltage, figure of merit, Transconductance, Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters

UNIT 2 - VLSI CIRCUIT DESIGN PROCESSES (9)

VLSI Circuit Design Processes: VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Lambda(λ)-based design rules for wires, contacts and Transistors, Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

UNIT 3 - GATE LEVEL DESIGN & BASIC CIRCUIT CONCEPTS (9)

Gate level Design: Logic gates and other complex gates, Switch logic, Alternate gate circuits.

Basic Circuit Concepts: Sheet Resistance Rs and its concepts to MOS, Area Capacitances calculations, Inverter Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out

UNIT 4 - SUBSYSTEM DESIGN & VLSI DESIGN STYLES (9)

Subsystem Design: Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters.

VLSI Design styles: Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices, parameters influencing low power design.

UNIT 5 - CMOS TESTING (9)

CMOS Testing: Need for testing, Design for testability - built in self-test (BIST) – testing combinational logic –testing sequential logic – practical design for test guidelines – scan design techniques.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the steps involved in fabrication of ICs using MOS transistor technology.	PO1, PO2, P03
CO2	Learn about the VLSI design processes, Stick diagrams and Layouts.	PO1, PO2, P03
CO3	Gain knowledge on the Gate Level Design concepts.	PO1, PO2, P03
CO4	Learn the design of various subsystems with different VLSI Design styles.	PO1, PO2, P03
CO5	Familiar with CMOS testing techniques.	PO1, PO2, P03

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, Eshraghian Dougles, A. Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3 Ed., 1997, Pearson Education.

REFERENCE BOOKS:

1. CMOS VLSI Design-A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Edn, Pearson, 2009.
2. Behzad Razavi , —Design of Analog CMOS Integrated Circuits‖, McGraw Hill, 2003.
3. Jan M. Rabaey, —Digital Integrated Circuits‖, Anantha Chandrakasan and Borivoje Nikolic, Prentice-Hall of India Pvt. Ltd, 2nd edition, 2009.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/117106092
2. https://nptel.ac.in/courses/117/106/117106093/
3. https://nptel.ac.in/courses/112/107/112107219/
4. https://nptel.ac.in/courses/117/106/117106093/

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

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III B.TECH. - VI SEMESTER

23ECE367L MICROWAVE AND OPTICAL COMMUNICATIONS LAB

L	T	P	C
0	0	3	1.5

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the working of microwave bench setup and characteristics of microwave sources.
2. To verify the characteristics of various microwave components and to draw the radiation pattern of antennas.
3. To verify the characteristics of optical sources & detectors and to study about losses in optical fiber.

PART-A:Microwave Lab-Any Seven (7) Experiments

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Attenuation Measurement
4. Directional Coupler Characteristics
5. VSWR Measurement
6. Impedance Measurements
7. Frequency and Wave length measurement
8. Scattering Parameters of Directional coupler
9. Scattering Parameters of Magic TEE
10. Radiation pattern measurement of a Antenna
11. Antenna gain measurement

Part B: Optical Fiber Lab-Any five (5) Experiments

1. Characterization of LED
2. Characterization of Laser Diode
3. Intensity Modulation of Laser output through Optical fiber
4. Measurement of data rate for digital Optical link
5. Measurement of Numerical Aperture.
6. Measurement of Losses for Analog optical link

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Understand the basics of waveguides, waveguide components, microwave & optical sources, etc.	**PO1**
CO2	Demonstration of Microwave Bench.	**PO2**
CO3	Analyze different waveguide components and microwave sources	**PO3**
CO4	Demonstrate on different waveguide components for measuring purpose.	**PO4**
CO5	Develop the measurement experiments with CW & AM modes	**PO5**
CO6	Follow ethical principles in designing and implementing various measuring circuits	**PO8**
CO7	Do experiments effectively as an individual and as a member in a group.	**PO9**

CO8	Communicate verbally and in written form, the understandings about the experiments.	**P10**
CO9	Continue updating their skill related to microwave sources Optical fiber for various applications during their life time	**P12**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3		-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-	-	-	-	-	-
CO6	-	-	-	-	-	-	-	3	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3		-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

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III B.TECH. - VI SEMESTER

23ECE368L	VLSI DESIGN LAB	L	T	P	C
		-	-	3	1.5

PRE-REQUISITES: VLSI Design

COURSE EDUCATIONAL OBJECTIVES:

1. To design a logic circuit using CMOS transistor using 180 nm technology in terms of schematic, symbol, test bench, DC and AC analysis.
2. To evaluate different schematics &output responses for AOI logic by using different software tools.
3. To design CMOS circuits using Full & Semi custom IC designs for analyzation.
4. To design different layouts using different software tools for analog circuits.

List of Experiments: (Any TEN of the experiments are to be conducted)

1. Design and analysis of CMOS Inverter
a) Implement CMOS inverter schematic using 180 nm technology and design its symbol.
b) Implement test bench for CMOS Inverter and check its output response.
c) Perform DC and AC analysis for CMOS inverter.
d) Check the performance of CMOS inverter using parametric sweep.

2. Design and analysis of NAND and NOR Logic gates
a) Implement NAND/NOR schematic using 180 nm technology and design its symbol.
b) Implement test bench for NAND/NOR and check its output response.
c) Perform DC and AC analysis for NAND/NOR.
d) Check the performance of NAND/NOR using parametric sweep.

3. Design and analysis of XOR and XNOR Logic gates
a) Implement XOR/XNOR schematic using 180 nm technology and design its symbol.
b) Implement test bench for XOR/XNOR and check its output response.
c) Perform DC and AC analysis for XOR/XNOR.
d) Check the performance of XOR/XNOR using parametric sweep.

4. Design of AOI logic
a) Design Schematic for AB+C_D and check its output response.
b) Design Schematic for AB_+C_D and check its output response.
c) Design Schematic for (A+B_)(C+D) and check its output response.
d) Design Schematic for (A+B_)(C_+D) and check its output response.

5. Design and analysis of Full adder
a) Design full adder using Full custom IC design.
b) Design full adder using Semi custom IC design.

6. Analysis of NMOS and PMOS characteristics
a) Implement test bench for NMOS/PMOS transistor.
b) Perform DC and AC analysis for NMOS/PMOS transistor
c) Check the performance of NMOS/PMOS transistor using parametric sweep.

7. Design and analysis of Common source amplifier
a) Implement CS amplifier schematic using 180 nm technology and design its symbol.
b) Implement test bench for CS amplifier and check its output response.
c) Perform DC and AC analysis for CS amplifier.
d) Check the performance of CS amplifier using parametric sweep.

8. Design and analysis of Common drain amplifier
a) Implement CD amplifier schematic using 180 nm technology and design its symbol.
b) Implement test bench for CD amplifier and check its output response.
c) Perform DC and AC analysis for CD amplifier.

d) Check the performance of CD amplifier using parametric sweep.

9. Design of MOS differential amplifier
a) Design differential amplifier schematic using 180 nm technology and its symbol.
b) Implement test bench for differential amplifier and check its output response.
c) Perform DC and AC analysis for differential amplifier.
d) Check the performance of differential amplifier using parametric sweep.

10. Design of differential amplifier using FET/BJT
a) Design differential amplifier using FET/BJT schematic using 180 nm technology and its symbol.
b) Implement test bench for two stage differential amplifier and check its output response.
c) Perform DC and AC analysis for differential amplifier.
d) Check the performance of differential amplifier using parametric sweep.

11. Design of Inverter Layout
a) Design and implement inverter schematic.
b) Design the layout for inverter using 180 nm tech file.
c) Perform LVS for schematic and layout
d) Check and remove all DRC violations.
e) Extract parasitic R and C in layout.

12. Design of NAND/NOR Layout
a) Design and implement NAND/NOR schematic.
b) Design the layout for inverter using 180 nm tech file.
c) Perform LVS for schematic and layout
d) Check and remove all DRC violations.
e) Extract parasitic R and C in layout

The students are required to design the schematic diagrams using CMOS logic and to draw the layout diagrams to perform the experiments with the Industry standard EDA Tools.

Software Required: i. Mentor Graphics/ Synopsis/ Cadence / Equivalent Industry Standard Software. ii. Personal computer system with necessary software to run the programs and to implement.

TEXT BOOKS:

1. Essentials of VLSI Circuits and Systems, Kamran Eshraghian, Eshraghian Dougles, A. Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3 Ed., 1997, Pearson Education.

REFERENCE BOOKS:

1. CMOS VLSI Design-A Circuits and Systems Perspective, Neil H.E Weste, David Harris, Ayan Banerjee, 3rd Edn, Pearson, 2009.
2. Behzad Razavi , —Design of Analog CMOS Integrated Circuits‖, McGraw Hill, 2003.
3. Jan M. Rabaey, —Digital Integrated Circuits‖, Anantha Chandrakasan and Borivoje Nikolic, Prentice-Hall of India Pvt. Ltd, 2nd edition, 2009.

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1. https://nptel.ac.in/courses/117/106/117106093/
2. https://nptel.ac.in/courses/112/107/112107219/
3. https://nptel.ac.in/courses/117/106/117106093/

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Demonstrate knowledge on programming the combinational and sequential circuit designs	PO1
CO2	Analyze the functionality of digital circuits	PO2
CO3	Design the circuits which are used for successful implementation of simple & complex systems	PO3
CO4	Conduct investigation and test the functionality on implementation of combinational and sequential elements.	PO4
CO5	Select appropriate FPGA hardware and procedure to analyze and implement Digital circuits	PO5
CO6	Follow ethical principles in analyzing and implementing functionalities of various circuits	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue to update the skills related to the program for various applications during the life time.	PO12

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-		-	-	-	-
CO6	-	-	-	-	-	-	-	2	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**2**	**3**	**3**	**-**	**3**

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III B.TECH. - VI SEMESTER

23ECE366L	MACHINE LEARNING AND DSP LAB (SKILL ORIENTED COURSE)	L	T	P	C
		-	1	2	2

PRE-REQUISITES: Basic mathematics

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the modules and dependencies for machine learning corresponding to different applications.
2. To understand a range of machine learning regression techniques & clustering along with their datasets.
3. To write the programs and implement k-Nearest Neighbor algorithm to classify the iris data sets, images & CNN.
4. To simulate the basic signal processing operations like convolution and correlation.
5. To simulate the DSP operations like DFT, FFT & implement IIR and FIR filters using simulation software and verify their frequency responses.

MACHINE LEARNING (Implement any six concepts)

Implement the following concepts using python with supporting applications.

1. Familiarizing with Anaconda and Jupyter for importing modules and dependencies for ML Familiarization with NumPy, Panda and Matplotlib by Loading Dataset in Python
2. **Linear regression:** Predict the profit of a company/House price from a dataset using the concept of linear regression. Implement the speech recognition model (NLP) from a speech/audio dataset using the concept of linear regression
3. **Logistic regression:**
   a) Identify whether the patient has diabetes or not from diabetes dataset using Logistic regression
   b) Implement the speech to text model (NLP- Speech recognitions system) from a speech dataset using the concept of linear regression
4. **Polynomial regression:**
   a. Determine the quality of wine using wine dataset with the help of polynomial regression
   b. Implement the speech recognition model (NLP) from a speech / audio data set using the concept of polynomial regression.
5. **K-means clustering:** Apply the concept of K-means clustering for image segmentation problem (Brain tumor and Lung images)/Color quantization
6. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set to demonstrate the working of the decision tree based ID3 algorithm.
7. Write a program to implement the k-Nearest Neighbor algorithm for image classification and distance metric learning for large margin with image classification applications using k-nearest neighbor.
8. **PCA/LDA:** Reduce the dimensionality of a dataset for Face recognition system
9. Design an Artificial neural network for Digit classification using Back Propagation Algorithm for MNIST Data set. Train MLP using Gradient descent algorithm by applying Linear, Sigmoid, tanh, and ReLu activation functions
10. **Digit recognition using CNN:** Identify the digit s 0-9 from MNIST data and CIFR 10 set using CNN
11. Image Classification using CNN: Classify cats and dogs using CNN from the given dataset
12. LSTM (Long Short-Term Memory Networks)/ARIMA--- Implementation biomedical signals (like EEG, ECG, EMG) classifications and disease prediction.

DIGITAL SIGNAL PROCESSING (Implement any six concepts)

1. Generate the following standard discrete time signals.
   i) Unit Impulse ii) Unit step iii) Ramp iv) Exponential v) Sawtooth
2. Generate sum of two sinusoidal signals and find the frequency response (magnitude and phase).
3. Implement and verify linear and circular convolution between two given signals.
4. Implement and verify autocorrelation for the given sequence and cross correlation between two given signals.
5. Compute and implement the N-point DFT of a given sequence and compute the power density spectrum of the sequence.
6. Implement and verify N-point DIT-FFT of a given sequence and find the frequency response (magnitude and phase).
7. Implement and verify N-point IFFT of a given sequence.
8. Design IIR Butterworth filter and compare their performances with different orders (Low Pass Filter /High Pass Filter)
9. Design IIR Chebyshev filter and compare their performances with different orders (Low Pass Filter /High Pass Filter).
10. Design FIR filter (Low Pass Filter /High Pass Filter) using windowing technique.
    i) Using rectangular window ii) Using hamming window iii) Using Kaiser window
11. Design and verify Filter (IIR and FIR) frequency response by using Filter design and Analysis Tool.
12. Compute the Decimation and Interpolation for the given signal.
13. Real time implementation of an audio signal using a digital signal processor.

REFERENCE BOOKS:

1. S.N.Sivanandamand, S.N.Deepa, Introduction to neural networks using Matlab,2006.
2. Simon Haykin, Neural Networks and Learning Machines, PHI, 2008.
3. Digital Signal Processing: Alon V. Oppenhelm, PHI
4. Digital Signal processing (II-Edition): S.K. Mitra, TMH

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Apply basic machine learning algorithms like regression, classification, and clustering to real-world datasets.	PO1
CO2	Analyze the performance of different machine learning models using appropriate metrics.	PO2
CO3	Design and implement supervised and unsupervised learning algorithms for engineering problems.	PO3
CO4	Conduct experiments with data preprocessing, feature selection, and model optimization, and interpret the results.	PO4
CO5	Use modern tools for building and evaluating machine learning models effectively.	PO5
CO6	Follow ethical principles in analyzing and implementing functionalities of various circuits	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue to update the skills related to the program for various applications during the life time.	PO12

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-		-	-	-	-
CO6	-	-	-	-	-	-	-	2	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**2**	**3**	**3**	**-**	**3**

IV B.TECH. - VII SEMESTER

23ECE471T **DATA COMMUNICATIONS AND NETWORKING** **L T P C**
3 0 0 3

PRE-REQUISITES: -

COURSE EDUCATIONAL OBJECTIVES:

1. To provide a conceptual understanding of the fundamentals of data communications and computer networks.
2. To explore different network architectures, models, and transmission media used in data communication.
3. To analyze error detection and correction methods, data link protocols, and medium access techniques.
4. To understand the functioning of network and transport layer protocols, including addressing, routing, and congestion control.
5. To study application layer protocols, network security mechanisms, and techniques to ensure data integrity.

UNIT I - OVERVIEW OF DATA COMMUNICATION AND NETWORKING (9)

Introduction; Data communications: components, direction of data flow; network criteria, physical structure, categories of network (LAN, MAN, WAN); Internet: brief history, Protocols and standards; Reference models: OSI reference model, TCP/IP reference model, their comparative study.

UNIT II - PHYSICAL LAYER (9)

Overview of data (analog & digital), signal (analog& digital), transmission (analog & digital) & transmission media (guided & unguided), queuing theory, its applications in data communication, Data Encoding Techniques, Circuit Switching, Time Division & Space Division Switching.

UNIT III - DATA LINK LAYER (9)

Types of errors, framing (character and bit stuffing), error detection & correction methods; Flow control; Protocols: Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC
Medium Access sub layer: Point to Point Protocol, Token Ring; Reservation, Polling, **Multiple Access Protocols**: Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA Traditional Ethernet, fast Ethernet.

UNIT IV - NETWORK LAYER (9)

Internetworking & devices: Repeaters, Hubs, Bridges, Switches, Router, Gateway; Addressing: IP addressing, subnetting; Routing: techniques, static Vs dynamic routing, Unicast Routing Protocols: RIP, OSPF, BGP; Other Protocols: ARP, IP, ICMP, IPV6.
Transport layer: Process to Process delivery; UDP; TCP; Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: Techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm.

UNIT V - APPLICATION LAYER (9)

Introduction to DNS, SMTP, SNMP, FTP, HTTP & WWW; Security: Cryptography (Public, Private Key based), Digital Signature.

TEXT BOOKS:

1. B.A.Forouzan – Data Communications and Networking (3rd Ed.) — TMH
2. A.S.Tanenbaum – Computer Networks (4th Ed.) ǁ – Pearson Education/PHI

REFERENCE BOOKS:

1. W. Stallings – Data and Computer Communications (5th Ed.) ǁ – PHI/ Pearson Education
2. Kurose and Rose – Computer Networking -A top-down approach featuring the internetǁ – Pearson Education
3. Leon, Garica, Widjaja – Communication Networksǁ – TMH

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/106/105/106105082/

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand of the fundamentals of data communications and computer networks.	**PO1**
CO2	Learn different network architectures, models, and transmission media used in data communication.	**PO1**
CO3	Analyze error detection and correction methods, data link protocols, and medium access techniques.	**PO1, PO2**
CO4	Grasp the functioning of network and transport layer protocols, including addressing, routing, and congestion control.	**PO1**
CO5	Gain knowledge on application layer protocols, network security mechanisms, and techniques to ensure data integrity.	**PO1**

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(Accredited by NBA)

III B.TECH.-VII SEMESTER

23ECE474L	INDUSTRIAL IOT AND AUTOMATION (SKILL ORIENTED COURSE)	L	T	P	C
		-	1	2	2

COURSE OBJECTIVES:

1. To introduce the fundamentals of Industrial IoT (IIoT), its architecture, and its differences from traditional IoT.
2. To understand the components of IIoT, including sensors, actuators, and control systems, and their integration with embedded platforms.
3. To explore communication technologies such as ZigBee, Bluetooth, NFC, RFID, and MQTT for IIoT applications.
4. To study data visualization techniques, dashboard creation, and web-based connectivity for IIoT systems.
5. To learn data retrieval techniques, machine-to-machine (M2M) communication, and cloud integration for IIoT applications. 6. To implement automation using PLCs, SCADA, and real-time control systems for industrial applications.

(All the modules need to be conducted and minimum one project to be done)

MODULE 1: INTRODUCTION & ARCHITECTURE

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IOT node, Challenges of IIOT.

Practice 1.

Introduction to Arduino, Introduction to raspberry Pi. https://www.youtube.com/watch?v=AQdLQV6vhbk

MODULE 2: IIOT COMPONENTS

Fundamentals of Control System, introductions, components, closed loop & open loop system. Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11). Digital switch, Electro Mechanical switches.

Practice

1. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
2. Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi/node mcu.
3. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi/node MCU.

MODULE 3: COMMUNICATION TECHNOLOGIES OF IIOT

Communication Protocols: IEEE 802.15.4, ZigBee, Bluetooth, BLE, NFC, RFID Industry standards communication technology (MQTT), wireless network communication.

Practice

1. Demonstration of MQTT communication.

MODULE 4: VISUALIZATION AND DATA TYPES OF IIOT

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

Practice

1. Visualization of diverse sensor data using dashboard (part of IoT‘s _control panel‘)
2. Sending alert message to the user. ways to control and interact with your environment)

MODULE 5: RETRIEVING DATA

Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction

(M2M).

Practice

1. Device control using mobile Apps or through Web pages.
2. Machine to Machine communication.

MODULE 6: CONTROL & SUPERVISORY LEVEL OF AUTOMATION

Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA).

Practice

1. Digital logic gates programming using ladder diagram.
2. Implementation of Boolean expression using ladder diagram.
3. Simulation of PLC to understand the process control concept.

Projects:

- IIoT based smart energy meter
- Smart Agriculture system
- Automation using controller via Bluetooth
- Temperature controlled Fan/cooler using controller
- Automatic streetlight
- Smart Baggage Tracker

TEXT BOOKS

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cyber manufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the Architecture, Development & Design of Embedded Systems and IOT.	PO1
CO2	Setup programming strategies and select proper mnemonics and run the program on the training boards.	PO2
CO3	Able to understand and work with ARM real time interfaces including digital to sensor and activator.	P03
CO4	Design and implement programs on ARM, Arduino, RIP. Know about the loT standards, communication technologies and protocols for IoT devices.	PO4
CO5	Implement case studies and applications using the tools and techniques of IoT Platform.	PO5
CO6	Follow ethical principles in designing, simulating and implementing various circuits. Work with Raspberry Pi using Python Programming	PO8
CO7	Do experiments effectively as an individual and as a member in a group.	PO9
CO8	Communicate verbally and in written form, the understandings about the experiments.	PO10
CO9	Continue updating their skill related to Embedded and IOT for various application during their life time	PO12

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	-	-	-	-	-	-	-	-	-	-	-
CO.2	-	3	-	-	-	-	-	-	-	-	-	-
CO.3	-	-	3	-	-	-	-	-	-	-	-	-
CO.4	-	-	-	3	-	-	-	-	-	-	-	-
CO.5	-	-	-	-	3	-	-	-	-	-	-	-
CO.6	-	-	-	-	-	-	-	3	-	-	-	-
CO.7	-	-	-	-	-	-	-	-	3	-	-	-
CO.8	-	-	-	-	-	-	-	-	-	3	-	-
CO.9	-	-	-	-	-	-	-	-	-	-	-	3
CO*	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**3**	**3**	**-**	**3**

IV B.TECH. - VII SEMESTER

23ECE475L	RF SYSTEM DESIGN TOOLS (SKILL ORIENTED COURSE)	L	T	P	C
		-	1	2	2

PRE-REQUISITES: Communication Systems and Antennas

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce RF design software and tools for designing and simulating RF systems.
2. To understand impedance matching techniques and the role of scattering parameters in RF circuit design.
3. To explore the design of RF power amplifiers, filters, oscillators, mixers, and voltage-controlled oscillators (VCOs).
4. To analyze microstrip transmission lines, their discontinuities, and their applications in RF systems.
5. To study the design, simulation, and measurement of antennas and microwave integrated circuits.

UNIT I - Basic Concepts in RF Design

Introduce any RF design software and orient students with the tools of the laboratory. Practice the tool to use it for significant design. Introduction to RF Design, Time Variance and Nonlinearity, Effects of nonlinearity, Passive impedance transformation, Scattering parameters, impedance matching, L match, Pi match, T match, Passive IC Components- Resistors, capacitors Inductors, Schottky Diode, RF Switch.

UNIT II - RF Power Amplifiers and Filters

RF Power amplifier design examples, Gain equalizers, Voltage controlled oscillators, Phase locked loops, Linearized PLL models, PLL design examples, High frequency oscillators, Loop filters, lumped filter. LPF, HPF and BPF.

UNIT III - LNA, VCO and Mixers

General considerations, Problem of input matching, Low Noise Amplifiers design in various topologies, Gain Switching, Band Switching, Voltage Controlled Oscillators, Mixers-General considerations, Passive down conversion mixers, Active down conversion mixers, Up conversion mixers.

UNIT IV - Microstrip transmission lines and discontinuities

S parameters of a Microstrip Transmission Line, Smith Chart, Analysis of Microstrip Transmission Line standing wave patterns at various frequencies, Different types of Transmission lines like CPW, Microstrip and Co-axial cable. Different types of Microstrip discontinuities like Bend, T, Via, Gap etc., Microstrip Ring Resonator.

UNIT V - Antennas and Microwave Integrated Circuits

Radiation Pattern, Gain, S Parameters, Return loss and VSWR. Design considerations of Microstrip Patch Antenna and Microstrip Array, Yagi Uda Antenna and Horn Antenna. Hybrid Microwave Integrated Circuits, Monolithic Microwave Integrated Circuits, Microwave Integrated Circuits: MMIC Amplifier.

Any twelve experiments are to be done:

1. Design and simulate Impedance matching circuits like L-Matching, Pi Matching and T-Matching.
2. Design and Simulate a Schottky Diode and RF Switch.
3. Design and simulate a RF BJT Amplifier and LNA.
4. Design and simulate a Power Amplifier and Gain Equalizer.
5. Analyse and measure the gain of a Power Amplifier and equalise its gain using an Equalizer.
6. Design and simulate a High Frequency Oscillator and Lumped Filter.

7. Measurement of insertion loss, -3dB Cut of frequency of LPF,HPF and BPF.
8. Design and Simulate a VCO and RF Mixer.
9. Measure the S parameters of a Micro strip Transmission Line and plot the normalised impedance on a smith chart
10. Analysis of Microstrip Transmission Line standing wave pattern at various frequencies.
11. Study of different types of Transmission lines like CPW, Microstrip and Co-axial and find/measure its Insertion Loss (S21 and S12)
12. Study of different types of Microstrip discontinuities like Bend, T, Via , Gap etc and find/measure its Insertion loss.
13. Determine the Bandwidth and Quality Factor of a Microstrip Ring Resonator.
14. Design and simulate the Radiation Pattern,gain, S11and VSWRof a Microstrip Patch Antenna and Microstrip Array.
15. Design and simulate the Radiation Pattern, gain, S11and VSWR of a Yagi Uda Antenna and Horn Antenna.
16. Design and Simulate a MMIC Amplifier.

Equipment Required

1. RF Circuit Design and Simulation Software
2. RF Training System
3. Antenna Measurement System with Antenna Design Software.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the basic concepts of RF design, including time variance, nonlinearity, scattering parameters, and impedance matching using tools like Smith Chart and RF simulation software.	**PO1**
CO2	Analyze passive and active RF components such as L, Pi, T matching networks, RF switches, filters, and amplifiers in RF circuits.	**PO2**
CO3	Design RF power amplifiers, gain equalizers, oscillators (VCO, PLL), and filters (LPF, HPF, BPF) for high-frequency applications.	**PO3**
CO4	Conduct experiments on transmission lines, microstrip discontinuities, ring resonators, and antenna parameters, and interpret S-parameters, VSWR, and return loss.	**PO4**
CO5	Utilize RF design tools for simulation and design of microwave circuits, antennas, and integrated circuits like MMIC.	**PO5**
CO6	Follow ethical principles in analyzing and implementing functionalities of various circuits	**PO8**
CO7	Do experiments effectively as an individual and as a member in a group.	**PO9**
CO8	Communicate verbally and in written form, the understandings about the experiments.	**PO10**
CO9	Continue to update the skills related to the program for various applications during the life time.	**PO12**

REFERENCE BOOKS:

1. Reinhold Ludwig, Pavel Bretchko, "RF Circuit Design: Theory and Applications", Pearson Education, 2nd Edition.
2. David M. Pozar, "Microwave Engineering", Wiley India, 4th Edition.
3. William F. Egan, "Practical RF System Design", Wiley, 2003.
4. Devendra K. Misra, "Radio Frequency and Microwave Communication Circuits: Analysis and Design", Wiley-Interscience, 2004.
5. T.C. Edwards, M.B. Steer, "Foundations of Interconnect and Microstrip Design", Wiley-

Blackwell, 3rd Edition, 2000.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/117105131
2. https://nptel.ac.in/courses/108101092
3. https://www.3ds.com/products-services/simulia/products/cst-studio- suite/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-
CO4	-	-	-	3	-	-	-	-	-	-	-	-
CO5	-	-	-	-	3	-	-		-	-	-	-
CO6	-	-	-	-	-	-	-	2	-	-	-	-
CO7	-	-	-	-	-	-	-	-	3	-	-	-
CO8	-	-	-	-	-	-	-	-	-	3	-	-
CO9	-	-	-	-	-	-	-	-	-	-	-	3
CO	**3**	**3**	**3**	**3**	**3**	**-**	**-**	**2**	**3**	**3**	**-**	**3**

sPROFESSIONAL ELECTIVE- I

III B.TECH. - V SEMESTER

23ECE355A	COMPUTER ARCHITECTURE & ORGANIZATION	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To learn the design of various functional units of digital computers and performance issues of computer systems.
2. To understand the basic processing unit and their connections.
3. To get familiar with different types of Data representation and Computer Arithmetic operations.
4. To know about different types of memory and their interconnections.
5. To learn the basics of parallel computing and pipelining.

UNIT I **(9)**

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt.

UNIT II **(9)**

Micro programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

Central Processing Unit: General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control.

UNIT III **(9)**

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.

Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT IV **(9)**

Input - Output Organization: Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Communication buses: Introduction to communication buses and its types

UNIT V **(9)**

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor. Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter-processor arbitration, Inter-processor communication and synchronization, Cache Coherence.

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Learn the design of various functional units of digital computers and performance issues of computer systems.	PO1
CO2	Understand the basic processing unit and their connections.	PO1
CO3	Know about different types of Data representation and Computer Arithmetic operations.	PO1, PO2
CO4	Learn about different types of memory and their interconnections.	PO1, PO2
CO5	Understand the basics of parallel computing and pipelining.	PO1

TEXT BOOKS:

4. Computer System Architecture – M. Moris Mano, Third Edition, Pearson/PHI.

REFERENCE BOOKS:

11. Computer Organization – Car Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
12. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI.
13. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/106/105/106105163/
2. https://nptel.ac.in/courses/106102157
3. https://archive.nptel.ac.in/courses/106/103/106103180/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.TECH. - V SEMESTER

23ECE355B **DETECTION AND ESTIMATION THEORY** **L T P C**
3 0 0 3

PRE-REQUISITES: Communication Systems

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the impact of white Gaussian noise on the detection of signals.
2. To analyze the detection of deterministic signals and random signals.
3. To learn about the nonparametric detections.
4. To analyze estimation signal parameter and apply suitable estimation techniques.
5. To understand the signal estimation in Discrete-Time techniques.

UNIT I STATISTICAL DECISION THEORY (9)

Review of Gaussian variables and processes; problem formulation and objective of signal detection and signal parameter estimation in discrete-time domain. Bayesian, minimax, and Neyman-Pearson decision rules, likelihood ratio, receiver operating characteristics, composite hypothesis testing, locally optimum tests, detector comparison techniques, asymptotic relative efficiency.

UNIT II - DETECTION OF DETERMINISTIC AND RANDOM SIGNALS (9)

Detection of Deterministic Signals:

Matched filter detector and its performance; generalized matched filter; detection of sinusoid with unknown amplitude, phase, frequency and arrival time, linear model.

Detection of Random Signals:

Estimator-correlator, linear model, general Gaussian detection, detection of Gaussian random signal with unknown parameters, weak signal detection

UNIT III - NONPARAMETRIC DETECTION (9)

Detection in the absence of complete statistical description of observations, sign detector, Wilcoxon detector, detectors based on quantized observations, robustness of detectors

UNIT IV - ESTIMATION OF SIGNAL PARAMETERS (9)

Minimum variance unbiased estimation, Fisher information matrix, Cramer-Rao bound, sufficient statistics, minimum statistics, complete statistics; linear models; best linear unbiased estimation; maximum likelihood estimation, invariance principle; estimation efficiency; Bayesian estimation: philosophy, nuisance parameters, risk functions, minimum mean square error estimation, maximum a posteriori estimation.

UNIT V - SIGNAL ESTIMATION IN DISCRETE-TIME (9)

Linear Bayesian estimation, Weiner filtering, dynamical signal model, discrete Kalman filtering

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the impact of white Gaussian noise on the detection of signals.	PO1, PO2
CO2	Analyze the detection of deterministic signals and random signals.	PO1, PO2
CO3	Learn about the nonparametric detections.	PO1, PO2
CO4	Analyze estimation signal parameter and apply suitable estimation techniques.	PO1, PO2
CO5	Understand the signal estimation in Discrete-Time techniques	PO1, PO2

TEXT BOOKS:

1. H. L. Van Trees, "Detection, Estimation and Modulation Theory: Part I, II, and III", John Wiley, NY, 1968.
2. H. V. Poor, "An Introduction to Signal Detection and Estimation", Springer, 2/e, 1998.

REFERENCE BOOKS:

1. S. M. Kay, "Fundamentals of Statistical Signal Processing: Detection Theory", Prentice Hall PTR, 1998.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/117103018

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.Tech-V Semester

23ECE355C	FUNDAMENTALS OF NANO-ELECTRONICS	L	T	P	C
		3	0	0	3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

1. To learn the basic understanding of nano electronics
2. The course offers a better understanding of the nano-micro fabrication.
3. Able to classify the different nanomaterials depending on the properties.
4. To Understand The phenomena using the characterization techniques
5. It provides a foundation for the device fabrication and various application in the field of sensors technology, optoelectronics, communication and nanotechnology etc.

UNIT –1: INTRODUCTION TO TUNNELING (9)

Tunnel junction and applications of tunneling, Tunneling through a Potential Barrier, Metal-Insulator, Metal-Semiconductor, and Metal-Insulator-Metal Junctions, Coulomb Blockade, Tunnel Junctions, Tunnel Junction Excited by a Current Source

UNIT-2: TUNNELING DEVICES (9)

Field Emission, Gate—Oxide Tunneling and Hot Electron Effects in nano MOSFETs, Theory of Scanning Tunneling Microscope, Double Barrier Tunneling and the Resonant Tunneling Diode.

UNIT-3: LITHOGRAPHY TECHNIQUES (9)

Introduction to lithography- Contact, proximity printing and Projection Printing, Resolution Enhancement techniques, Positive and negative photoresists, Electron Lithography, Projection Printing. Lithography based on Surface Instabilities: Wetting, De- wetting, Adhesion, Limitations, Resolution and Achievable / line widths, Lift off process, Bulk Micro machining.

UNIT-4: MEMS DEVICES (9)

Introduction to MEMS and NEMS, working principles, micro sensors, micro actuation- thermal actuation, piezoelectric actuation and electrostatic actuation–micro gripers, motors, valves, pumps, accelerometers, fluidics and capillary electrophoresis, active and passive micro fluidic devices, Piezo resistivity, Piezoelectricity and thermoelectricity.

UNIT-5: NANOELECTRONIC DEVICES (9)

Scaling of physical systems – Geometric scaling & Electrical system scaling. The Single-Electron Transistor: The Single- Electron Transistor Single-Electron Transistor Logic, Other SET and FET Structures, Carbon Nanotube Transistors (FETs and SETs), Semiconductor Nanowire FETs and SETs, Molecular SETs and Molecular Electronics, Graphenes, fullerenes- Structure and Properties.

Total Hours: 45

COURSEOUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	To understand and analyze the fundamental physics of nano electronics	PO1
CO2	Discuss various Properties of electrons in nanostructures	PO1, PO2
CO3	Describe deep insight to fabrication and characterization techniques in nanostructures	PO1, PO2
CO4	Familiarize with concepts of electronics transportation in nanostructures, understanding the working principles of MEMS and NEMS	PO1
CO5	Demonstrate the working of various nano electronics devices	PO1, PO2,PO3

TEXTBOOKS:

1. Stephen D. Senturia, "Microsystem Design, Springer Verlag", 2001.
2. Marc Madou, "Fundamentals of microfabrication & Nano Technology", Taylor and Francis, 2011.
3. T. Fukada & W.Mens, "Micro Mechanical system Principle & Technology", Elsevier, 1998.
4. Julian W.Gardnes, Vijay K. Varda, "Micro sensors MEMS & Smart Devices", 2001.

REFERENCE BOOKS:

1. Nano Terchnology and Nano Electronics – Materials, devices and measurement Techniques by WR Fahrner – Springer.
2. Nano: The Essentials – Understanding Nano Scinece and Nanotechnology by T.Pradeep; Tata Mc.Graw Hill.
3. Nanoelectronics and Nanosystems – From Transistor to Molecular and Quantum Devices by Karl Goser, Peter Glosekotter, Jan Dienstuhl
4. Quantum-Based Electronic Devices and Systems by M. Dutta and M.A. Stroscio, World Scientific.
5. Micro sensors MEMS& Smart Devices, Julian W.Gardnes, Vijay K. Varda, 2001

REFERENCE WEBSITE:

1. https://www.edx.org/course/fundamentals-of-nanoelectronics-basic- concepts
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-701-introduction-to-nanoelectronics-spring-2010/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	2	-	-	-	-	-	-	-	-	-
CO	**3**	**2.3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.TECH. - V SEMESTER

23ECE355D **INFORMATION THEORY AND CODING** **L T P C**
3 0 0 3

PRE-REQUISITES: Communication Systems

COURSE EDUCATIONAL OBJECTIVES:

1. To provide an insight into the concept of information in the context of communication theory and communication receivers.
2. To implement various source coding algorithms and analyze their performance.
3. To gain knowledge about techniques for error detection and error correction.
4. To design linear block codes and cyclic codes.
5. To get familiar with various convolutional codes.

UNIT I **(9)**

Information Theory: Introduction, Definition of Entropy, Conditional Entropy, Relative Entropy, Basic Properties of Entropy, Mutual Information, Information Inequalities, Problem solving.

Block to Variable length Coding: Prefix-free Code, Coding a single Random Variable, Prefix, Free Code, Kraft Inequality, Bounds on optimal Code length, Coding a Single Random Variable, Rooted Tree with Probabilities, Shanon-Fano Coding, Free fix code, Coding an information Source, Huffman Coding, Example.

Variable to Block Length Coding: Proper message set, assigning probabilities to K-ary rooted tree corresponding to a proper message set, Prefix free Coding of a proper message set, Tunstall message set, Tunstall coding.

UNIT II **(9)**

Asymptotic Equi-partition Property, Chebyshev inequality, Weak law of large numbers, Typical Sequences, Block to Block Coding of DMS: Consequences of Asymptotic Equipartition Property, Problem solving.

Universal Source Coding: Lempel-Ziv Algorithm, LZ -77 Encoding and Decoding, Lempel- Ziv Welch (LZW) Algorithm, LZW Encoding, and Decoding.

Coding of Sources with memory, Channel Capacity, Noisy Channel Coding Theorem, Differential Entropy, Gaussian Channel, Rate Distortion Theory, Blahut-Arimoto Algorithm, problem solving.

UNIT III **(9)**

Error Control Coding: Introduction to Error Control Codes, Error Probability with Repetition in the Binary Symmetric Channel, Parity Check Bit Coding for Error Detection, Block Coding for Error Detection and Correction, The Hamming Distance, The upper bound of the Probability of Error with Coding, Soft Decision Decoding, Hard Decision Decoding.

UNIT IV **(9)**

Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Encoding Block Codes, Decoding of Block Codes, Single Parity Check bit Code, Repeated Codes, Hadamard Code, Hamming Code, Cyclic Codes, Generator and Parity-Check Matrices of Cyclic Codes, Encoding and Decoding of Cyclic Codes, BCH codes, Reed-Solomon Code.

UNIT V **(9)**

Convolutional Coding, Code Generation, Decoding Convolutional Code, the Code Tree, Decoding in the presence of Noise, State and Trellis Diagrams, The Viterbi Algorithm, Comparison of Error Rates in Coded and Uncoded Transmission, Turbo Codes, LDPC codes, Hard and Soft Decision Decoding.

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Learn the concepts of information in the context of communication theory and communication receivers.	PO1
CO2	Implement various source coding algorithms and analyze their performance.	PO1, PO2
CO3	Gain knowledge about techniques for error detection and error correction.	PO1, PO2
CO4	Design linear block codes and cyclic codes.	PO1, PO2
CO5	Understand various convolutional codes.	PO1, PO2

TEXT BOOKS:

1. Thomas M.Cover, Joy A. Thomas, Elements of Information Theory, John Wiley & Sons,2nd Edition, 2006.
2. Herbert Taub, Donald L Shilling, Goutam Saha, Principles of Communication Systems, 4th Edition, McGraw Hill, 2017.

REFERENCE BOOKS:

14. Shu Lin, Daniel J. Costello Jr., Error Control Coding, Pearson, Second Edition, 2013.
15. Simon Haykin, Communication Systems, John Wiley, 4th Edition, 2010.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/117101053
2. https://archive.nptel.ac.in/courses/108/102/108102117/
3. https://archive.nptel.ac.in/noc/courses/noc18/SEM2/noc18-ee39/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

PROFESSIONAL ELECTIVE- II

III B.TECH. - VI SEMESTER

23ECE364A	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Electronic devices and circuits

COURSE EDUCATIONAL OBJECTIVES:

1. To know about the performance characteristics of instruments and measurement of electrical quantities.
2. To understand the construction, working and applications of different types of CRO's.
3. To analyze the working of different types of bridges.
4. To study the working of signal & function generators and analyzers.
5. To analyze the working of sensors and transducers in measuring physical parameters.

UNIT I- PERFORMANCE CHARACTERISTICS OF INSTRUMENTS (9)

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multi range, range extension/solid state and differential voltmeters, AC voltmeters–multi range, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

UNIT II- OSCILLOSCOPES (9)

Oscilloscopes: Introduction, Basic Principle, Standard specifications of CRO, CRT features, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method). Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

UNIT III – BRIDGES (9)

Bridges: DC Bridges for Measurement of resistance: Wheat stone bridge, Kelvin's Bridge, AC Bridges for Measurement of inductance- Maxwell's bridge, Hay's Bridge, Anderson bridge. Measurement of capacitance- Schearing Bridge, Wien Bridge. Errors and precautions in using bridges.

UNIT IV- SIGNAL GENERATORS (9)

Signal Generators: Signal generator-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach).Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

UNIT V- SENSORS AND TRANSDUCERS (9)

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Learn about the performance characteristics of instruments and measurement of electrical quantities.	**PO1**
CO2	Grasp the working of sensors and transducers in measuring physical parameters	**PO1, PO2**
CO3	Compare the working of different types of bridges.	**PO1**
CO4	Know the working of signal & function generators and analyzers.	**PO1, PO2**
CO5	Understand the Construction, working and applications of different types of CRO's.	**PO1, PO2**

TEXT BOOKS:

1. A.D.Helfrick and W.D. Cooper,—Modern Electronic Instrumentation and Measurement Techniques, 5th Edition, PHI, 2002.
2. H.S.Kalsi,—Electronic Instrumentation,2nd edition, Tata McGrawHill, 2004.

REFERENCES:

1. DavidA.Bell, - Electronic Instrumentation & Measurements, 2nd Edition, PHI, 2003.
2. K.LalKishore, - Electronic Measurements & Instrumentations, Pearson Education, 2009.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/108/105/108105153

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

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III B.TECH.-VI SEMESTER

23ECE364B	EMBEDDED SYSTEMS & IOT	L T P C 3 0 0 3

PRE-REQUISITES: Microprocessor and microcontroller

COURSE OBJECTIVES:

1. To understand the Architecture, Development & Design of Embedded Systems and IoT.
2. To learn the architecture and programming of ARM Microcontroller.
3. To be able to work with Raspberry Pi using Python Programming.
4. To know about the loT standards, communication technologies and protocols for IoT devices.
5. To implement case studies and applications using the tools and techniques of IoT Platform.

UNIT I - EMBEDDED SYSTEMS AND INTERNET OF THINGS (9)

Introduction, Hardware & Software Architecture of Embedded Systems, Embedded Systems Development process, Architecture of Internet of Things, Physical Design & Logical Design of IoT, IoT Enabling Technologies, IoT Levels & Deployment Tools, Applications of Embedded Systems and IoT, Design Methodology for IOT Products.

UNIT II- ARM MICROCONTROLLERS ARCHITECTURE AND PROGRAMMING (9)

Architecture, Pin Diagram, Register Set & Modes, Memory Organization, Instruction set, Programming ports, Timer/Counter, Serial communication, I/O System, Development Tools, interrupts in C, Introduction ARM mBed platform.

UNIT III - FUNDAMENTALS OF PYTHON PROGRAMMING & RASPBERRY PI (9)

Introduction to python programming, Data Types & Data Structures, working with functions, Modules & Packages, File Handling, classes, REST full Web Services, Client Libraries, Introduction & programming Raspberry Pi3, Interfaces, Integrating Input Output devices with Raspberry Pi3

UNIT IV - IOT TECHNOLOGIES, STANDARDS, TOOLS & M2M NETWORK (9)

Fundamental characteristics and high level requirements of IoT, IoT Reference models; Introduction to Communication Technologies & Protocols of IoT: BLE, Wi-Fi, LoRA, 3G/4G Technologies and HTTP, MQTT, CoAP protocols; Relevant Practicals on above technologies, M2M Network, SDN (Software Defined Networking) & NFV (Network Function Virtualization) for IoT

UNIT V- IOT PLATFORM, CLOUD COMPUTING PLATFORMS & DATA ANALYTICS FOR IOT DEVELOPMENT (9)

IOT Platform Architecture (IBM Internet of Things & Watson Platforms); API Endpoints for Platform Services; Devices Creation and Data Transmission; Introduction to NODE-RED and Application deployment, Introduction to Data Analytics, Apache Hadoop, Apache Oozie, Spark & Storm

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the Architecture, Development & Design of Embedded Systems and IoT.	PO1, PO2, P03
CO2	Learn the architecture and programming of ARM Microcontroller.	PO1, PO2, P03
CO3	Work with Raspberry Pi using Python Programming	PO1, PO2, P03, PO4
CO4	Know about the loT standards, communication technologies and protocols for IoT devices.	PO1, PO2, PO3
CO5	Implement case studies and applications using the tools and techniques of IoT Platform.	PO1, PO2, PO3, PO4

TEXT BOOKS:

1. Arsheep Bahga , Vijay Madisetti , —Internet of Things: A Hands-On Approach, 1st Edition, VPT, 2014.
2. K.V.K.K.Prasad, —Embedded Real Time Systems: Concepts, Design and Programming, 1st Edition, Dreamtech Publication, 2014.
3. Adrian McEwen, Hakim Cassimally, —Designing the Internet of Things, Wiley Publications, 2013

REFERENCE BOOKS:

1. Jonathan W Valvano, —Embedded Microcomputer Systems: Real-Time Interfacing, 3rd Edition, Thomson Engineering, 2012.
2. Olivier Hersent, David Boswarthick, Omar Elloumi, —The Internet of Things: Key applications and Protocols, 2nd Edition, Wiley Publications, 2012.
3. Rene Beuchat, Andrea Guerrieri & Sahand Kashani —Fundamentals of System-on-Chip Design on Arm Cortex-M Microcontrollers Paperback, 2 August 2021.

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
CO*	**3**	**3**	**2.4**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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III B.TECH. - VI SEMESTER

23ECE364D	FPGA DESIGN	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Digital Electronics, VLSI Design

COURSE EDUCATIONAL OBJECTIVES:

1. To learn about the use of FPGAs in digital design and the full FPGA design flow.
2. To be able to design ASM, Boolean Implementation with minimal resources.
3. To acquire knowledge on timing issues, violation and analysis of issues. Designs with eliminated issues.
4. To gain the knowledge and demonstrate the architectural as well as functional aspects of FPGAs.
5. To apply the concepts of FPGA design in implementing various logic circuits.

UNIT –1: DESIGN WITH FPGA (9)

Digital IC design flow - The role of FPGAs in digital design – advantages and applications & different FPGA families&Hierarchical design- CAD Tools.

UNIT –2: DIGITAL SYSTEM DESIGN (9)

The ASM chart - design from an ASM chart for mealy and Moore machine.Boolean implementation for minimal number of Flip-Flops - design from an ASM chart: One-Hot controller implementation state table entry to a PLD.

UNIT –3: TIMING ISSUES (9)

Clock skew in state machines -Initialization and lockout in state machines. CLOCKING AND METASTABILITY Set up time hold time – setup time hold time violations - critical path - calculation of maximum clock frequency – meta-stability - synchronizers – design examples.

UNIT –4: FPGA ARCHITECTURES (9)

FPGA architectures – Configurable logic blocks - Configurable I/O blocks – Programmable interconnect – clock circuitry – Xilinx FPGA architecture – Programming Technologies: Anti-fuse, SRAM, EPROM, EEPROM.

UNIT –5: LOGIC IMPLEMENTATION FOR FPGA (9)

Logic synthesis - logic optimization - simulation – types of simulation – physical design for FPGAs: placement, routing - testing – need for testing, testing methods - Goals and objectives - low power techniques – Design examples Traffic light controller, score board and controller, keyboard scanner and controller.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Translate a software application into hardware logic for FPGA architectures	PO1
CO2	Demonstrate knowledge and design of ASM concepts	PO1, PO2
CO3	Analyze the timing issues relatedto sequential logic implementation	PO1, PO2
CO4	Analyze and understand the concepts of FPGA Architectures	PO1, PO2
CO5	Understand and apply the concept of FPGA design in various logic implementations	PO1, PO2

TEXT BOOKS:

1. Morris Mano, "Logic and computer design fundamentals", Pearson Education, 4/e, 2008.
2. Michael D. Ciletti, "Advanced Digital design with the Verilog HDL", Pearson Education, 2/e, 2010.
3. Samir Palnitkar, "Verilog HDL: A guide to digital design and synthesis", Pearson Education India, 2010.

REFERENCE BOOKS:

4. Zainalabedin Navabi, "Verilog Digital System Design", Tata McGraw Hill, New Delhi, 2010.
5. Roth and John, "Principles of digital systems design", Cengage learning, 2010.
6. Bhasker J, "A Verilog HDL Primer", BS Publications, 2007.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/117/108/117108040/ 2.https://www.xilinx.com/products/silicon-devices/fpga/what-is-an-fpga.html

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

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III B.TECH. - VI SEMESTER

23ECE264E **SPEECH PROCESSING** **L T P C**
3 0 0 3

PRE-REQUISITES: Signals Systems

COURSE EDUCATIONAL OBJECTIVES:

1. To impart knowledge on anatomy and physiology of speech organs and the process of Speech Production.
2. To understand the methods for extracting of speech using Time domain parameters.
3. To learn the Frequency Domain Methods for Speech Processing.
4. To interpret and analyze LPC Parameters for Speech Processing.
5. To introduce the concepts of homomorphic Speech Processing.

UNIT I - FUNDAMENTALS OF DIGITAL SPEECH PROCESSING (9)

Introduction, Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production – Uniform lossless tube model, effect of losses in vocal tract and radiation at lips, Digital models for speech signals.

UNIT II - TIME DOMAIN METHODS FOR SPEECH PROCESSING (9)

Time domain parameters of speech, methods for extracting the parameters: Zero crossings, Auto-correlation function, pitch estimation.

UNIT III - FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING (9)

Introduction, Short time Fourier analysis, Filter bank analysis, Spectrographic analysis, Formant extraction, Pitch extraction.

UNIT IV - LINEAR PREDICTIVE CODING (LPC) FOR SPEECH (9)

Linear predictive Coding (LPC) for Speech: Formulation of linear prediction problem in time domain, solution of normal equations, Interpretation of linear prediction in auto correlation and spectral domains, Method of Solution of the LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

UNIT V - HOMOMORPHIC SPEECH PROCESSING (9)

Introduction, Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, pitch Detection and Formant Estimation; Applications of speech processing – Speech Enhancement, Speech recognition, Speech synthesis and Speaker Verification.

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Gain knowledge on anatomy and physiology of speech organs and the process of Speech Production.	PO1, PO2, PO3, PO4
CO2	Understand the methods for extracting of speech using Time domain parameters.	PO1, PO2, PO3, PO4
CO3	Learn the Frequency Domain Methods for Speech Processing.	PO1, PO2, PO3, PO4
CO4	Interpret and analyze LPC Parameters for Speech Processing.	PO1, PO2, PO3, PO4
CO5	Grasp the concept so homomorphic Speech Processing.	PO1, PO2, PO3, PO4

TEXT BOOKS:

1. L.R.Rabiner and S.W.Schafer,Digital Pocessing of Speech Signals,Pearson Education.
2. DouglasO' Shaughnessy,Speech Communications: Human & Machine,2nd Ed., Wiley- IEEE Press.

REFERENCE BOOKS:

1. Thomas F. Quatieri, Discrete Time Speech Signal Processing: Principles and Practice, 1stEd., Pearson Education.
2. Ben Gold & Nelson Morgan,Speech and Audio Signal Processing:Processing and Perception of Speech and Music ,1st Ed., Wiley.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/103/112103109/
2. https://nptel.ac.in/courses/122/104/122104015/
3. https://www.digimat.in/nptel/courses/video/112106180/L01.html
4. https://nptel.ac.in/courses/112/106/112106286/
5. https://nptel.ac.in/courses/112/105/112105164/
6. https://nptel.ac.in/courses/112/103/112103108/
7. https://nptel.ac.in/courses/122/104/122104014/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

PROFESSIONAL ELECTIVE- III

III B.TECH. - VI SEMESTER

		L	T	P	C
23CSM364A	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING (PROFESSIONAL CORE - ECE)	3	0	0	3

PRE-REQUISITES: NIL

COURSE EDUCATIONAL OBJECTIVES:

- To learn the basics and problems of Artificial Intelligence with rationality and structure of agents.
- To describe the search for solutions using various search strategies & algorithms for optimization.
- To evaluate the representation of Agents with Propositional Logic in Shopping World.
- To understand the concepts of Machine Learning with different Perspectives.
- To analyze Decision Tree Representation with different problems& issues.

UNIT –1: INTRODUCTION (9)

What Is AI, The Foundations of Artificial Intelligence, The History of Artificial Intelligence, The State of the Art, Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

UNIT –2: PROBLEM SOLVING (9)

Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies, informed (Heuristic) Search Strategies, Local Search Algorithms and Optimization Problems, Searching with Nondeterministic Actions.

UNIT –3: KNOWLEDGE REPRESENTATION (9)

Knowledge-Based Agents, Logic, Propositional Logic: A Very Simple Logic, Ontological Engineering, Categories and Objects, Events, Mental Events and Mental Objects, Reasoning Systems for Categories, The Internet Shopping World.

UNIT –4: INTRODUCTION TO MACHINE LEARNING (9)

Well-Posed Learning Problem, Designing a Learning system, Perspectives and Issues in Machine Learning.

Concept Learning and The General-to-Specific Ordering: Introduction, A Concept Learning Task, Concept Learning as Search, FIND-S: Finding a Maximally Specific Hypothesis, Version Spaces and the Candidate Elimination Algorithm, Remarks on Version spaces and Candidate-Elimination, Inductive Bias

UNIT –5: DECISION TREE LEARNING (9)

Introduction, Decision Tree Representation, Appropriate Problems for Decision Tree Learning, The Basic Decision Tree Learning Algorithm, Hypothesis Space Search in Decision Tree Learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	To learn the basics and problems of Artificial Intelligence with rationality and structure of agents.	PO1, PO2, P03, PO4
CO2	To describe the search for solutions using various search strategies & algorithms for optimization.	PO1, PO2, P03, PO4
CO3	To evaluate the representation of Agents with Propositional Logic in Shopping World.	PO1, PO2, P03, PO4
CO4	To understand the concepts of Machine Learning with different Perspectives.	PO1, PO2, P03, PO4
CO5	To analyze Decision Tree Representation with different problems& issues.	PO1, PO2, P03, PO4

TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach", 3rd Edition, Pearson
2. Tom M. Mitchell, Machine Learning, McGraw Hill Edition, 2013.

REFERENCE BOOKS:

1. Saroj Kaushik, "Artificial Intelligence", Cengage Learning India, 2011
2. Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, 2018.
3. David Poole and Alan Mackworth, "Artificial Intelligence: Foundations for Computational Agents", Cambridge University Press 2010.
4. Trivedi, M.C., "A Classical Approach to Artifical Intelligence", Khanna Publishing House, Delhi, 2018.
5. Christopher Bishop, Pattern Recognition and Machine Learning (PRML), Springer, 2007.
6. ShaiShalev-Shwartz and Shai Ben-David, Understanding Machine Learning: From Theory to Algorithms (UML), Cambridge University Press, 2014.

RECOMMENDED ONLINE COURSES:

1. https://onlinecourses.nptel.ac.in/noc23_cs45/
2. https://onlinecourses.nptel.ac.in › noc20_cs87/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	3	2	3	2	-	-	-	-	-	-	-	-
CO3	3	3	3	3	-	-	-	-	-	-	-	-
CO4	2	3	3	3	-	-	-	-	-	-	-	-
CO*	2.75	2.5	2.75	2.5	-	-	-	-	-	-	-	-

III B.TECH. - VI SEMESTER

23ECE365B	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Signals and systems and stochastic process

COURSE EDUCATIONAL OBJECTIVES:

1. To learn the fundamentals of Image Processing with different Transforms.
2. To understand functions of Intensity Transformations and working fundamentals of Spatial Filters
3. To implement various models of Restoring and Reconstruction of Images from filtering projections.
4. To study the concepts of image compression using different coding &Wavelets and Multiresolution Processes.
5. To design image processing systems using Segmentation techniques for Morphological & Color Images.

UNIT I - INTRODUCTION (9)

Introduction: Introduction to Image Processing, Fundamental steps in digital image processing, components of an image processing system, image sensing and acquisition, image sampling and quantization, some basic relationships between pixels, an introduction to the mathematical tools used in digital image processing.

Image Transforms: Need for image transforms, DFT of one variable, Walsh Transform. Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform, Comparison of different image transforms.

UNIT II - INTENSITY TRANSFORMATIONS AND FILTERING (9)

Intensity Transformations and Spatial Filtering: Background, Some basic intensity transformation functions, histogram processing, fundamentals of spatial filtering, smoothing spatial filters, sharpening spatial filters, Combining spatial enhancement methods Filtering in the **Frequency Domain:** Preliminary concepts, The Basics of filtering in the frequency domain, image smoothing using frequency domain filters, Image Sharpening using frequency domain filters, Selective filtering.

UNIT III - IMAGE RESTORATION AND RECONSTRUCTION (9)

Image Restoration and Reconstruction: A model of the image degradation / Restoration process, Noise models, restoration in the presence of noise only-Spatial Filtering, Periodic Noise Reduction by frequency domain filtering, Linear, Position –Invariant Degradations, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering, geometric mean filter, image reconstruction from projections.

UNIT IV - IMAGE COMPRESSION AND MULTIRESOLUTION PROCESSING (9)

Image compression: Fundamentals, Basic compression methods: Huffman coding, Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding, Bit-Plane coding, Block Transform coding, Predictive coding Wavelets and Multiresolution Processing: Image pyramids, subband coding, Multiresolution expansions, wavelet transforms in one dimensions & two dimensions.

UNIT V – SEGMENTATION AND MORPHOLOGY (9)

Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation. Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing, basic morphological algorithms for boundary extraction, thinning, gray-scale morphology, Segmentation using morphological watersheds.

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Learn the fundamentals of Image Processing with different Transforms.	PO1, PO2
CO2	Understand the functions of Intensity Transformations and working fundamentals of Spatial Filters	PO1, PO2, PO3
CO3	Implement various models of Restoring and Reconstruction of Images from filtering projections.	PO1, PO2
CO4	Grasp the concepts of image compression using different coding &Wavelets and Multiresolution Processes.	PO1, PO2,PO3
CO5	Design the image processing systems using Segmentation techniques for Morphological	PO1, PO2

TEXT BOOKS:

1. R.C. Gonzalez and R.E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.
2. Jayaraman, S. Esakkirajan, and T. Veerakumar, Digital Image Processing, Tata McGraw-Hill Education, 2011.

REFERENCE BOOKS:

1. Anil K. Jain, Fundamentals of Digital Image Processing, Prentice Hall of India, 2002.
2. B. Chanda, D. Dutta Majumder, Digital Image Processing and Analysis, PHI, 2009.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/117105079

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

III B.TECH. - VI SEMESTER

23ECE365C **SATELLITE COMMUNICATIONS** **L T P C**
3 0 0 3

PRE-REQUISITES: Communication systems

COURSE EDUCATIONAL OBJECTIVES:

1. To learn the principles of orbital mechanics& satellite launch system with performance parameters.
2. To describe the elements of communication satellite design for matching reliability.
3. To know the working concepts of various multiple access techniques and Onboard processing.
4. To analyze the satellite links design with communication links.
5. To evaluate the working of earth station design with satellite broadcasting.

UNIT I - **(9)**
Introduction Elements of orbital mechanics. Equations of motion. Tracking and orbit determination. Orbital correction/control. Satellite launch systems. Multistage rocket launchers and their performance

UNIT II **(9)**
Elements of communication satellite design. Spacecraft subsystems. Reliability considerations. Spacecraft integration.

UNIT III - **(9)**
Multiple access techniques. FDMA, TDMA, CDMA. Random access techniques. Satellite onboard processing.

UNIT IV - **(9)**
Satellite link design: Performance requirements and standards. Design of satellite links – DOMSAT, INSAT, INTELSAT and INMARSAT. Satellite - based personal communication. links.

UNIT V - **(9)**
Earth station design. Configurations. Antenna and tracking systems. Satellite broadcasting.

Total Hours:45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**POs**
CO1	Learn the principles of orbital mechanics& satellite launch system with performance parameters.	**PO1**
CO2	Describe the elements of communication satellite design for matching reliability.	**PO1, PO2**
CO3	Gain knowledge on various multiple access techniques and Onboard processing.	**PO1, PO2**
CO4	Analyze the satellite links design with communication links.	**PO1, PO2**
CO5	Evaluate the working of earth station design with satellite broadcasting.	**PO1, PO2**

TEXT BOOKS:

1. D. Roddy, Satellite Communication (4/e), McGraw- Hill, 2009.
2. T. Pratt & C.W. Bostain, Satellite Communication, Wiley 2000.

REFERENCE BOOKS:

1. B.N. Agrawal, Design of Geosynchrons Spacecraft, Prentice- Hall,1986.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/117/105/117105131/

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
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III B.TECH. - VI SEMESTER

23ECE365D	TELEVISON ENGINEERING	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Communication systems

COURSE EDUCATIONAL OBJECTIVES:

1. To familiarize with the television standards and principles
2. To demonstrate knowledge on the concepts of signal Transmission, propagation, principles of cameras and picture tubes
3. To know the operation of monochrome and color Television system
4. To analyse the operation of color signal decoding
5. To summarise the concepts of digital TV engineering.

UNIT I - INTRODUCTION (9)

TV transmitter and receivers - synchronization. Television Pictures: Geometric form and aspect ratio - image continuity - interlaced scanning - picture resolution - Composite video signal: Horizontal and vertical sync - scanning sequence. Colour signal generation and Encoding: Perception of brightness and colours - additive colour mixing - video signals for colours - luminance signal - colour difference signals - encoding of colour difference signals - formation of chrominance signal PAL encoder.

UNIT II: TV SIGNAL TRANSMISSION AND PROPAGATION (9)

Picture signal transmission - positive and negative modulation - VSB transmission - sound signal transmission - standard channel BW - TV transmitter - TV signal propagation - interference - TV broadcast channels.

TV Cameras : Camera tube types - Vidicon - Silicon Diode Array Vidicon - Monochrome TV camera - color camera. CCD Image Sensors.

Picture Tubes : Monochromatic Picture tube - Electrostatic focussing - Beam deflection - picture tube characteristics and specifications - colour picture tubes. 625 -line monochrome system - PAL colour system - TV standards.

UNIT III:MONOCHROME AND COLOUR TV RECEIVER (9)

RF tuner - IF subsystem - video amplifier - sound section - syncs separation and processing - deflection circuits - scanning circuits. PAL -D Colour Receiver: Electronic tuners - IF subsystem - Y -signal channel - Chroma decoder - Separation of U & V Colour Phasors - synchronous demodulators - Subcarrier generation - raster circuits.

UNIT IV: IF SUBSYSTEM AND COLOUR SIGNAL DECODING (9)

TV Receiver Tuners: Tuner operation - VHF and UHF tuners - digital tuning techniques - remote control of receiver functions.

PAL – D decoder - chroma signal amplifiers - separation of U and V signals - Color burst separation - Burst phase discriminator - ACC amplifier - Indent and colour killer circuits - RO phase shift and 180o PAL–SWITCH circuitry - U & V demodulator- colour signal mixing.

UNIT V: DIGITAL TV TECHNOLOGY (9)

LCD-TV ,LED TV, Smart TV and Organic LED(OLED) TV RECEIVERS -working principle, operation and applications ,HD technology, tele conference method,DTH operation.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Understand the concept of television standards, transmitter and receivers	PO1
CO2	Demonstrate the knowledge on signal transmission, cameras and picture tubes	PO1, PO2
CO3	Analyse the differences between monochrome and colour tv receiver	PO1, PO2
CO4	Demonstrate the knowledge on colour signal decoding and IF sub system	PO1, PO2
CO5	Acquire the knowledge on different digitally operated TV receivers	PO1, PO2

TEXT BOOKS:

1. R.R. Gulati ,''Modern Television Practice – Principles - Technology and Service'' –2nd edition , 2002, , New Age International Publication, New Delhi.
2. R.R. Gulati, ''Monochrome and Colour TV –3rd edition'' ,2002 , ,New Age Internationalpublication,NewDelhi.

REFERENCE BOOKS:

1. S.P. Bali,'' Colour Television Theory and Practice ''–6th edition , 1998 , , TMH ,New Delhi.
2. R.G.Gupta,'' Television Engineering and Video Systems'' –1st edition, 2007, , TMH,New Delhi
3. B. Grob and C.E. Herndon,'' Basic Television and Video Systems'' – 1st edition, 1999, McGraw Hill, New Delhi.
4. A M Dhake ,''Television and video Engineering'' –2nd edition, 1995, TMH,New Delhi

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

PROFESSIONAL ELECTIVE- IV

IV B.TECH. - VII SEMESTER

23ECE472A	CELLULAR & MOBILE COMMUNICATIONS	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To explain the basic cellular system and its working.
2. To understand the impact of multipath fading channels and techniques to mitigate fading effects in cellular communication.
3. To explore frequency management, channel assignment strategies, and different types of handoffs in cellular networks.
4. To analyze the performance of mobile antennas, interference issues, and cellular system design principles.
5. To evaluate system performance metrics such as dropped call rates, handoff strategies, and spectrum efficiency.

UNIT I - INTRODUCTION TO CELLULAR MOBILE RADIO SYSTEMS (9)

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.

UNIT II - FUNDAMENTALS OF CELLULAR RADIO SYSTEM DESIGN AND INTERFERENCE(9)

Elements of Cellular Radio System Design: General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of cellular system.

Interference: Introduction to Co-channel interference, real time co-channel interference, Co channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

UNIT III – CELL COVERAGE FOR SIGNAL AND TRAFFIC (9)

Cell Coverage for Signal and Traffic: Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long-distance propagation antenna height gain, form of a point-to-point model.

UNIT IV – CELL SITE AND MOBILE ANTENNAS (9)

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

Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non fixed channel assignment.

UNIT V – HANDOFF AND SYSTEM EVALUATION (9)

Handoff: Handoff, dropped calls and cell splitting, types of handoffs, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

System Evaluations: Performance evaluation, Signal evaluation, Measurement of average received level and level crossings, Spectrum efficiency evaluation.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the basic cellular system and its working.	**PO1, PO2**
CO2	Explain the impairments caused by multipath fading and methods to mitigate fading effects in mobile communication.	**PO1, PO2**
CO3	Apply concepts of cellular communication to solve problems related to mobile antennas and system design.	**PO1, PO2**
CO4	Analyze co-channel and non-co-channel interferences, different types of handoffs, and dropped call rates.	**PO1, PO2**
CO5	Evaluate the performance of cellular systems, including signal reception, handoff efficiency, and spectrum utilization.	**PO1, PO2**

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Gordon L. Stuber, Principles of Mobile communications, Springer International 2nd Edition, 2007.
2. Lee, Wireless and Mobile Communications, Mc Graw Hills, 3rd Edition, 2006.
3. Jon W.Mark and WeihuaZhqung, Wireless communications and Networking, PHI, 2005.
4. R.Blake, Wireless communication Technology, Thompson Asia Pvt.Ltd., 2004.

REFERENCE WEBSITE:

1. https://www.geeksforgeeks.org/cellular-networks/
2. https://www.tutorialspoint.com/wireless_communication_cellular_networks.htm

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

IV B.TECH. - VII SEMESTER

23ECE472C	DSP PROCESSORS & ARCHITECTURES	L	T	P	C
		3	0	0	3

PRE-REQUISITES : Digital signal processing

COURSE EDUCATIONAL OBJECTIVES:

1. To describe the unique features and significance of Digital Signal Processing (DSP).
2. To demonstrate various computational parameters and accuracy considerations in DSP systems.
3. To introduce architectural improvements in programmable DSP devices and their execution models.
4. To expose students to basic DSP algorithms, including filtering, FFT, and adaptive processing.
5. To outline DSP processor applications and their interfacing with memory and I/O peripherals.

UNIT I - INTRODUCTION TO DSP AND COMPUTATIONAL ACCURACY (9)

Introduction, a 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, Analysis and Design tool for DSP Systems MATLAB, DSP using MATLAB. 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, Compensating filter.

UNIT II - DSP ARCHITECTURES AND PIPELINING (9)

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, B.Tech.– Electronics & Communication Engineering JNTUAR23Regulations Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing. **Execution Control and Pipelining:** Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects, Pipeline Programming models.

UNIT III - PROGRAMMABLE DSP DEVICES (9)

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, 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 IV - IMPLEMENTATION OF DSP ALGORITHMS (9)

Implementations of Basic DSP Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing. **Implementation of FFT Algorithms:** 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 V – MEMORY AND I/O INTERFACING (9)

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

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Summarize the fundamental features and role of Digital Signal Processing in real-world applications.	**PO1, PO2**
CO2	Evaluate dynamic range, precision, and error sources in DSP implementations.	**PO1, PO2,PO4**
CO3	Explain the architectural features of DSP processors and their computational efficiency.	**PO1, PO2,PO4**
CO4	Analyze the performance of DSP algorithms on programmable DSP platforms.	**PO1, PO2,PO4**
CO5	Select and implement DSP processors for real-time applications, including memory and peripheral interfacing.	**PO1, PO2,PO4**

TEXT BOOKS:

1. Ferdinand P. Beer, E. Russell Johnston, David Mazurek, Phillip J. Cornwell, Brian 1. Avtar Singh and S. Srinivasan, Digital Signal Processing Implementation, 1st Edition, Cengage Learning, 2004.
2. Lapsley et al., DSP Processor Fundamentals, Architectures & Features, S. Chand and Co., 2000.

REFERENCE BOOKS:

1. B. Venkata Ramani and M. Bhaskar, Digital Signal Processors: Architecture, Programming and Applications, TMH, 2004.
2. Jonathan Stein, Digital Signal Processing: A Computer Science Perspective, John Wiley, 2000.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/112/103/112103109/
2. https://nptel.ac.in/courses/122/104/122104015/
3. https://www.digimat.in/nptel/courses/video/112106180/L01.html
4. https://nptel.ac.in/courses/112/106/112106286/
5. https://nptel.ac.in/courses/112/105/112105164/
6. https://nptel.ac.in/courses/112/103/112103108/
7. https://nptel.ac.in/courses/122/104/122104014/

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

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IV B.TECH. - VII SEMESTER

23ECE372D	MICRO ELECTRO MECHANICAL SYSTEMS	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To provide knowledge on Microsystems technology and Laws of scaling.
2. To educate on the rudiments of micro sensors and micro actuation techniques.
3. To introduce various fabrication processes of MEMS.
4. To introduce different Micro manufacturing techniques in MEMS.
5. To educate on the Micro system packaging techniques & its applications of MEMS.

UNIT I - INTRODUCTION TO MICROSYSTEMS (9)

Cellular Overview of microelectronics manufacture and Microsystems technology, Definition - MEMS materials - Laws of scaling - The multi disciplinary nature of MEMS - Survey of materials central to micro engineering - Applications of MEMS in various industries.

UNIT II - MICRO SENSORS AND ACTUATORS (9)

Working principle of Microsystems - micro actuation techniques - micro sensors – types – Micro actuators – types – micro-pump – micro-motors – micro – valves – micro grippers – micro accelerometers.

UNIT III – FABRICATION PROCESS (9)

Substrates - single crystal silicon wafer formation – Photolithography – Ion implantation – Diffusion – Oxidation – CVD - Physical vapor deposition - Deposition epitaxy - etching process.

UNIT IV – MICRO SYSTEM MANUFACTURING (9)

Bulk Micro manufacturing - surface micro machining – LIGA – SLIGA - Micro system packaging materials - die level - device level - system level - packaging techniques – die preparation – surface bonding - wire bonding - sealing.

UNIT V – MICROSYSTEMS DESIGN AND PACKAGING (9)

Design considerations, Mechanical Design, Process design, Realization of MEMS components using intellisuite. Micro system packaging, Packing Technologies, Assembly of Microsystems, Reliability in MEMS.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos**
CO1	Be familiar with the important concepts applicable to Microsystems technology.	**PO1**
CO2	Be fluent with the MEMS Sensors.	**PO1**
CO3	To educate on the rudiments of Micro fabrication techniques.	**PO1, PO2**
CO4	To introduce different Micro manufacturing techniques used for MEMS.	**PO1, PO2**
CO5	Apply the MEMS for different Packing Technologies for its applications.	**PO1, PO2**

TEXT BOOKS:

1. Tai-Ran Hsu "MEMS and Microsystems Design and Manufacture". Tata McGraw-Hill Publishing Company Ltd.
2. Chang Liu "Foundation of MEMS". Pearson Education.
3. Stephen D Senturia 'Microsystem Design', Springer Publication, 2000.
4. Rai - Choudhury P. "MEMS and MOEMS Technology and Applications", PHI Learning Private Limited, 2009.

REFERENCES:

1. Francis E.H. Tay and Choong .W.O, "Micro fluidics and Bio mems application", IEEE Press New York, 1997.
2. Trimmer William S., Ed., "Micromechanics and MEMS", IEEE Press New York, 1997.
3. Maluf, Nadim, "An introduction to Micro electro mechanical Systems Engineering", AR Tech house, Boston 2000.
4. Julian W.Gardner, Vijay K.Varadan, Osama O. Awadel Karim, "Micro sensors MEMS and Smart Devices", John Wiby & sons Ltd., 2001.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/117/105/117105082/
2. https://www.lboro.ac.uk/microsites/mechman/research/ipm- ktn/pdf/Technology_review/an-introduction-to-mems.pdf

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

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IV B.TECH. - VII SEMESTER

23ECE472E	RADAR ENGINEERING	L	T	P	C
		3	0	0	3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the basic working principle of Radar and target detection procedure.
2. To learn about the working and applications of CW and Frequency modulated Radar.
3. To comprehend the working and applications of MTI and Pulse Doppler Radar.
4. To understand different methods of tracking a target and their limitations.
5. To analyze the effect of noise at the receiver and uses of phased array antennas and navigational aids.

UNIT I - BASICS OF RADAR (9)

Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems. Radar Equation: SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Display types, Illustrative Problems.

UNIT –2 - CW AND FREQUENCY MODULATED RADAR (9)

Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems.FM-CW Radar, Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

UNIT III - MTI AND PULSE DOPPLER RADAR (9)

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

UNIT IV - TRACKING RADAR (9)

Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two-coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT V - DETECTION OF RADAR SIGNALS IN NOISE (9)

Introduction, Noise Figure and Noise Temperature, Matched Filter Receiver – Response Characteristics and Derivation, Correlation detection, Detection criteria, Detector Characteristics, Automatic Detection, Constant False Alarm Rate Receiver. Introduction to Software Defined Radio, Introduction to Stealth technology.

Radar Receivers: Introduction to Phased Array Antennas- Basic Concepts, Electronically Steered Phased Array Antennas, Phase Shifters, Frequency – scan Arrays, Radiation for Phased Array, Architecture for Phased Arrays. Radiation Pattern. Beam Steering and Beam Width changes. Navigational Aids: Direction Finder, VOR, ILS and Loran.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to	Pos

CO1	Learn the basic working principle of Radar and target detection procedure.	**PO1**
CO2	Know the working and applications of CW and Frequency modulated Radar.	**PO1**
CO3	Gain the knowledge of about MTI and Pulse Doppler Radar.	**PO1, PO2**
CO4	Understand different methods of tracking a target and their limitations.	**PO1, PO2**
CO5	Analyze the effect of noise at the receiver and uses of phased array antennas and navigational aids.	**PO1, PO2**

TEXT BOOKS:

1. Merrill I. Skolnik, —Introduction to Radar Systems‖, 2nd Edition, TMH Special Indian Edition, 2007.
2. Byron Edde, —Radar Principals, Technology, Applications‖, Pearson Education, 1992.

REFERENCE BOOKS:

1. Peebles, —Radar Principles‖, Wiley, New York, 1998.
2. G.S.N.Raju, —Radar Engineering and Fundamentals of Navigational Aids‖, I. K. International Pvt. Ltd.
3. G. SasiBhushan Rao, — Microwave and Radar Engineering‖, Pearson Education, 2014

REFERENCE WEBSITE:

1. https://www.tutorialspoint.com/radar_systems/index.html
2. https://www.youtube.com/watch?v=K1pOShhWGhk

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

PROFESSIONAL ELECTIVE- V

IV B.TECH. - VII SEMESTER

23ECE473A	5G COMMUNICATIONS	L T P C 3 - - 3

PRE-REQUISITES: Digital communication

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce the fundamental concepts of 5G spectrum, radio access technologies, and system requirements.
2. To understand the architecture and physical layer aspects of 5G networks, including MIMO and beamforming.
3. To explore advanced 5G radio-access technologies and their role in multi-user communication.
4. To study network slicing, SDN, NFV, and their applications in vehicular communications.
5. To analyze mobility management, interference control, and dynamic network reconfiguration in 5G.

UNIT I - 5G RADIO SPECTRUM AND CHANNEL MODEL (9)

5G Radio Spectrum: 5G spectrum landscape and requirements, Spectrum access modes and sharing scenarios, 5G spectrum technologies.

5G Channel Model: The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling.

5G Use Cases and System Concept: Use cases and requirements, 5G system concept.

UNIT II– RADIO INTERFACE ARCHITECTURE (9)

Radio Interface Architecture: 5G architecture options, core network architecture, RAN architecture. 5G PHYSICAL LAYER: Physical channels and signals, 5G frame structure, physical layer procedures (MIMO, Power control, link adaptation, beam forming).

UNIT III - 5G RADIO-ACCESS TECHNOLOGIES (9)

5G Radio-Access Technologies: Access design principles for multi-user communications, multi-carrier with filtering: a new waveform, non-orthogonal schemes for efficient multiple access

UNIT IV – INTRODUCTION TO 5G NETWORK SLICING (9)

Introduction to 5G Network Slicing: Network Slicing, E2E Slicing, SDN and NFV Slicing **Vehicular Communications:** From V2V to AV2X, key standards, VC architectures, V2X Use cases

UNIT V – MOBILITY AND HANDOFF MANAGEMENT IN 5G (9)

Mobility and Handoff Management in 5G: Network deployment types, Interference management in 5G, Mobility management in 5G, Dynamic network reconfiguration in 5G.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the 5G radio spectrum and channel models, including spectrum sharing and propagation challenges.	PO1, PO2
CO2	Analyze the 5G network architecture, including the core network, RAN, and physical layer procedures.	PO1, PO2
CO3	Evaluate different 5G radio-access technologies, including new waveforms and non-orthogonal multiple access schemes.	PO1, PO2
CO4	Apply network slicing concepts and vehicular communication techniques for efficient 5G network deployment.	PO1, PO2, PO3
CO5	Develop strategies for mobility and handoff management to optimize network performance and minimize interference.	PO1, PO2, PO3

TEXT BOOKS:

1. Afif Osseiran, Jose F Monserrat, Patrick Marsch, —5G Mobile and Wireless Communications Technology‖, Cambridge University Press, 2016
2. Saad Z. Asif, —5G Mobile Communications Concepts and Technologies, CRC Press, Taylor & Francis Group, First Edition, 2018
3. HarriHolma, Antti Toskala, Takehiro Nakamura, —5G Technology 3GPP NEW RADIO‖, John Wiley & Sons First Edition,2020

REFERENCE BOOKS:

1. Gordon L. Stuber, —Principles of Mobile Communication‖, KLUWER ACADEMIC PUBLISHERS, 2nd Edition, 2002
2. Joseph C. Liberti, Theodore S. Rappaport, —Smart Antennas for Wireless Communications‖, Prentice Hall PTR, 1999
3. Ying Zhang, —Network Function Virtualization Concepts and Applicability in 5G Networks‖, John Wiley & Sons, 2018.

REFERENCE WEBSITE:

1. https://nptel.ac.in/courses/108101092
2. https://nptel.ac.in/courses/117106114
3. https://nptel.ac.in/courses/108104091
4. https://nptel.ac.in/courses/117101050

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	-
CO.2	2	3	-	-	-	-	-	-	-	-	-	-
CO.3	2	3	-	-	-	-	-	-	-	-	-	-
CO.4	2	2	2	-	-	-	-	-	-	-	-	-
CO.5	2	2	2	-	-	-	-	-	-	-	-	-
CO*	**2.2**	**2.4**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

IV B.TECH. - VII SEMESTER

23ECE473B **LOW POWER VLSI DESIGN** **L T P C**
3 0 0 3

PRE-REQUISITES: VLSI Design, Digital Electronics

COURSE EDUCATIONAL OBJECTIVES:

1. To understand the need for low-power circuit design and analyze different power dissipation mechanisms in VLSI circuits.
2. To explore various low-power design approaches at the system, circuit, and mask levels.
3. To study low-power adder architectures and their role in power-efficient computing.
4. To examine different low-power multiplier architectures and their impact on digital design.
5. To gain knowledge of low-power memory technologies and their future developments.

UNIT –1: FUNDAMENTALS OF LOW POWER VLSI (9)

Fundamentals: Need for Low Power Circuit Design, Sources of Power Dissipation – Static and Dynamic Power Dissipation, Short Circuit Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

UNIT –2: LOW-POWER DESIGN APPROACHES (9)

Low-Power Design Approaches: Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches.
Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

UNIT –3: LOW-VOLTAGE LOW-POWER ADDERS (9)

Low-Voltage Low-Power Adders: Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques – Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

UNIT –4: LOW-VOLTAGE LOW-POWER MULTIPLIERS (9)

Low-Voltage Low-Power Multipliers: Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

UNIT –5: LOW-VOLTAGE LOW-POWER MEMORIES (9)

Low-Voltage Low-Power Memories: Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		Pos
CO1	Understand the need for low-power circuit design and analyze different power dissipation mechanisms in VLSI circuits.	PO1, PO2, P03, PO4
CO2	Learn various low-power design approaches at the system, circuit, and mask levels.	PO1, PO2, P03, PO4
CO3	Gain knowledge on low-power adder architectures and their role in power-efficient computing.	PO1, PO2, P03, PO4
CO4	Examine different low-power multiplier architectures and their impact on digital design.	PO1, PO2, P03, PO4
CO5	Grasp knowledge of low-power memory technologies and their future developments.	PO1, PO2, P03, PO4

TEXT BOOKS:

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

REFERENCE BOOKS:

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998.
3. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons,2000.

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/106/105/106105034/
2. https://archive.nptel.ac.in/courses/106/105/106105034/
3. https://nptel.ac.in/courses/117106092
4. https://nptel.ac.in/courses/117106092

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	-	-	-	-	-	-	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-
CO3	3	2	2	2	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-
CO*	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES
(Autonomous)
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING
(Accredited by NBA)

IV B.TECH. - VII SEMESTER

23ECE473C **MEDICAL ELECTRONICS** **L T P C**
3 - - 3

PRE-REQUISITES: Nil

COURSE EDUCATIONAL OBJECTIVES:

1. To gain knowledge and analyze the various physiological parameters and its recording methods, signal characteristics.
2. To understand the respiratory, Blood pressure, temperature measurements etc.
3. To study about the various assist devices used in the hospitals.
4. To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.
5. To know the recent trends in Tele-medicine and laser in medicine.

UNIT I - ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING (9)

The origin of Bio-potentials; bio potential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II– BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT (9)

pH, PO2, PCO2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood cell counters.

UNIT III - ASSIST DEVICES (9)

Cardiac pacemakers, DC Defibrillator, Dialyzer, Heart lung machine

UNIT IV – PHYSICAL MEDICINE AND BIOTELEMETRY (9)

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

UNIT V – RECENT TRENDS IN MEDICAL INSTRUMENTATION (9)

Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to Telemedicine.

Total Hours: 45

COURSE OUTCOMES:

On successful completion of the course, students will be able to		**Pos**
CO1	Distinguish and analyze the various physiological parameters and its recording methods, signal characteristics.	**PO1, PO2**
CO2	Describe the respiratory, Blood pressure, temperature measurements etc.	**PO1, PO2**
CO3	Analyze function of various assist devices used in the hospitals.	**PO1, PO2**
CO4	Demonstrate knowledge about equipment used for physical. Medicine and the various recently developed diagnostic and therapeutic techniques.	**PO1, PO2**
CO5	Extend knowledge medicine. on recent trends in telemedicine and laser in	**PO1, PO2**

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.
2. John G.Webster, "Medical Instrumentation Application and Design" Wiley India 3rd, Edition, 2007.

REFERENCE BOOKS:

1. Khandpur, R.S, "Handbook of Biomedical Instrumentation" TATA McGraw-Hill, New Delhi, 2003.
2. Joseph J. Carr and John M. Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 2004.

REFERENCE WEBSITE:

1. https://onlinecourses.nptel.ac.in/noc21_ee105

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO.1	3	2	-	-	-	-	-	-	-	-	-	-
CO.2	3	3	-	-	-	-	-	-	-	-	-	-
CO.3	3	3	-	-	-	-	-	-	-	-	-	-
CO.4	3	2	-	-	-	-	-	-	-	-	-	-
CO.5	3	2	-	-	-	-	-	-	-	-	-	-
CO*	**3**	**2.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

IV B.TECH. - VII SEMESTER

23ECE473D **WIRELESS SENSOR NETWORKS** **L T P C**
3 0 0 3

PRE-REQUISITES: Data Communication and Computer Network

COURSE EDUCATIONAL OBJECTIVES:

1. To introduce the fundamental concepts and architecture of wireless sensor networks.
2. To explore various network architectures, optimization techniques, and design principles for wireless sensor networks.
3. To study MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication.
4. To understand the infrastructure establishment of sensor networks, including topology control and synchronization.
5. To provide knowledge on sensor network platforms, programming challenges, and simulation tools.

UNIT I - OVERVIEW OF WIRELESS SENSOR NETWORKS (9)

Single-Node Architecture - Hardware Components- Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks- Types of wireless sensor networks.

UNIT II - ARCHITECTURES (9)

Network Architecture- Sensor Networks-Scenarios- Design Principle, Physical Layer and Transceiver Design Considerations, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III -NETWORKING SENSORS (9)

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wakeup Concepts - SMAC, - B-MAC Protocol, IEEE 802.15.4 standard and ZigBee, the Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols Energy-Efficient Routing, Geographic Routing.

UNIT IV - INFRASTRUCTURE ESTABLISHMENT (9)

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT - V SENSOR NETWORK PLATFORMS AND TOOLS (9)

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node level Simulators, State-centric programming.

COURSE OUTCOMES:

On successful completion of the course, students will be able to		POs
CO1	Learn the fundamental concepts and architecture of wireless sensor networks.	**PO1**
CO2	Explore various network architectures, optimization techniques, and Design principles for wireless sensor networks.	**PO1, PO3**
CO3	Gain knowledge of MAC protocols, routing techniques, and addressing mechanisms for efficient sensor network communication.	**PO1**
CO4	Understand the infrastructure establishment of sensor networks, including topology control and synchronization.	**PO1**
CO5	Grasp the knowledge on sensor network platforms, programming challenges, and simulation tools.	**PO1**

TEXT BOOKS:

1. Holger Karl & Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks‖, John Wiley, 2005.
2. Feng Zhao & Leonidas J.Guibas, —Wireless Sensor Networks-An Information Processing Approach", Elsevier, 2007

REFERENCE BOOKS:

1 Waltenegus Dargie, Christian Poellabauer, —Fundamentals Of Wireless Sensor Networks Theory and Practice, By John Wiley & Sons Publications, 2011
2. Kazem Sohraby, Daniel Minoli, &Taieb Znati, —Wireless Sensor Networks-Technology, Protocols, and Applications, John Wiley, 2007.
3. Anna Hac, —Wireless Sensor Network Designs, John Wiley, 2003

REFERENCE WEBSITE:

1. https://archive.nptel.ac.in/courses/106/105/106105160/

CO\ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	1	-	-	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	-	-	-	-	-	-	-	-	-	-	-
CO	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**