

B.TECH.
ELECTRONICS AND COMMUNICATION ENGINEERING
R20 SYLLABUS

B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING

R20 COURSE STRUCTURE

B.TECH. ELECTRONICS AND COMMUNICATION ENGINEERING
R20 COURSES STRUCTURE

I SEMESTER (IYearB.Tech I Semester)

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	20BSC1101	Calculus & Ordinary Differential Equations	3	0	0	3	30	70	100
2	20BSC1102	Linear Algebra & Numerical Methods	3	0	0	3	30	70	100
3	20BSC1105	AppliedPhysics	3	0	0	3	30	70	100
4	20ESC1101	Programming For Problem Solving using C	3	0	0	3	30	70	100
5	20ESC1102	Engineering Drawing	1	0	4	3	30	70	100
6	20MC1101	Environmental Science	2	0	0	0	30	70	100
Laboratory Courses									
7	20BSC1106	Applied Physics Lab	0	0	3	1.5	30	70	100
8	20ESC1103	Programming for Problem Solving Using C Lab	0	0	3	1.5	30	70	100
9	20ESC1106	ElectronicWorkshop Lab	0	0	3	1.5	30	70	100
10	20MC1102	Soft Skills Course-I	2	0	0	0	30	70	100
Total			17	0	13	19.5	300	700	1000

II SEMESTER (I Year B.Tech II Semester)

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P			CIE	SEE
Theory Courses									
1	20BSC1204	Applied Chemistry	3	0	0	3	30	70	100
2	20ESC1206	Basic Electronic Devices & Circuits	3	0	0	3	30	70	100
3	20ESC1207	Python Programming	3	0	0	3	30	70	100
4	20ESC1211	Network Analysis	3	0	0	3	30	70	100
5	20HSMC1201	English	3	0	0	3	30	70	100
6	20MC1201	Constitution of India	2	0	0	0	30	70	100
Laboratory Courses									
7	20BSC1205	Applied Chemistry Lab	0	0	3	1.5	30	70	100
8	20ESC1212	Basic Electronic Devices & Circuits Lab	0	0	3	1.5	30	70	100
9	20HSMC1202	English Lab	0	0	3	1.5	30	70	100
10	20MC1202	Soft Skills Course-II	2	0	0	0	30	70	100
Total			19	0	9	19.5	300	700	1000

III SEMESTER (II Year B.Tech I Semester)

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P			CIE	SEE
Theory Courses									
1	20BSC2101	Vector Calculus, Transforms & PDE	3	0	0	3	30	70	100
2	20MC2101	Essence of Indian Traditional Knowledge	2	0	0	0	30	70	100
3	20PCC2121	Electronic Circuit Analysis	3	0	0	3	30	70	100
4	20PCC2122	Digital Electronics & Logic Design	3	0	0	3	30	70	100
5	20PCC2123	Signals and systems	3	0	0	3	30	70	100
6	20PCC2124	RandomVariables and Stochastic Processes	3	0	0	3	30	70	100
Laboratory Courses									
7	20PCC2125	Electronic Circuit Analysis Lab	0	0	3	1.5	30	70	100
8	20PCC2126	Digital Electronics & Logic Design Lab	0	0	3	1.5	30	70	100
9	20PCC2127	Signal Processing Lab	0	0	3	1.5	30	70	100
10	20SOC2101	Skill Oriented Course–I	1	0	2	2	0	100	100
Total			18	0	11	21.5	270	730	1000

IV SEMESTER (II Year B.Tech II Semester)

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P			CIE	SEE
Theory Courses									
1	20ESC2205	Java Programming	3	0	0	3	30	70	100
2	20HSMC2201	Managerial Economics & Financial Analysis	3	0	0	3	30	70	100
3	20PCC2217	Pulse and Digital Circuits	3	0	0	3	30	70	100
4	20PCC2218	Electromagnetic Waves and Transmission Lines	3	0	0	3	30	70	100
5	20PCC2219	Analog Communications	3	0	0	3	30	70	100
Laboratory Courses									
6	20ESC2206	Java Programming Lab	0	0	3	1.5	30	70	100
7	20PCC2220	Pulse and Digital Circuits Lab	0	0	3	1.5	30	70	100
8	20PCC2221	Analog Communications Lab	0	0	3	1.5	30	70	100
9	20SOC2201	Skill Oriented Course-II	1	0	2	2	0	100	100
Total			16	0	11	21.5	240	660	900
Honors/Minor Courses			4	0	0	4			

V SEMESTER (III Year B.Tech I Semester)

V SEMESTER (III Year B.Tech I Semester)									
S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	20MC3101	Professional Ethics and Universal HumanValues	2	0	0	0	30	70	100
2	20PCC3116	Linear and Digital IC Applications	3	0	0	3	30	70	100
3	20PCC3117	VLSI Design	3	0	0	3	30	70	100
4	20PCC3118	Antenna and Wave Propagation	3	0	0	3	30	70	100
5	20PEC3104	Professional Elective –1	3	0	0	3	30	70	100
6	20OEC3104	Open Elective–1	3	0	0	3	30	70	100
Laboratory Courses									
7	20PCC3119	Linear and Digital IC Applications Lab	0	0	3	1.5	30	70	100
8	20PCC3120	VLSI Lab	0	0	3	1.5	30	70	100
9	20PROJ3101	Community Service Project	0	0	8	4	0	100	100
10	20PROJ3102	Summer Internship-I	0	0	0	1.5	0	100	100
11	20SOC3102	Skill Oriented Course-III	1	0	2	2	0	100	100
Total			18	0	16	25.5	240	860	1100
Honors/Minor Courses			4	0	0	4			

VI SEMESTER (III Year B.Tech II Semester)

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P			CIE	SEE
Theory Courses									
1	20PCC3208	Microprocessors and Microcontrollers	3	0	0	3	30	70	100
2	20PCC3219	Digital Signal Processing	3	0	0	3	30	70	100
3	20PCC3220	Digital Communications	3	0	0	3	30	70	100
4	20PEC3204	Professional Elective –2	3	0	0	3	30	70	100
5	20OEC3204	Open Elective–2	3	0	0	3	0	100	100
Laboratory Courses									
6	20PCC3211	Microprocessor and Microcontrollers Lab	0	0	3	1.5	30	70	100
7	20PCC3221	Digital Signal Processing Lab	0	0	3	1.5	30	70	100
8	20PCC3222	Advanced Communications Lab	0	0	3	1.5	30	70	100
9	20SOC3202	Skill Oriented Course-IV	1	0	2	2	0	100	100
Total			16	0	11	21.5	210	690	900
Honors/Minor Courses			4	0	0	4			

VII SEMESTER (IV Year B.Tech I Semester)

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
Theory Courses									
1	20HSMC4101	Management and Organizational Behavior	3	0	0	3	30	70	100
2	20PEC4110	Professional Elective –3	3	0	0	3	30	70	100
3	20PEC4111	Professional Elective –4	3	0	0	3	30	70	100
4	20PEC4112	Professional Elective –5	3	0	0	3	30	70	100
5	20OEC4107	Open Elective–3	3	0	0	3	30	70	100
6	20OEC4108	Open Elective–4	3	0	0	3	30	70	100
Laboratory Courses									
7	20PROJ4101	Summer Internship-II	0	0	0	3	0	100	100
8	20SOC4102	Skill Oriented Course-V	1	0	2	2	0	100	100
Total			19	0	2	23	180	620	800
Honors/Minor Courses			4	0	0	4			

VIII SEMESTER (IV Year B.Tech II Semester)

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P		CIE	SEE	Total
1	20PROJ4201	Project work, seminar and internship in industry	0	0	0	8	50	150	200
Total			0	0	0	8	50	150	200

PROFESSIONAL ELECTIVE (PE) COURSES

Pool-1: Communications

Pool-2: VLSI

Pool-3: Software Programming

Pool-4: Embedded Systems

Pool-5: Signal Processing

	PROFESSIONAL ELECTIVE-1 (IIIB.Tech. I Semester) (V Semester)	PROFESSIONAL ELECTIVE-2 (IIIB.Tech. II Semester) (VI Semester)	PROFESSIONAL ELECTIVE-3 (IVB.Tech. I Semester) (VII Semester)	PROFESSIONAL ELECTIVE-4 (IVB.Tech. I Semester) (VII Semester)	PROFESSIONAL ELECTIVE-5 (IVB.Tech. I Semester) (VII Semester)
Pool-1	Information Theory & Coding (20PEC3104A)	Microwave & Radar Engineering (20PEC3204A)	Optical Communications (20PEC4110A)	Cellular and Mobile Communications (20PEC4111A)	5G Communication (20PEC4112A)
Pool-2	Digital System Design using HDL (20PEC3104B)	Analog IC Design (20PEC3204B)	Digital IC Design (20PEC4110B)	VLSI Testing & Testability (20PEC4111B)	Low Power VLSI Design (20PEC4112B)
Pool-3	Data structures and Algorithms (20PEC3104C)	Business Intelligence & Analytics (20PEC3204C)	Augmented Reality (20PEC4110C)	Data Acquisition Systems (20PEC4111C)	Deep Learning (20PEC4112C)
Pool-4	Computer Architecture and Organization (20PEC3104D)	Robotics and Automation (20PEC3204D)	Advanced Computer Architecture (20PEC4110D)	Embedded Systems (20PEC4111D)	Wireless Sensor Networks (20PEC4112D)
Pool-5	Simulation & Mathematical Modeling (20PEC3104E)	Pattern Recognition (20PEC3204E)	DSP processors and Architectures (20PEC4110E)	Bio- Medical Signal Processing (20PEC4111E)	Digital Image Processing (20PEC4112E)

OPEN ELECTIVE (OE) COURSES OFFERED BY ECE TO OTHER BRANCHES

OPEN ELECTIVE-1	OPEN ELECTIVE-2	OPENELECTIVE-3	OPEN ELECTIVE-4
Basic Electronic Devices & Circuits (20OEC3104A)	Pulse and digital Circuits (20OEC3204A)	Digital Integrated Circuits & Applications (20OEC4107A)	Linear Integrated Circuits & Applications (20OEC4108A)
Digital Logic Design (20OEC3104B)	Fundamentals of Microprocessors & Microcontrollers (20OEC3204B)	Embedded Systems (20OEC4107B)	Fundamentals of FPGA (20OEC4108B)
Signals and Systems (20OEC3104C)	Principles of Communications (20OEC3204C)	Information Theory & Coding (20OEC4107C)	Data Communication Systems (20OEC4108C)
Digital Image Processing (20OEC3104D)	Image and Video Signal Processing (20OEC3204D)	Adaptive Signal Processing (20OEC4107D)	Bio-Medical Signal Processing (20OEC4108D)

B.Tech Honors in Electronics and Communication Engineering
HONOR COURSES OFFERED

TRACK-1: IOT

TRACK-2: SIGNAL

PROCESSING TRACK-3: VLSI
DESIGN

TRACK-4: COMMUNICATIONS

B.Tech Honors in Electronics and Communication Engineering (TRACK-1:IOT)							
S.NO.	COURS ENAME	L	T	P	CREDITS	PRE-REQ	OFFERED TO
1	Introduction to IoT (2-2)	3	0	0	3		ECE
2	IoT Lab (2-2)	0	2	1	1		
3	Introduction to Industry 4.0 and Industrial IOT (3-1)	3	0	0	3		
4	Advanced IOT Lab (3-1)	0	2	1	1		
5	Cyber security & Privacy (3-2)	3	0	0	3		
6	Cyber Security Lab (3-2)	0	2	1	1		
7	Mobile Application Development for IoT (3-2)	3	0	0	3		
8	Mobile Application Development for IoT Lab (3-2)	0	2	1	1		
9	Applications of IoT in Robotics (4-1)	3	0	0	3		
10	IoT in Robotics Lab (4-1)	0	2	1	1		
Total		15	0	10	20		

B.Tech Honors in Electronics and Communication Engineering (TRACK-2:SIGNAL PROCESSING)							
S.NO.	COURSE NAME	L	T	P	CREDITS	PRE-REQ	OFFERED TO
1	Signal Processing Techniques(2-2)	3	0	0	3		ECE
2	Signal Processing Techniques Lab (2-2)	0	0	2	1		
3	Speech Processing(3-1)	3	0	0	3		
4	Speech Processing Lab (3-1)	0	0	2	1		
5	Advanced Digital Signal Processing (3-2)	3	0	0	3		
6	Advanced Digital Signal Processing Lab (3-2)	0	0	2	1		
7	Video Signal Processing (3-2)	3	0	0	3		
8	Video Signal Processing Lab(3-2)	0	0	2	1		
9	DSPP rocessors (4-1)	3	0	0	3		
10	DSP Processors Lab (4-1)	0	0	2	1		
Total		15	0	10	20		

DEGREE IN HONOR DISCIPLINE							
B.Tech Honors in Electronics and Communication Engineering (TRACK-3:VLSI DESIGN)							
S.NO.	COURSE NAME	L	T	P	CREDITS	PRE-REQ	OFFERED TO
1	CMOS Analog IC Design (2-2)	3	0	0	3		ECE
2	CMOS Analog IC Design Lab (2-2)	0	0	2	1		
3	CMOS Digital IC design (3-1)	3	0	0	3		
4	CMOS Digital IC design Lab (3-1)	0	0	2	1		
5	System on Chip (3-2)	3	0	0	3		
6	System on Chip Lab (3-2)	0	0	2	1		
7	Design for Testability (3-2)	3	0	0	3		
8	Design for Testability Lab (3-2)	0	0	2	1		
9	Low Power VLSI Design (4-1)	3	0	0	3		
10	Low Power VLSI Design Lab (4-1)	0	0	2	1		
Total		15	0	10	20		

DEGREE IN HONOR DISCIPLINE							
B.Tech Honors in Electronics and Communication Engineering (TRACK-4:COMMUNICATIONS)							
S.NO.	COURSE NAME	L	T	P	CREDITS	PRE-REQ	OFFERED TO
1	Software Defined Radio (2-2)	3	0	0	3		ECE
2	Cognitive Radio (3-1)	3	0	0	3		
3	Information Theory & Coding (3-2)	3	0	0	3		
5	Global Navigational Satellite Systems (3-2)	3	0	0	3		
6	Data Communications (4-1)	3	0	0	3		
7	Data Communications Lab (4-1)	0	0	2	1		
8	Optical Networks (4-1)	3	0	0	3		
9	Optical Networks Lab (4-1)	0	0	2	1		
Total		18	0	4	20		

B.Tech Minors in Electronics and Communication Engineering
MINOR COURSES OFFERED

TRACK-1: IOT

TRACK-2: SIGNAL PROCESSING

TRACK-3: COMMUNICATION ENGINEERING

TRACK-4: VLSI DESIGN

DEGREE IN MINOR DISCIPLINE						
B.Tech Minors in Electronics and Communication Engineering (TRACK-1:IOT)						
S.NO.	COURSE NAME	L	T	P	CREDITS	OFFERED TO
1.	Introduction to IoT (2-2)	3	0	0	3	Other Departments except ECE
2	IoT Lab (2-2)	0	0	2	1	
3	Introduction to Security of Cyber-Physical Systems (3-1)	3	0	0	3	
4	Introduction to Industry 4.0 and Industrial IOT (3-1)	3	0	0	3	
5	IOT with Arduino & Raspberry Pi (3-2)	3	0	0	3	
6	IOT with Arduino & Raspberry Pi Lab (3-2)	0	0	2	1	
7	Ubiquitous Sensing, Computing, and Communication (3-2)	3	0	0	3	
8	Embedded Systems for IOT (4-1)	3	0	0	3	
Total		18	0	4	20	

DEGREE IN MINOR DISCIPLINE						
B.Tech Minors in Electronics and Communication Engineering (TRACK-2:SIGNAL PROCESSING)						
S.NO.	COURSE NAME	L	T	P	CREDITS	OFFERED TO
1	Analog Electronics (2-2)	3	0	0	3	Other Departments except ECE
2	Analog Electronics Lab (2-2)	0	0	2	1	
3	Digital Electronics (3-1)	3	0	0	3	
4	Digital Electronics Lab (3-1)	0	0	2	1	
5	Signals and Systems (3-2)	3	0	0	3	
6	Signal Processing Lab (3-2)	0	0	2	1	
7	Introduction to Digital Signal Processing (3-2)	3	0	0	3	
8	Digital Signal Processing Lab (3-2)	0	0	2	1	
9	Digital Image Processing (4-1)	3	0	0	3	
10	Image Processing Lab (4-1)	0	0	2	1	
Total		15	0	10	20	

DEGREE IN MINOR DISCIPLINE						
B.Tech Minors in Electronics and Communication Engineering (TRACK-3:COMMUNICATION ENGINEERING)						
S.NO.	COURSE NAME	L	T	P	CREDITS	OFFERED TO
1	Analog Electronics (2-2)	3	0	0	3	Other Departments except ECE
2	Analog Electronics Lab (2-2)	0	0	2	1	
3	Digital Electronics (3-1)	3	0	0	3	
4	Digital Electronics Lab (3-1)	0	0	2	1	
5	Principles Of Communications (3-2)	3	0	0	3	
6	Basic Communication Engineering Lab (3-2)	0	0	2	1	
7	Data Communication (3-2)	3	0	0	3	
8	Data Communication Lab (3-2)	0	0	2	1	
9	Communication Systems (4-1)	3	0	0	3	
10	Communication Systems Lab (4-1)	0	0	2	1	
Total		15	0	10	20	

DEGREE IN MINOR DISCIPLINE						
B.Tech Minors in Electronics and Communication Engineering (TRACK-4:VLSI DESIGN)						
S.NO.	COURSE NAME	L	T	P	CREDITS	OFFERED TO
1	Analog Electronics (2-2)	3	0	0	3	Other Departments except ECE
2	Analog Electronics Lab (2-2)	0	0	2	1	
3	Digital Logic Design (3-1)	3	0	0	3	
4	Digital Logic Design Lab (3-1)	0	0	2	1	
5	Linear & Digital IC Applications (3-2)	3	0	0	3	
6	LDICA Lab (3-2)	0	0	2	1	
7	VLSI Technology (3-2)	3	0	0	3	
8	VLSI Lab (3-2)	0	0	2	1	
9	Low Power VLSI (4-1)	3	0	0	3	
10	CMOS VLSI Design Lab (4-1)	0	0	2	1	
Total		15	0	10	20	



**KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

		L	T	P	Cr.
B.Tech. (I Sem.)	CALCULUS & ORDINARY DIFFERENTIAL EQUATIONS				
	Course Code: 20BSC1101 (Common to ALL BRANCHES)	3	0	0	3

Pre-requisites: Basic knowledge in Mathematics

Course Objectives:

1. To familiarize a variety of well-known sequences and series, with a developing intuition about the behavior of new ones.
2. To enlighten the learners in the concept of differential equations and multivariable calculus.
3. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

C101.1	:	Analyze the nature of sequence and series and apply the concepts of mean value theorems.
C101.2	:	Solve linear ordinary differential equations of first order and first degree
C101.3	:	Solve linear ordinary differential equations of higher order and its applications
C101.4	:	Calculate total derivative, Jacobian and maxima/minima of functions of two variables
C101.5	:	Find areas and volumes using double and triple integrals

UNIT – I	10	hrs

Sequences, Series and Mean value theorems

Sequences and Series: Convergences and divergence – Ratio test – Comparison tests – Integral test – Cauchy's root test – Alternate series – Leibnitz's rule.

Mean Value Theorems (without proofs): Rolle's Theorem – Lagrange's mean value theorem – Cauchy's mean value theorem – Taylor's and Maclaurin's theorems with remainders.

UNIT – II	10	hrs

Differential equations of first order and first degree:

Linear differential equations – Bernoulli's equations – Exact equations and equations reducible to exact form.

Applications: Newton's Law of cooling – Law of natural growth and decay – Orthogonal trajectories – Electrical circuits.

UNIT – III	10	hrs

Linear differential equations of higher order:

Non-homogeneous equations of higher order with constant coefficients – with non-homogeneous term of the type e^{ax} , $\sin ax$, $\cos ax$.

Polynomials in x^n , $e^{ax}v(x)$ and $x^n v(x)$, Method of Variation of parameters.

Applications: LCR circuit, Simple Harmonic motion.

UNIT – IV	10	hrs

Partial differentiation

Introduction – Homogeneous function – Euler's theorem – Total derivative – Chain rule – Jacobian – Functional dependence – Taylor's and McLaurin's series expansion of functions of two variables.

Applications: Maxima and Minima of functions of two variables without constraints and Lagrange's method (with constraints).

UNIT – V	10	hrs

Multiple integrals:

Double and Triple integrals – Change of order of integration – Change of variables. Applications: Finding Areas and Volumes.

	Text Books															
	1	B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers,														
	2	B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.														
	Reference Books															
	1	Erwin Kreyszig Advanced Engineering Mathematics, 10th Edition, Wiley-India.														
	2	Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14th Edition, Pearson.														
	3	Lawrence Turyn Advanced Engineering Mathematics, CRC Press, 2013.														
	4	Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press.														
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PS O3
	C101.1	3	2													
	C101.2	3	2													
	C101.3	3	2													
	C101.4	3	2													
	C101.5	3	2													
	Avg.	3	2													



**KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

		L	T	P	Cr.
B.Tech. (I Sem.)	LINEAR ALGEBRA & NUMERICAL METHODS				
	Course Code: 20BSC1102 (Common to CE, ME& ECE)	3	0	0	3

Pre-requisites: Basic knowledge in Mathematics

Course Objectives:

1. To instruct the concept of Matrices in solving linear algebraic equations
2. To elucidate the different numerical methods to solve nonlinear algebraic equations
3. To disseminate the use of different numerical techniques for carrying out numerical integration.
4. To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications.

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

C103.1	:	Apply matrix techniques to solve system of linear equations.
C103.2	:	Compute various powers of a matrix and identify the nature of the quadratic form.
C103.3	:	Solve algebraic and transcendental equations using numerical methods.
C103.4	:	Compute interpolating polynomial for the given data
C103.5	:	Solve ordinary differential equations using numerical methods

UNIT – I	10	hrs

Solving systems of linear equations, Eigen values and Eigen vectors:

Rank of a matrix by echelon form and normal form – Solving system of homogeneous and non-homogeneous linear equations – Gauss Elimination method – Eigen values and Eigen vectors and properties. (Article-2.14 in text book-1).

UNIT – II	10	hrs

Cayley–Hamilton theorem and Quadratic forms:

Cayley-Hamilton theorem (without proof) – Applications – Finding the inverse and power of a matrix by Cayley-Hamilton theorem – Reduction to Diagonal form – Quadratic forms and nature of the quadratic forms – Reduction of quadratic form to canonical forms by orthogonal transformation. Singular values of a matrix, singular value decomposition. (text book-3).

UNIT – III	10	hrs

Iterative methods:

Introduction– Bisection method–Secant method – Method of false position– Iteration method. Newton-Raphson method (One variable and simultaneous equations) – Jacobi and Gauss-Seidel methods for solving system of equations numerically.

UNIT – IV	10	hrs

Interpolation:

Introduction– Errors in polynomial interpolation – Finite differences– Forward differences– Backward differences – Central differences – Relations between operators – Newton's forward and backward formulae for interpolation – Interpolation with unequal intervals – Lagrange's interpolation formula– Newton's divide difference formula.

UNIT – V	10	hrs

Numerical differentiation and integration, Solution of ordinary differential equations with initial conditions:

Numerical differentiation using interpolating polynomial – Trapezoidal rule– Simpson's 1/3rd and 3/8th rule– Solution of initial value problems by Taylor's series– Picard's method of successive approximations– Euler's method – Runge-Kutta method (second and fourth order).

Text Books

	1	B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers,														
	2	B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.														
	3.	David Poole, Linear Algebra-A modern introduction,4 th Edition,cengage,2014														
	Reference Books															
	1	Erwin Kreyszig Advanced Engineering Mathematics, 10th Edition, Wiley-India.														
	2	Joel Hass, Christopher Heil and Maurice D. Weir, Thomas calculus, 14th Edition, Pearson.														
	3	Lawrence Turyn Advanced Engineering Mathematics, CRC Press, 2013.														
	4	Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press														
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PS O3
	C103.1	3	2													
	C103.2	3	2													
	C103.3	3	2													
	C103.4	3	2													
	C103.5	3	2													
	Avg.	3	2													



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

		L	T	P	Cr.
I B.Tech. (I Sem.)	APPLIED PHYSICS				
	Course Code: R20BSC1105 (Common to EEE & ECE)	3	0	0	3

Pre-requisites: Knowledge of theoretical and experimental Physics from +2 Levels.

Course Objectives:

1. Impart knowledge of wave optics phenomena like interference, diffraction and polarization required to design instruments with higher resolution.
2. Impart knowledge in basic concepts of LASERs and optical fibers along with its engineering applications.
3. Impart the fundamental concepts of quantum mechanics.
4. Explore the knowledge of magnetic and dielectric materials and their utility in appliances.
5. Aware the physics of Semiconductors and superconductors and their working mechanism for their utility in Engineering applications.

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

C102.1	:	Analyze the optical applications using the concepts of interference diffraction and polarization.
C102.2	:	Apply the basics of laser mechanism and fiber optics for the communications systems.
C102.3	:	Apply the concepts of quantum mechanics and free electron theory to understand the behavior of electrons and formation of energy bands.
C102.4	:	Understand the polarization phenomenon in dielectric materials and properties of magnetic materials for engineering applications.
C102.5	:	Study the basic concepts of semiconductors and superconductors and their working mechanism for their utility in engineering applications.

UNIT – I	10	hrs

Wave Optics

Interference: Principle of superposition – Interference of light – Interference in thin films (Reflection Geometry) & applications – Colors in thin films- Newton’s Rings- Determination of wavelength and refractive index.

Diffraction: Introduction – Fresnel and Fraunhofer diffraction – Fraunhofer diffraction due to single slit, double slit – N-slits (Qualitative) – Grating – Dispersive power and resolving power of Grating (Qualitative).

Polarization: Introduction-Types of polarization - Polarization by reflection, refraction and Double refraction - Nicol’s Prism -Half wave and Quarter wave plates.

UNIT – II	10	hrs

Lasers and Fiber optics

Lasers: Introduction – Characteristics of laser – Spontaneous and Stimulated emissions of radiation – Einstein’s coefficients – Population inversion – Lasing action- Pumping mechanisms – Ruby laser – He-Ne laser – Applications of lasers.

Fiber optics: Introduction – Principle of optical fiber- Acceptance Angle-Numerical Aperture- Classification of optical fibers based on refractive index profile and modes – Propagation of electromagnetic wave through optical fibers - Applications.

UNIT – III	10	hrs

Quantum Mechanics, Free Electron Theory and Band theory

Quantum Mechanics: Dual nature of matter – Heisenberg’s Uncertainty Principle – Significance and properties of wave function – Schrodinger’s time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and

demerits) – Quantum free electron theory– Equation for electrical conductivity based on quantum free electron theory- Fermi-Dirac distribution- Density of states (3D) - Fermi energy. Band theory of Solids: Bloch’s Theorem (Qualitative) - Kronig - Penney model (Qualitative) - E vs K diagram - effective mass of electron – Classification of crystalline solids.																
UNIT – IV														10	hrs	
Dielectric and Magnetic Materials Dielectric Materials: Introduction – Dielectric polarization – Dielectric polarizability, Susceptibility and Dielectric constant – Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) – Lorentz internal field- Clausius-Mossotti Equation- Piezoelectricity. Magnetic Materials: Introduction – Magnetic dipole moment – Magnetization-Magnetic susceptibility and permeability – Origin of permanent magnetic moment – Classification of magnetic materials: Dia, para, Ferro, antiferro & Ferrimagnetic materials – Domain concept for Ferromagnetism & Domain walls (Qualitative) – Hysteresis – soft and hard magnetic materials-. Eddy currents- Engineering applications.																
UNIT – V														10	hrs	
Semiconductors and Superconductors Semiconductors: Introduction- Intrinsic semiconductors – Density of charge carriers – Electrical conductivity – Fermi level – extrinsic semiconductors – density of charge carriers – dependence of Fermi energy on carrier concentration and temperature - Drift and diffusion currents – Einstein’s equation- Hall effect – Hall coefficient –Applications of Hall effect. Superconductors: Introduction – Properties of superconductors – Meissner effect – Type I and Type II superconductors – BCS theory (Qualitative) – Josephson effects (AC and DC)-SQUIDS – High Tc superconductors -Applications of superconductors.																
Text Books																
1	Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, and S. Chand Company.															
2	Engineering Physics by V. Rajendran, Tata McGraw-Hill Education.															
Reference Books																
1	Engineering physics – D.K. Battacharya and Poonam Tandon, Oxford University press.															
2	Engineering Physics by M. R. Srinivasan, New Age International Publishers, 2009.															
3	Engineering Physics – B.K. Pandey and S. Chaturvedi, 1 st Edition, Cengage Learning, 2013 .															
4	Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, 1 st Edition, University Press, 2010.															
5	Fundamentals of Physics – Halliday, Resnick and Walker, 10th Edition, John Wiley & Sons, 2013.															
e-resources																
1	NPTEL: https://youtu.be/py3InCNED8o															
2	NPTEL: https://youtu.be/PK4yFaGHSFc?list=PLU0oJASljGxdZMtypwhvGrnmuzNnNdcKt															
3	NPTEL: https://youtu.be/9seDKvbaoHU?list=PLqGm0yRYwTgr7v3HhdrI_Kcc38369fw-															
4	NPTEL: http://www.nptelvideos.in/2012/11/quantum-mechanics-and-applications.html															
5	NPTEL: https://nptel.ac.in/courses/122/106/122106034/															
6	NPTEL: https://youtu.be/DocyilQj8yE															
7	NPTEL: https://nptel.ac.in/courses/113106032/15%20%20Magnetic%20Properties.pdf															
8	NPTEL: https://nptel.ac.in/courses/108/108/108108122/															
9	NPTEL: https://www.digimat.in/nptel/courses/video/115103108/L01.html															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	P O 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O2	PS O3
	C102.1	3	2													
	C102.2	3	2													
	C102.3	3	2													
	C102.4	3	2													
	C102.5	3	2													



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	Cr.
B.Tech. (I Sem.)	PROGRAMMING FOR PROBLEM SOLVING USING C				
	Course Code: 20 ESC1101 (Common to CE, EEE, ME, ECE, CSE, IT and AI & ML)	3	0	0	3
Pre-requisites: Basic Engineering Mathematics					
Course Objectives:					
1. To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program 2. To acquire knowledge of the operators, selection, control statements and repetition in C 3. To learn about the design concepts of arrays, strings, and functions. 4. To gain knowledge about pointers, dynamic memory allocation and know the significance of Preprocessor 5. To be familiarized about File I/O and its operations					
Course Outcomes: At the end of the course, the student will be able to					
C105.1	: Formulate simple algorithms for arithmetic and logical problems.				
C105.2	: Implement conditional branching, iteration and recursion.				
C105.3	: Use arrays to formulate algorithms and programs.				
C105.4	: Use pointers and structures to formulate algorithms and programs.				
C105.5	: Apply programming to solve simple numerical method problems.				
UNIT – I		10		hrs	
Introduction to Computers: Creating and running Programs, Computer Numbering System, Storing Integers, and Storing Real Numbers Introduction to the C Language: Background, C Programs, Identifiers, Types, Variable, Constants, Input/output, Programming Examples, Scope, Storage Classes and Type Qualifiers. Structure of a C Program: Expressions Precedence and Associativity, Side Effects, Evaluating Expressions, Type Conversion Statements, Simple Programs, Command Line Arguments.					
UNIT – II		8		hrs	
Bitwise Operators: Exact Size Integer Types, Logical Bitwise Operators, Shift Operators. Selection & Making Decisions: Logical Data and Operators, Two Way Selection, Multiway Selection, More Standard Functions. Repetition: Concept of Loop, Pretest and Post-test Loops, Initialization and Updating, Event and Counter Controlled Loops, Loops in C, Other Statements Related to Looping, Looping Applications, Programming Examples.					
UNIT – III		10		hrs	
Arrays: Concepts, Using Array in C, Array Application, Two Dimensional Arrays, Multidimensional Arrays, Programming Example – Calculate Averages. Strings: String Concepts, C String, String Input / Output Functions, Arrays of Strings, String Manipulation Functions String/ Data Conversion, A Programming Example – Morse Code Enumerated. Structure and Union: the Type Definition (Type def), Enumerated Types, Structure, Unions, and Programming Application.					
UNIT – IV		10		hrs	
Pointers: Introduction, Pointers to pointers, Compatibility, L value and R value Pointer Applications: Arrays, and Pointers, Pointer Arithmetic and Arrays, Memory Allocation Function, Array of Pointers, Programming Application. Processor Commands: Processor Commands.					
UNIT – V		10		hrs	
Functions: Designing, Structured Programs, Function in C, User Defined Functions, Inter Function Communication, Standard Functions, Passing Array to Functions, Passing Pointers to Functions, Recursion, Command Line Arguments Text Input / Output: Files, Streams, Standard Library Input / Output Functions, Formatting Input /					

	Output Functions, Character Input / Output Functions Binary Input / Output: Text versus Binary Streams, Standard Library, Functions for Files, Converting File Type.															
	Text Books															
1	Byron Gottfried, “Programming with C”, Third Edition (Schaum’s Outlines), 2017, Mc-Graw Hill.															
2	Programming for Problem Solving, Behrouz A. Forouzan, Richard F. Gilberg, Adapted by Dr L. Sumalatha, First Edition 2020, Cengage.															
	Reference Books															
1	Computer Fundamentals and Programming, Sumithabha Das, Mc Graw Hill, 2019.															
2	Programming in C, Ashok N. Kamthane, Amit Kamthane, Third Edition 2015, and Pearson.															
3	Computer Fundamentals and Programming in C, Pradip Dey, Manas Ghosh, Second Edition 2013, Oxford.															
	CO-PO/PSO Mapping Matrix															
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C105.1	3	2													
	C105.2	3	2													
	C105.3	3	2													
	C105.4	3	2													
	C105.5	3	2													
	Avg.	3	2													



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.	
B.Tech. (I Sem.)		ENGINEERING DRAWING					
		Course Code: 20ESC1102 (Common to CE, EEE, ME & ECE)		1	0	4	3
Pre-requisites: Mathematics at +2 Levels.							
Course Objectives: To introduce the students, the techniques of constructing the various types of polygons, curves and scales. The objective is also to draw the orthographic projections, visualize and represent the 3D objects in 2D planes with proper dimensioning and scaling.							
Course Outcomes: At the end of the course, the student will be able to							
C104.1	:	Construct the polygons, Curves and scales in different methods					
C104.2	:	Draw the orthographic projections of a point and a line inclined to one and both the reference planes.					
C104.3	:	Draw the projections of plane figures inclined to one and both the reference planes.					
C104.4	:	Draw the projections of regular solids with the axis inclined to one and both the reference planes.					
C104.5	:	Convert the isometric views into orthographic views & vice versa and draw 2D, 3D objects using Auto CAD.					
UNIT – I						10	hrs
Objective: To introduce the students to use drawing instruments and to draw polygons, Engineering Curves and scales Polygons: Constructing regular polygons by general methods, inscribing and describing polygons on circles. Curves: Parabola, Ellipse and Hyperbola by general and special methods, cycloids, involutes, tangent & normal for the curves. Scales: Plain scales, diagonal scales and vernier scales.							
UNIT – II						10	hrs
Objective: To introduce the students to use orthographic projections, projections of points & simple lines. To make the students draw the projections of the lines inclined to both the planes. Orthographic Projections: Reference plane, importance of reference lines, Projections of Points: Projections of points in various quadrants, Projections of Straight lines: Projections of Straight line parallel to both the planes, line parallel to one plane and inclined to other plane, line inclined to both the planes, determination of true lengths, angle of inclination and traces.							
UNIT – III						9	hrs
Objective: The objective is to make the students draw the projections of the plane inclined to both the planes. Projections of planes: regular planes perpendicular/parallel to one reference plane and inclined to the other reference plane; inclined to both the reference planes.							
UNIT – IV						10	hrs
Objective: The objective is to make the students to draw the projections of the various types of solids in different positions inclined to one of the planes. Projections of Solids – Prisms, Pyramids, Cones and Cylinders in different positions with the axis inclined to one of the planes and both the planes.							
UNIT – V						10	hrs
Objective: The objective is to represent the object in 3D view through isometric views. The student will be able to represent and convert the isometric view to orthographic view and vice versa. Orthographic views: Conversion of isometric views to orthographic views. Isometric views: Conversion of orthographic views to isometric views.							

CAD: Computer Aided Design, drawing practice using Auto CAD, creating 2D&3D drawings of objects using Auto CAD. Note: In the End Examination there will be no question from CAD																
Text Books																
1	Engineering Drawing (53 rd Edition 2014) by N.D. Bhatt, V.M. Panchal, Pramod. R. Ingle, Charotar Publishing House Pvt. Ltd.															
2	Engineering Graphics (3 rd Edition 2019) by Agarwal. B & Agarwal. C.M., Tata McGraw Hill Publishers.															
Reference Books																
1	Engineering Drawing (3 rd Edition) by K.L.Narayana & P. Kannaiah, Scitech Publishers.															
2	Engineering Drawing and Computer Graphics (3 rd Edition) by Shah M. B. & Rana B.C., Pearson Education.															
3	Engineering Graphics (1 st January 2012) by PI Varghese, McGrawHill Publishers.															
4	Engineering Drawing + Auto Cad (6 th Edition) by K Venugopal, V. Prabhu Raja, New Age															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C104.1	2	3													
	C104.2	2	3													
	C104.3	2	3													
	C104.4	2	3													
	C104.5	2	3													
	Avg.	2	3													



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (I Sem.)		ENVIRONMENTAL SCIENCE				
		Course Code: 20MC1101 (Common to CE, ME & ECE)	2	0	0	0
Pre-requisites: Basic Knowledge in Environment and protection.						
Course Objectives:						
1. Overall understanding of the natural resources						
2. Basic understanding of the ecosystem and its diversity.						
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities						
4. An understanding of the environmental impact of developmental activities.						
5. Awareness on the social issues, environmental legislation and global treaties.						
Course Outcomes: At the end of the course, the student will be able to						
C109.1	:	Describe the scope, importance of sustainability, structure and function of ecosystem				
C109.2	:	Explain the importance of Natural Resources for the sustenance of life and conservation of Natural resources				
C109.3	:	Describe how biodiversity is in extinction in India and the need of conservation practices.				
C109.4	:	Illustrate the adverse effects of pollution and remedial solutions				
C109.5	:	Analyze issues both in rural and urban environment and assess the possible steps to be taken to combat the challenges				
UNIT – I					10	hrs
Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information technology in environment and human health. Ecosystems: Concept of an ecosystem. -Structure and function of an ecosystem; Producers, consumers and decomposers. -Energy flow in the ecosystem -Ecological succession. -Food chains, food webs and ecological pyramids; Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.						
UNIT – II					10	hrs
Natural resources and associated problems: Forest resources: Use and over –exploitation, deforestation –Timber extraction –Mining, dams and other effects on forest and tribal people. Water resources: Use and over utilization of surface and ground water –Floods, drought, conflicts over water, dams –benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification; Role of an individual in conservation of natural resources; Equitable use of resources for sustainable lifestyles.						
UNIT – III					10	hrs
Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity-classification -Value of biodiversity: consumptive use, productive use, Social-Biodiversity at national and local levels. India as mega-diversity nation -Hot-spots of biodiversity -Threats to biodiversity: habitat loss, man-wildlife conflicts. -Endangered and endemic species of India –Conservation of biodiversity: conservation of biodiversity.						
UNIT – IV					10	hrs
Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise						

pollution, Nuclear hazards. Role of an individual in prevention of pollution. -Pollution case studies, Sustainable Life Studies. Impact of Fire Crackers on Men and his well being. Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e –waste management.																
UNIT – V															10	hrs
Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness. Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus –Green business and Green politics. The student should Visit an Industry / Ecosystem and submit a report individually on any issues related to Environmental Studies course and make a power point presentation.																
Text Books																
1	Environmental studies by Anubha Kaushik and C.P.Kaushik.															
2	Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai.															
Reference Books																
1	Text Book of Environmental Studies by Deeshita Dave & P. UdayaBhaskar, Cengage learning.															
2	Glimpses of Environment by K.V.S.G. Murali Krishna Published by Environmental Protection Society, Kakinada, A.P.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C109.1	3					2	3	1							
	C109.2	3					2	3	1							
	C109.3	3					2	3	1							
	C109.4	3					2	3	1							
	C109.5	3					2	3	1							
	Avg.	3					2	3	1							



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			L	T	P	Cr.
I B.Tech. (I Sem.)		APPLIED PHYSICS LAB				
		Course Code: 20BSC1106 (Common to EEE & ECE)	0	0	3	1.5
Pre-requisites: Knowledge of intermediate experimental Physics from +2 Levels.						
Course Objectives:						
1. To gain practical knowledge by applying the experimental methods to correlate with the theoretical studies.						
2. To learn the usage of electrical and optical systems for various measurements.						
3. Apply the analytical techniques and graphical analysis to the experimental data.						
4. To achieve perfectness in experimental skills and the study of practical applications.						
5. To develop intellectual communication skills and discuss the basic principles of scientific concepts in a group.						
Course Outcomes: At the end of the course, the student will be able to						
C107.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C107.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C107.3	Determine the optical parameters based on interference and diffraction.					
C107.4	Find Planck’s constant, electrical and magnetic properties of materials by using appropriate circuits.					
List of Experiments (Any of the 10 experiments are required to be conducted) (8 from Physical lab & 2 from Virtual lab)						
1	Determination of thickness of thin object by wedge method.					
2	Determination of radius of curvature of given plano convex lens by Newton’s rings.					
3	Determination of dispersive power of the prism.					
4	Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.					
5	Laser: Determination of wavelength using diffraction grating.					
6	Determination of numerical aperture and acceptance angle of an optical fiber.					
7	Study of variation of magnetic field along the axis of a current carrying circular coil by Stewart & Gee’s method.					
8	Determination of dielectric constant using charging and discharging method.					
9	Study the variation of B-H Curve by Magnetizing the magnetic material.					
10	Determine the energy gap of a semiconductor using p-n junction diode.					
11	Resistivity of a Superconductor using four probe method & Meissner effect.					
12	Estimation of Planck’s constant using photoelectric effect.					
Virtual Lab Experiments						

13	Estimation of Planck's constant using photoelectric effect.
14	Study the variation of B-H Curve by Magnetizing the magnetic material.
15	Blackbody Radiations: Determination of Stefan's Constant.
16	Determination of Hall voltage and Hall coefficient of a given semiconductor using Hall Effect.
17	Determine the energy gap of a semiconductor using p-n junction diode.

Reference Books:

1	S. Balasubramanian, M.N. Srinivasan, A Text book of Practical Physics, S Chand Publishers, 2017.
2	College customized Engineering Physics Lab Manual.

e-resources

1	https://vlab.amrita.edu/index.php

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C107.1									3	2					
C107.2								2	3	2					
C107.3	3	2		3					2						
C107.4	3	2		3					2						
Avg.	3	2		3				2	2.5	2					



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	Cr.
B.Tech. (I-Sem.)	PROGRAMMING FOR PROBLEM SOLVING USING C LAB				
	Course Code: 20ESC1103 (Common to CE, EEE, ME, ECE, CSE, IT and AI&ML)	0	0	3	1.5
Pre-requisites: Basic Engineering Mathematics					
Course Objectives:					
1. To write C programs using basic concepts in C like operators, control statements etc., 2. To design modular, reusable and readable C programs using concepts like Arrays, Functions and Pointers. 3. To write programs using Structures and Unions. 4. To write programs to perform file operations.					
Course Outcomes: At the end of the course, the student will be able to					
C108.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
C108.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
C108.3	Do programming in C language				
C108.4	Write diversified solutions in C language.				
List of Experiments (All experiments are required to be conducted)					
1	Exercise 1: 1. Write a C program to print a block F using hash (#), where the F has a height of six characters and width of five and four characters. 2. Write a C program to compute the perimeter and area of a rectangle with a height of 7 inches and width of 5 inches. 3. Write a C program to display multiple variables.				
2	Exercise 2: 1. Write a C program to calculate the distance between the two points. 2. Write a C program that accepts 4 integers' p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".				
3	Exercise 3: 1. Write a C program to convert a string to a long integer. 2. Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shapes. 3. Write a C program to calculate the factorial of a given number.				

4	Exercise 4: 1. Write a program in C to display the n terms of even natural number and their sum. 2. Write a program in C to display the n terms of harmonic series and their sum. $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$ terms. 3. Write a C program to check whether a given number is an Armstrong number or not.
5	Exercise 5: 1. Write a program in C to print all unique elements in an array. 2. Write a program in C to separate odd and even integers in separate arrays. 3. Write a program in C to sort elements of array in ascending order.
6	Exercise 6: 1. Write a program in C for multiplication of two square Matrices. 2. Write a program in C to find transpose of a given matrix.
7	Exercise 7: 1. Write a program in C to search an element in a row wise and column wise sorted matrix. 2. Write a program in C to print individual characters of string in reverse order.
8	Exercise 8: 1. Write a program in C to compare two strings without using string library functions. 2. Write a program in C to copy one string to another string.
9	Exercise 9: 1. Write a C Program to Store Information Using Structures with Dynamically Memory Allocation 2. Write a program in C to demonstrate how to handle the pointers in the program.
10	Exercise 10: 1. Write a program in C to demonstrate the use of & (address of) and *(value at address) operator. 2. Write a program in C to add two numbers using pointers.
11	Exercise 11: 1. Write a program in C to add numbers using call by reference. 2. Write a program in C to find the largest element using Dynamic Memory Allocation.
12	Exercise 12: 1. Write a program in C to swap elements using call by reference. 2. Write a program in C to count the number of vowels and consonants in a string using a pointer.
13	Exercise 13: 1. Write a program in C to show how a function returning pointer. 2. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc() function.
14	Exercise 14: 1. Write a C program to find sum of n elements entered by user. To perform this program, allocate memory dynamically using calloc() function. Understand the difference between the above two programs 2. Write a program in C to convert decimal number to binary number using the function.
15	Exercise 15: 1. Write a program in C to check whether a number is a prime number or not using the function. 2. Write a program in C to get the largest element of an array using the function.
16	Exercise 16: 1. Write a program in C to append multiple lines at the end of a text file. 2. Write a program in C to copy a file in another name. 3. Write a program in C to remove a file from the disk.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
C108.1	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-
C108.2	-	-	-	-	-	-	-	2	3	2	-	-	-	-	-
C108.3	3	2	-	3	-	-	-	-	3	-	-	-	-	-	-

	C108.4	3	2	-	3	-	-	-	-	3	-	-	-	-	-	-
	Avg.	3	2	-	3	-	-	-	2	3	2	-	-	-	-	-



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (I Sem.)		ELECTRONICWORKSHOPLAB				
		Course Code: 20ESC1106		0	0	3
						1.5
Pre-requisites: IntermediatePhysics						
Course Objectives:						
1. To identify various active and passive electronic components.						
2. To demonstrate testing and measuring instrument like regulated power supplies, cathode ray oscilloscope, function generators and other instruments.						
3. To enable wiring / soldering practice on simple electronic circuits.						
4. To build simple circuits on bread board and testing.						
Course Outcomes: At the end of the course, the student will be able to						
C106.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
C106.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
C106.3	:	Identify Various passive and active electronic components like R, L, C, Diodes, Transistors.				
C106.4	:	Demonstrate the functionality of Function generators, power supplies, DMMs, CROs.				
List of Experiments						
(All experiments are required to be conducted)						
1	Identification of components:					
	Identification of Passive components: (i) Resistors: TypesofResistors, Value of Resistance using colorcode, DRBS. (ii) Capacitors: Types of capacitors, value of capacitance usingcolor code, DCBS. (iii) Inductors:Types of Inductors,DLB (iv) Rheostats: Types of Rheostats, Types of potentiometers, Relays. (v) Switches: Types of Switches. (vi) Cables: Types of Cables. (vii) Types of Instruments used. Identification of Active elements: (TwoTerminal, ThreeTerminal Devices) (i) SCdiode,Zenerdiode,DIAC (ii) Three Terminal Devices: BJT, UJT, SCR, FET, MOSFET, TRIAC. (iii) Digital and Analog ICs. (TO and Flat packages) IC regulators types. (iv) Testing of above components using Multimeters.					
2	Laboratory Equipment:					
	(i) Meters: 1) Types of Voltmeters, Types of Ammeters both Analog and Digital. 2) Types of Multimeters (Analog & Digital) 3) AVO Meters. 4) FET input Voltmeter. (ii) Laboratory Function Generators and Audio Oscillators. (iii) Power Supplies. (iv) RF Generators (v) Different Types of Transformers.(Power,AF,RFetc.)					
3	Soldering Practice:					
	Tools Kit including soldering iron Tools Kit: (i) Insulated nose player					

		(ii) Insulated cutting player (iii) Screw driver kit (iv) Electrical tester (v) Soldering iron,Lead,Flex
	4	PCB layout and Design:
		Materials required,centimeter graph sheets,marker
	5	Testing of Components:
		Active and Passive Components
	6	CRO:
		Acquaintance with CRO Measurements on CRO

Reference Books:

	1	Electronic Devices and Circuits-J.Millman, C.Halkias, TataMc-GrawHill, Second Edition, 2007.
	2	Electronic Devices and Circuits-K.LalKishore, BS Publications, Fourth Edition, 2016.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C106.1	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-
C106.2	-	-	-	-	-	-	-	2	3	2	-	-	-	-	-
C106.3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	2
C106.4	2	-	-	-	-	-	-	-	-	-	-	-	-	-	3
Avg.	2	-	-	-	-	-	-	2	3	2	-	-	-	-	2.5



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	Cr
B. Tech (I Sem.)	SOFT SKILLS COURSE-I (NPTEL-Enhancing soft skills and personality-IIT KANPUR)				
	Course Code: 20MC1102 (Common to All Branches)	2	0	0	0
Pre-requisites: Basic English Knowledge					
Course Objectives:					
1. Become more effective individual through goal/target setting, self-motivation. 2. Function effectively in multi-disciplinary and heterogeneous teams. 3. Practice creative thinking 4. Develop team work and Inter-personal relationships. 5. Manage conflicts and improves leadership quality.					
Course Outcomes: At the end of the course, the student will be able to					
C110.1	:	Illustrate fixed and growth mindset.			
C110.2	:	Interpret the value and importance of time by prioritizing positive attitude.			
C110.3	:	Organize money and health wisely.			
C110.4	:	Make use of knowledge to acquaint with Ethics and Etiquette.			
UNIT – I		2			hrs
- Highlights of Developing Soft Skills and Personality Course-1-24 - Highlights of Developing Soft Skills and Personality Course-25-48 - Definitions and Types of Mindset - Learning Mindsets - Secrets of Developing Growth Mindsets					
UNIT – II		2			hrs
- Importance of Time and Understanding Perceptions of Time - Using Time Efficiently - Understanding Procrastination - Overcoming Procrastination - Don't Say "Yes" to Make Others Happy!					
UNIT – III		2			hrs
- Types of People - How to Say "No" - Controlling Anger - Gaining Power from Positive Thinking-1 - Gaining Power from Positive Thinking-2					
UNIT – IV		2			hrs
- What Makes Others Dislike You? - What Makes Others Like You? -1 - What Makes Others Like You? -2 - Being Attractive-1 - Being Attractive-2					
UNIT – V		2			hrs
- Common Errors-1 - Common Errors-2 - Common Errors-3 - Common Errors-4 - Common Errors-5					
UNIT – VI		2			hrs

	• Humour in Communication • Humour in the Workplace • Function of Humour in the Workplace • Money and Personality • Managing Money															
	UNIT – VII													2	hrs	
	• Health and Personality • Managing Health-1: Importance of Exercise • Managing Health-2: Diet and Sleep • Love and Personality • Managing Love															
	UNIT–VIII													2	hrs	
	• Ethics and Etiquette • Business Etiquette • Managing Mind and Memory • Improving Memory • Care for Environment • Highlights of the Course															
	Reference Books															
	1	Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.														
	2	Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.														
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PSO3
	C110.1								2		3		1			
	C110.2								2		3		1			
	C110.3								2		3		1			
	C110.4								2		3		1			
	Avg.								2		3		1			

II SEMESTER (I Year B.Tech II Semester)

S. No.	Course Code	Course Title	Contact hours/week			Credits	Scheme of Valuation		
			L	T	P			CIE	SEE
Theory Courses									
1	20BSC1204	Applied Chemistry	3	0	0	3	30	70	100
2	20ESC1206	Basic Electronic Devices & Circuits	3	0	0	3	30	70	100
3	20ESC1207	Python Programming	3	0	0	3	30	70	100
4	20ESC1211	Network Analysis	3	0	0	3	30	70	100
5	20HSMC1201	English	3	0	0	3	30	70	100
6	20MC1201	Constitution of India	2	0	0	0	30	70	100
Laboratory Courses									
7	20BSC1205	Applied Chemistry Lab	0	0	3	1.5	30	70	100
8	20ESC1212	Basic Electronic Devices & CircuitsLab	0	0	3	1.5	30	70	100
9	20HSMC1202	English Lab	0	0	3	1.5	30	70	100
10	20MC1202	Soft Skills Course-II	2	0	0	0	30	70	100
Total			19	0	9	19.5	300	700	1000



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		L	T	P	Cr.
B.Tech. (II Sem.)	APPLIED CHEMISTRY				
	Course Code: 20BSC1204 (Common to ECE & EEE)	3	0	0	3

Pre-requisites: Intermediate Chemistry

Course Objectives:

1. Importance of usage of plastics in household appliances and composites (FRP) in aerospace and automotive industries.
2. Outline the basics for the construction of electrochemical cells, batteries and fuel cells. Understand the mechanism of corrosion and how it can be prevented.
3. Explain the preparation of semiconductors and nanomaterials, engineering applications of nanomaterials, superconductors and liquid crystals.
4. Recall the increase in demand for power and hence alternative sources of power are studied due to depleting sources of fossil fuels. Advanced instrumental techniques are introduced.
5. Outline the basics of computational chemistry and molecular switches.

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

C112.1	:	Enumerate the uses of polymeric materials.
C112.2	:	Describe electrochemical cells, corrosion and its control methods.
C112.3	:	Illustrates engineering applications of nano-materials, liquid crystals and super conductors.
C112.4	:	Explain principles and applications of UV-Visible and IR spectroscopy and power generation from non-conventional sources.
C112.5	:	comprehends importance of computational chemistry and molecular machines

UNIT – I

10 hrs

POLYMER TECHNOLOGY

Polymerisation: - Introduction, methods of polymerization (emulsion and suspension), mechanical properties.

Plastics: Compounding, fabrication (compression, injection, blown film and extrusion), preparation, properties and applications (PVC, polycarbonates and Bakelite), mention some examples of plastic materials used in electronic gadgets, recycling of e-plastic waste (waste to wealth).

Elastomers: - Introduction, preparation, properties and applications (Buna S, thiokol and polyurethanes).

Composite materials: Fiber reinforced plastics,

Conducting polymers.

Biodegradable polymers, biopolymers, biomedical polymers.

UNIT – II

10 hrs

ELECTROCHEMICAL CELLS AND CORROSION

Single electrode potential, electrochemical series and uses of series, standard hydrogen electrode, calomel electrode, construction of glass electrode, batteries (Dry cell, Li ion battery and zinc air cells), fuel cells (H_2 - O_2 , CH_3OH - O_2 , phosphoric acid and molten carbonate).

Corrosion: Definition, theories of corrosion (chemical and electrochemical), galvanic corrosion, differential aeration corrosion, stress corrosion, galvanic series, factors influencing rate of corrosion, corrosion control (proper designing and cathodic protection), Protective coatings (surface preparation, cathodic coatings, anodic coatings, electroplating and electroless plating[nickel], Paints (constituents, functions and special paints).

UNIT – III

10 hrs

MATERIAL CHEMISTRY

Part I: Non-elemental semiconducting materials:- Stoichiometric, controlled valency & chalcogen

photo/semiconductors-preparation of semiconductors (distillation, zone refining, Czochralski crystal pulling, epitaxy, diffusion, ion implantation) - Semiconductor devices (p-n junction diode as rectifier, junction transistor). Insulators & magnetic materials: electrical insulators-ferro and ferri magnetism-Hall effect and its applications. Part II: Nano materials:- Introduction, sol-gel method, characterization by (Brunauer Emmet Teller [BET]), (scanning electron microscopy [SEM]) and (transmission electron microscopy [TEM]), applications of graphene and fullerenes, carbon nanotubes (types, preparation and applications). Liquid crystals: Introduction-types-applications. Super conductors:-Type –I, Type II-characteristics and applications.			
UNIT – IV		10	hrs
SPECTROSCOPIC TECHNIQUES & NON-CONVENTIONAL ENERGY SOURCES SPECTROSCOPIC TECHNIQUES Electromagnetic spectrum-UV (laws of absorption, instrumentation, theory of electronic spectroscopy, Frank-condon principle, chromophores and auxochromes, intensity shifts, applications), FT-IR [instrumentation and differentiation of sp, sp ² , sp ³ and IR stretching of functional groups (alcohols, carbonyls, amines) applications], magnetic resonance imaging and CT scan (procedure & applications). NON-CONVENTIONAL ENERGY SOURCES Design, working, schematic diagram, advantages and disadvantages of photovoltaic cell,hydro power, geothermal power, tidal and wave power, ocean thermal energy conversion.			
UNIT – V		10	hrs
ADVANCED CONCEPTS/TOPICS IN CHEMISTRY Computational Chemistry: Introduction to computational chemistry, Ab Initio studies. Molecular switches: characteristics of molecular motors and machines, Rotaxanes and Catenanes as artificial molecular machines, prototypes – linear motions in rotaxanes, an acid-base controlled molecular shuttle, a molecular elevator, an autonomous light-powered molecular motor.			
Text Books			
1	Engineering Chemistry by Jain & Jain; Dhanpat Rai Publishing Co., Latest Edition		
2	Engineering Chemistry by Shikha Agarwal; Cambridge University Press, 2019 Edition.		

Reference Books																
	1	A text book of Engineering Chemistry by S.S.Dara, S.S. Umare; S.Chand & Co., Ltd., Latest Edition.														
	2	Engineering Chemistry by Shashi Chawla; Dhanpat Rai Publishing Co., Latest Edition.														
	3	Engineering Chemistry by Prasanth Rath, B.Ramadevi, Ch.Venkata Ramana Reddy, Subendu Chakravarthy; Cengage Publications, 2019 Edition.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C112.1	3	2													
	C112.2	3	2													
	C112.3	3	2													
	C112.4	3	2													
	C112.5	3	2													
	Avg.	3	2													



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (II Sem.)	BASICELECTRONICDEVICES&CIRCUITS					
		Course Code: 20ESC1206 (Common to EEE & ECE)	3	0	0	3
Pre-requisites: IntermediatePhysicsandMathematics						
Course Objectives:						
1. Tolearnandunderstandthebasicconceptsofsemiconductorphysics.						
2. Tolearn andunderstandtheapplicationofdiodesasrectifierswiththeiroperationandcharacteristicswith andwithout filters arediscussed.						
3. AcquireknowledgeabouttheprincipleofworkingandoperationofBipolarJunctionTransistorandField Effect Transistor and theircharacteristics.						
4. Tolearnandunderstandthepurposeoftransistorbiasinganditssignificance.						
5. SmallsignalequivalentcircuitanalysisofBJTandFETtransistoramplifiersandcomparedifferentconfiguration s.						
Course Outcomes: At the end of the course, the student will be able to						
C114.1	:	ExplainthebasicconceptsofsemiconductorphysicsandPNJunctiondiodecharacteristics.				
C114.2	:	Discusstheconstruction, operation, electrical characteristics of different diodes and the application of diodes as rectifiers with and without filters.				
C114.3	:	Acquire knowledge about the principle of working and operation of Bipolar JunctionTransistor and Field EffectTransistor and their characteristics.				
C114.4	:	Explain the transistor biasing,stabilization and compensation techniques.				
C114.5	:	Analyze theSmall Signalmodel ofBJTand FETamplifiers.				
UNIT – I			10	hrs		
Review of Semi Conductor Physics: Hall Effect, continuity equation, law of junction, FermiDiracfunction, Fermi level inintrinsic and extrinsicSemiconductors						
Junction Diode Characteristics: Energy band diagram of PN junction Diode, Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation,V-ICharacteristics,temperaturedependenceonV-Icharacteristics,Dioderesistance,Diodecapacitance.						
UNIT – II			10	hrs		
SpecialSemiconductorDevices:ZenerDiode,Breakdownmechanisms,Zenerdiodeapplications,LED,Varactor Diode,Photodiode,TunnelDiode,UJT,PN-PNDiode,SCR.Construction,operation and V-Icharacteristics.						
Rectifiers and Filters:Basic Rectifier setup, half wave rectifier, full wave rectifier, bridgerectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and outputwaveforms, Filters, Inductor filter (Series inductor), Capacitor filter (Shunt Capacitor), π - Filter,comparisonof various filtercircuits in termsofripple factors.						
UNIT – III			10	hrs		
TransistorCharacteristics:						
BJT:Junctiontransistor,transistorcurrentcomponents,transistorequation,transistorconfigurations, transistor as an amplifier, characteristics of transistor in Common Base, CommonEmitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/reachthrough, Photo transistor,typical transistor junctionvoltagevalues.						
FET: FET types, construction, operation, characteristics μ , g_m , r_d parameters, MOSFET- types,construction, operation, characteristics,comparison betweenJFETand MOSFET.						
UNIT – IV			10	hrs		
Transistor Biasing and Thermal Stabilization:						
Need for biasing, operating point, load lineanalysis,BJTbiasing- methods,basicstability,fixedbias,collectortobasebias,self-bias,Stabilization against variations in V_{BE} , I_c ,						

and β , Stability factors, (S, S', S''), Bias compensation, Thermal runaway, Thermal stability. FET Biasing-methods and stabilization.																
UNIT – V															10	hrs
Small Signal Low Frequency Transistor Amplifier Models: BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers. FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.																
Text Books																
1	Electronic Devices and Circuits-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2007.															
2	Electronic Devices and Circuits-K. Lal Kishore, BS Publications, Fourth Edition, 2016															
Reference Books																
1	Integrated Electronics-J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition, 2009															
2	Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, 4 th Edition, 2008.															
3	Electronics devices & circuit theory-Robert L. Boylestad and Loui Nashelsky, Pearson/Prentice Hall, Tenth Edition, 2009.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C114.1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
	C114.2	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
	C114.3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
	C114.4	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
	C114.5	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
	Avg.	3	2.6	-	-	-	-	-	-	-	-	-	-	2	-	-



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (II Sem.)		PYTHON PROGRAMMING				
		Course Code: 20ESC1207 (Common to CSE, IT,CSE- AIML ECE, EEE)		3	0	0
Pre-requisites: Basic Mathematics						
Course Objectives:						
1. To learn the fundamental concepts of Python.						
2. To be familiarized with various string operations.						
3. To learn the usage of various data structures in programs.						
4. To be familiarized with File I/O and OOP concepts.						
5. To learn the Exception Handling and GUI packages.						
Course Outcomes: At the end of the course, the student will be able to						
C115.1	:	formulate the simple algorithms for arithmetic and logical operations of python.				
C115.2	:	implement python programs using control statements.				
C115.3	:	apply suitable data structures using python in solving various problems.				
C115.4	:	implement python programs using file operations and OOP concepts.				
C115.5	:	implement python programs using Exception Handling and GUI package.				
UNIT – I					10	hrs
Introduction: Introduction to Python, Program Development Cycle, Input, Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from the Keyboard, Performing Calculations, Operators. Type conversions, Expressions, More about Data Output. Data Types and Expression: Strings Assignment, and Comment, Numeric Data Types and Character Sets, Using functions and Modules. Decision Structures and Boolean Logic: if, if-else, if-elif-else Statements, Nested Decision Structures, Comparing Strings, Logical Operators, Boolean Variables. Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops, Nested Loops.						
UNIT – II					8	hrs
Control Statement: Definite iteration for Loop Formatting Text for output, Selection if and if else Statement Conditional Iteration The While Loop Strings and Text Files: Accessing Character and Substring in Strings, Data Encryption, Strings and Number Systems, String Methods Text Files.						
UNIT – III					10	hrs
List and Dictionaries: Lists, Defining Simple Functions, Dictionaries Design with Function: Functions as Abstraction Mechanisms, Problem Solving with Top Down Design, Design with Recursive Functions, Case Study Gathering Information from a File System, Managing a Program’s Namespace, Higher Order Function. Modules: Modules, Standard Modules, Packages.						
UNIT – IV					10	hrs
File Operations: Reading config files in python, Writing log files in python, Understanding read functions, read(), readline() and readlines(), Understanding write functions, write() and writelines(), Manipulating file pointer using seek, Programming using file operations. Object Oriented Programming: Concept of class, object and instances, Constructor, class attributes and destructors, Real time use of class in live projects, Inheritance, overlapping and overloading operators, Adding and retrieving dynamic attributes of classes, Programming using Oops support. Design with Classes: Objects and Classes, Data modeling Examples, Case Study An ATM, Structuring Classes with Inheritance and Polymorphism.						
UNIT – V					10	hrs
Errors and Exceptions: Syntax Errors, Exceptions, Handling Exceptions, Raising Exceptions, User-defined Exceptions, Defining Clean-up Actions, Redefined Clean-up Actions. Graphical User Interfaces: The Behavior of Terminal Based Programs and GUI Based, Programs, Coding						

Simple GUI-Based Programs, Other Useful GUI Resources.																
Programming: Introduction to Programming Concepts with Scratch.																
Text Books																
1	Fundamentals of Python First Programs, 3rd Edition Kenneth. A. Lambert, Cengage															
2	Python Programming: A Modern Approach, Vamsi Kurama, Pearson 2018															
Reference Books																
1	Martin C. Brown, “The Complete Reference Python”, 4th Edition, McGraw Hill, 2018.															
2	Wesley J. Chun, “Core Python Programming”, 2nd Edition, Pearson.															
3	Mark Lutz, “Programming Python”, 5th Edition, O’REILLY Media, 2017.															
4	Reema Thareja, “Python Programming: Using Problem Solving Approach”, Oxford University Press, 2019.															
e-resources																
1	https://www.python.org/															
2	https://www.tutorialspoint.com/python3/python_tutorial.pdf															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
	C115.1	3	2	-												
	C115.2	3	2	-												
	C115.3	3	2	-												
	C115.4	3	2	-												
	C115.5	3	2	-												
	Avg.	3	2	-												



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			L	T	P	Cr.	
B.Tech. (II Sem.)		NETWORK ANALYSIS					
		Course Code: 20ESC1211		3	0	0	
Pre-requisites: Intermediate Physics and Mathematics							
Course Objectives:							
1. To understand the basic concepts in Electrical circuits.							
2. To know the behavior of transients' state in RLC circuits.							
3. To know the behavior of the steady states RLC Circuits and Coupled circuits.							
4. To understand resonance in RLC Circuit and the applications of network theorems for analysis of electrical networks.							
5. To understand the two port network parameters.							
Course Outcomes: At the end of the course, the student will be able to							
C113.1	:	Analyze the DC and AC networks and apply network topology concepts.					
C113.2	:	Explain steady state and transients states behavior of RLC circuits.					
C113.3	:	Analyze AC networks and magnetic circuits.					
C113.4	:	Calculate resonant frequency and apply network theorems to the circuits.					
C113.5	:	Analyze the two port network parameters.					
UNIT – I						10	hrs
Introduction to Electrical Circuits: Network elements classification, Electric charge and current, Electric energy and potential, Resistance parameter – series and parallel combination, Inductance parameter – series and parallel combination, Capacitance parameter – series and parallel combination. Energy sources: Ideal, Non-ideal, Independent and dependent sources, Source transformation, Kirchhoff's laws, Mesh analysis and Nodal analysis problem solving with resistances only including dependent sources also.							
Fundamentals and Network Topology: Definitions of terms associated with periodic functions: Time period, Angular velocity and frequency, RMS value, Average value, Form factor and peak factor- problem solving, Phase angle, Phasor representation, Addition and subtraction of phasors, mathematical representation of sinusoidal quantities, explanation with relevant theory, problem solving. Principal of Duality with examples.							
Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule.							
UNIT – II						10	hrs
Transients: First order differential equations, Definition of time constants, R-L circuit, R-C circuit with DC excitation, evaluating initial conditions procedure, second order differential equations, homogeneous, non-homogenous, problem solving using R-L-C elements with DC excitation and AC excitation, Response as related to s-plane rotation of roots. Solutions using Laplace transform method.							

UNIT – III														10	hrs	
Steady State Analysis of A.C Circuits: Impedance concept, phase angle, series R-L, R-C, R-L- C circuits problem solving. Complex impedance and phasor notation for R-L, R-C, R-L-C problem solving using mesh and nodal analysis, Star-Delta conversion, problem solving. Coupled Circuits: Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Natural current, Dot rule of coupled circuits, conductively coupled equivalent circuits- problem solving.																
UNIT – IV														10	hrs	
Resonance: Introduction, Definition of Q, Series resonance, Bandwidth of series resonance, Parallel resonance, Condition for maximum impedance, current in anti resonance, Bandwidth of parallel resonance, general case-resistance present in both branches, anti resonance at all frequencies. Network Theorems: Thevinin’s, Norton’s, Milliman’s, Reciprocity, Compensation, Substitution, Superposition, Max Power Transfer, Tellegen’s- problem solving using dependent sources also.																
UNIT – V														10	hrs	
Two-port Networks: Relationship of two port networks, Z-parameters, Y-parameters, Transmission line parameters, h-parameters, Inverse h-parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also.																
Text Books																
1	Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3rd Edition, 2000.															
2	Network Analysis by K.Satya Prasad and S Sivanagaraju, Cengage Learning, 2009.															
Reference Books																
1	Network lines and Fields by John. D. Ryder 2nd edition, Asia publishing house, 1961.															
2	Basic Circuit Analysis by DR Cunningham, Jaico Publishers, 2005.															
3	Network Analysis and Filter Design by Chadha, Umesh Publications, 2012.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O 2	PS O 3
	C113.1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
	C113.2	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
	C113.3	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
	C113.4	3	3	-	-	-	-	-	-	-	-	-	-	2	-	-
	C113.5	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-
	Avg.	3	2.2	-	-	-	-	-	-	-	-	-	-	2.2	-	-



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B. Tech (II Sem)		ENGLISH				
		Course Code: 20HSMC1201 (Common to CE, ME & ECE)	3	0	0	3
Pre-requisites: Basic English Knowledge						
Course Objectives:						
1. Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers.						
2. Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials.						
3. Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations.						
4. Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information.						
5. Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing.						
Course Outcomes: At the end of the course, the student will be able to						
C111.1	:	Distinguish social contexts as well as debatable issues of Indian society and focused practice of language skills.				
C111.2	:	Explain the importance of the great cause in spite of disparities and inequalities with special emphasis on communication abilities.				
C111.3	:	Appraise renowned personalities and examine gender discrimination with emphasis on writing skills.				
C111.4	:	Justify environmental sustainability and racial issues along with discussions and structured talks.				
C111.5	:	Develop strategies for success and self-esteem through reading skills.				
UNIT – I			10	hrs		
Lesson-1:A Drawer full of happiness from “InfoTech English”, Maruthi Publications						
Lesson-2:Deliverance by Premchand from “The Individual Society”, Pearson Publications. (Non-detailed)						
Listening: Listening to short audio texts and identifying the topic. Listening to short audio texts and identifying the context and specific pieces of information to answer a series of questions both in speaking and writing. Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests. Self-introductions and introducing others.						
Reading: Skimming text to get the main idea. Scanning to look for specific pieces of information.						
Reading for Writing: Paragraph writing (specific topics) using suitable cohesive devices; linkers, sign posts and transition signals; mechanics of writing - punctuation, capital letters.						
Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words.						
Grammar: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countable and uncountable; singular and plural basic sentence structures; simple question form - wh-questions; word order in sentences.						
UNIT – II			10	hrs		
Lesson-1:Nehru’s letter to his daughter Indira on her birthday from “InfoTech English”, Maruthi Publications.						
Lesson-2:Bosom Friend by Hira Bansode from “The Individual Society”, Pearson Publications. (Non-detailed)						
Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts, both in speaking and writing.						

Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks. Functional English: Greetings and leave takings. Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together. Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications) Grammar: Use of articles and zero article; prepositions.			
UNIT – III		10	hrs
Lesson-1:Stephen Hawking-Positivity ‘Benchmark’ from “InfoTech English”, Maruthi Publications. Lesson-2:Shakespeare’s Sister by Virginia Woolf from “The Individual Society”, Pearson Publications. (Non-detailed) Listening: Listening for global comprehension and summarizing what is listened to, both in speaking and writing. Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed. Functional English: Complaining and Apologizing. Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension. Critical reading. Reading for Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions. Letter writing-types, format and principles of letter writing. E-mail etiquette, Writing CV’s. Vocabulary: Technical vocabulary from across technical branches (20 words). GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words. Grammar: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.			
UNIT – IV		10	hrs
Lesson-1: Like a Tree, Unbowed: Wangari Maathai-biography from “InfoTech English”, Maruthi Publications Lesson-2: Telephone Conversation-Wole Soyinka from “The Individual Society”, Pearson Publications. (Non-detailed) Listening: Making predictions while listening to conversations/ transactional dialogues without video (only audio); listening to audio-visual texts. Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions. Functional English: Permissions, Requesting, Inviting. Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicative process or display complicated data. Reading for Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables. Writing SOP, writing for media. Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Close Encounters. Grammar: Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms.			
UNIT – V		10	hrs
Lesson-1:Stay Hungry-Stay foolish from “InfoTech English”, Maruthi Publications Lesson-2:Still I Rise by Maya Angelou from “The Individual Society”, Pearson Publications. (Non-detailed) Listening: Identifying key terms, understanding concepts and interpreting the concepts both in speaking and writing. Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides. Functional English: Suggesting/Opinion giving. Reading: Reading for comprehension. RAP Strategy Intensive reading and Extensive reading techniques. Reading for Writing: Writing academic proposals- writing research articles: format and style. Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Coherence, matching emotions. Grammar: Editing short texts – identifying and correcting common errors in grammar and usage			

	(articles, prepositions, tenses, subject verb agreement)
	Text Books
1	“InfoTech English”, Maruthi Publications (Detailed)
2	“The Individual Society”, Pearson Publications.(Non-detailed)
	Reference Books
1	Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2	Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3	Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4	Hewings, Martin. Cambridge Academic English (B2). CUP,2012.
	e-resources
1	https://www.englishclub.com/vocabulary/synonyms-antonyms.htm
2	https://www.oxfordlearnersdictionaries.com/
3	https://www.oxfordlearnersdictionaries.com/grammar/

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PSO 3
	C111.1						1				3					
	C111.2						1				3					
	C111.3						1				3					
	C111.4						1				3					
	C111.5						1				3					
	Avg.						1				3					



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr
B.Tech (II Sem)		CONSTITUTION OF INDIA				
		Course Code: 20MC1201 (Common to CE, ME & ECE)			2	0 0 0
Pre-requisites: Basic societal knowledge						
Course Objectives:						
1. To enable the student to understand the importance of constitution. 2. To understand the structure of executive, legislature and judiciary. 3. To philosophy of fundamental rights and duties. 4. To understand the autonomous nature of constitutional bodies like Supreme Court and high court controller and auditor general of India and election commission of India. 5. To understand the central and state relation financial and administrative.						
Course Outcomes: At the end of the course, the student will be able to						
C119.1	:	explain the importance and the features of Indian Constitution.				
C119.2	:	identify the structure and powers of Union Government and the administration of the Indian Union.				
C119.3	:	explain the structure and administration of State Government.				
C119.4	:	distinguish three tier government system of Local Administration.				
C119.5	:	evaluate the purpose of Election Commission and its rules and functions.				
UNIT – I					10	hrs
Introduction to Indian Constitution: Constitution meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy. Learning outcomes: After completion of this unit student will understand the concept of Indian constitution ● Apply the knowledge on directive principle of state policy ● Analyze the History, features of Indian constitution ● Evaluate Preamble Fundamental Rights and Duties						
UNIT – II					10	hrs
Union Government and its Administration Structure of the Indian Union: Federalism, Centre State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions; Learning outcomes: -After completion of this unit student will ● Understand the structure of Indian government ● Differentiate between the state and central government ● Explain the role of President and Prime Minister ● Know the Structure of supreme court						

UNIT – III		10	hrs
State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions Learning outcomes: -After completion of this unit student will • Understand the structure of state government • Analyze the role Governor and Chief Minister • Explain the role of state Secretariat Differentiate between structure and functions of state secretariat			
UNIT – IV		10	hrs
Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation Pachayati Raj: Functions PRI: ZilaPanchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy. Learning outcomes: -After completion of this unit student will • Understand the local Administration • Compare and contrast district administration role and importance • Analyze the role of Mayer and elected representatives of Municipalities • Evaluate Zilla panchayat block level organization			
UNIT – V		10	hrs
Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissioner ate State Election Commission: Functions of Commissions for the welfare of SC/ST/OBC and women Learning outcomes: -After completion of this unit student will • Know the role of Election Commission apply knowledge • Contrast and compare the role of Chief Election Commissioner and Commissiononerate • Analyze role of state election commission • Evaluate the role of states in national development priorities, sectors and strategies.			
Text Books			
1	Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd., New Delhi		
2	SubashKashyap, Indian Constitution, National Book Trust		
3	J.A. Siwach, Dynamics of Indian Government &Politics		
4	D.C. Gupta, Indian Government and Politics		
5	H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)		
e-resources			
1	https://lecturenotes.in/video-tutorial/63226-constitution-of-india?reading=true		
2	https://lecturenotes.in/s/910-constitution-of-india-ci/videos		

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO3
	C119.1						2		2	1			1			
	C119.2						2		2	1			1			
	C119.3						2		2	1			1			
	C119.4						2		2	1			1			
	C119.5						2		2	1			1			
	Avg.						2		2	1			1			



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			L	T	P	Cr.
B.Tech. (II Sem.)		APPLIED CHEMISTRY LABORATORY				
		Course Code: 20BSC1205 (Common to ECE & EEE)	0	0	3	1.5
Pre-requisites: Intermediate Chemistry Lab						
Course Objectives:						
1. To provide the students with a solid foundation in chemistry laboratory required to solve the engineering problems						
2. To expose the students in practical aspects of the theoretical concepts.						
3. To train the students on how to handle the instruments.						
Course Outcomes: At the end of the course, the student will be able to						
C117.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C117.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C117.3	Determine the strength of unknown solutions by using different types of volumetric titrations like acid base, redox and complexometric titrations.					
C117.4	Apply the acquired knowledge of electro chemistry to conduct experiments like					
List of Experiments (Any of the 10 experiments are required to be conducted)						
Introduction to Chemistry laboratory – Molarity, normality, primary, secondary standard solutions, volumetric titrations, quantitative analysis.						
1	Determination of HCl using standard Na ₂ CO ₃ .					
2	Determination of alkalinity of a sample containing Na ₂ CO ₃ and NaOH.					
3	Determination of Mn ⁺² using standard oxalic acid solution.					
4	Determination of ferrous iron using standard K ₂ Cr ₂ O ₇ . solution.					
6	Determination of pH of water and soil samples.					
7	Determination of the concentration of acetic acid using sodium hydroxide (pH-metry method).					
8	Determination of the concentration of strong acid vs strong base (by conductometric method).					
9	Determination of strong acid vs strong base (by potentiometric method).					
10	Demonstration Method: Preparation of Bakelite.					
11	VIRTUAL LABS: EMF Measurement: To find EMF of the cell.					
12	Water Analysis: Determination of physical parameters.					

	Reference Books:														
1	Sudharani, “Lab manual on Engineering Chemistry” Dhanpat Rai Publications, Co., New Delhi. (2009).														
	Virtual Lab: https://vlab.amrita.edu/														
CO-PO/PSO Mapping Matrix															
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C117.1									3	2					
C117.2								2	3	2					
C117.3	2	2		2					2						
C117.4	2	2		2					2						
Avg.	2	2		2				2	2.5	2					



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			L	T	P	Cr.
B.Tech. (II Sem.)	BASIC ELECTRONIC DEVICES & CIRCUITS LAB					
		Course Code: 20ESC1212 (Common to EEE & ECE)	0	0	3	1.5
Pre-requisites: Intermediate Physics and Mathematics						
Course Objectives:						
1. To familiarize with lab equipment like power supplies, function generators, CROs, DMMs.						
2. To study the characteristics of semiconductor diodes and transistors.						
3. To determine the frequency response of amplifiers using BJT and FETs.						
Course Outcomes:At the end of the course, the student will be able to						
C118.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C118.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C118.3	Determine V-I characteristics of diodes and transistors.					
C118.4	Determine frequency response of BJT and FET Amplifiers.					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	P-N Junction Diode Characteristics					
	Part A:Germanium Diode (Forward bias & Reversebias)					
	Part B: Silicon Diode (Forward Bias only)					
2	Zener Diode Characteristics					
	Part A:V-I Characteristics					
	Part B:Zener Diode as Voltage Regulator					
3	CRO Operation and its Measurements					
4	Rectifiers (without and with c-filter)					
	Part A: Half-wave Rectifier					
	Part B:Full-wave Rectifier					
5	BJT Characteristics (CE Configuration)					
	Part A:InputCharacteristics					
	Part B:Output Characteristics					
6	FET Characteristics (CS Configuration)					
	Part A: Drain Characteristics					
	Part B:Transfer Characteristics					
7	SCR Characteristics					
8	UJT Characteristics					
9	Transistor Biasing					
10	BJT-CE Amplifier					

	11	Emitter Follower-CC Amplifier														
	12	FET-CS Amplifier														
	Reference Books:															
	1	Electronic Devices and Circuits-J.Millman, C.Halkias,Tata Mc-GrawHill,Second Edition,2007.														
	2	Electronic Devices and Circuits-K.LalKishore, BSPublications, Fourth Edition, 2016.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C118.1	-	-	-	-	-	-	-	-	3	2	-	-	-	-	-
	C118.2	-	-	-	-	-	-	-	2	3	2	-	-	-	-	-
	C118.3	3	-	-	3	-	-	-	-	-	-	-	-	-	-	3
	C118.4	2	-	-	2	-	-	-	-	-	-	-	-	-	-	2
	Avg.	2.5	-	-	2.5	-	-	-	2	3	2	-	-	-	-	2.5



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		L	T	P	Cr.
B.Tech. (II Sem.)	ENGLISH LAB				
	Course Code: 20HSMC1202 (Common to CE, ME & ECE)	0	0	3	1.5
Pre-requisites: Basic English knowledge					
Course Objectives:					
1. To acquaint the students with fundamentals of communication. 2. Help them honing oral, written and non-verbal communication skills. 3. Transform them as effective communicators.					
Course Outcomes: At the end of the course, the student will be able to					
C116.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
C116.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
C116.3	Identify and produce sounds of English language by dividing the word into syllabic patterns.				
C116.4	Use accentual patterns effectively in an accurate manner and find out common errors in language usage.				
List of Experiments (Any of the 10 experiments are required to be conducted)					
1	Introduction, Consonants, Vowels				
2	Plural marker rule, Past tense marker rule, Pronunciation rules				
3	Syllable, syllabic consonant, punctuation rules				
4	Word stress, word accent in disyllabic words, word accent in polysyllabic words				
5	Stress in compound words, contrastive word stress				
6	Rhythm and pronunciation, weak/ strong forms and contracted forms, practice of rhythm				
7	Intonation, locating prominent words, tones, punctuation practice with dialogues				
8	Common errors in pronunciation				
9	Accent neutralization				
10	Check your progress				
11	Newspapers reading: understanding and identifying key terms and structures useful for writing reports.				
Reference Books:					
1	Exercises in Spoken English Part 1,2,3,4, OUP and CIEFL.				
2	English Pronunciation in use- Mark Hancock, Cambridge University Press.				

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO3
	C116.1									3	2					
	C116.2								2	3	2					
	C116.3					2				2	3					
	C116.4					2				2	3					
	Avg.					2			2	2.5	2.5					



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			L	T	P	Cr.
B. Tech (II Sem)	SOFT SKILLS COURSE-II (NPTEL- Speaking effectively-IIT KHARAGPUR)					
		Course Code: 20MC1202 (Common to All branches)	2	0	0	0
Pre-requisites: Basic English Knowledge						
Course Objectives:						
1. Become more effective individual through goal/target setting, self-motivation.						
2. Function effectively in multi-disciplinary and heterogeneous teams.						
3. practice creative thinking						
4. Develop team work and Inter-personal relationships.						
5. Manage conflicts and improves leadership quality.						
Course Outcomes: At the end of the course, the student will be able to						
C120.1	:	Compile and present organized and focused messages in public speaking settings.				
C120.2	:	Utilize traditional rhetorical methods and modes of persuasion to speechmaking.				
C120.3	:	Make use of verbal and nonverbal presentation skills for confident and effective oral messages.				
C120.4	:	Develop effective presentations using digital and non-digital presentation tools.				
UNIT – I			2	hrs		
Introduction						
• The Art of Speaking						
• Encoding Meaning Using Verbal and Nonverbal Symbols						
• Cross Cultural Communication						
• Verbal Communication						
• Encoding Meaning Using Verbal Symbols						
How Words Work and How to Use Words						
UNIT – II			2	hrs		
Importance of Nonverbal Communication						
• Encoding Meaning Using Nonverbal Symbols						
• How to Improve Body Language?						
• Eye Communication, Facial Expression, Dress and Appearance						
• Posture and Movement, Gesture, Paralanguage						
• Role Plays and Activities						
UNIT – III			2	hrs		
Phonetics						
• Standard Language and Queen’s English						
• Phonemes of English: Vowels						
• Phonemes of English: Diphthongs and Consonants						
• Stress and Rhythm						
• Intonation						
UNIT – IV			2	hrs		
Voice and Delivery						
• Voice and Personality						
• How to Improve Voice						
• How to Improve Delivery						
• Pace, Pause, Pitch						
• Volume, Modulation, Resonance						
UNIT – V			2	hrs		

Basic Conversational Skills - Greetings and making introductions - Asking for information and giving instructions - Making requests - Agreeing and disagreeing - Making recommendations			
UNIT – VI		2	hrs
Appearing in Interviews and taking Interviews - Interviewing Skills - Appearing in an Interview - Conducting an Interview - Analysis of a bad interview - Analysis of a good interview			
UNIT– VII		2	hrs
Making and Assessing Presentations - How to Make Successful Presentations - How to Make Successful Presentations - Analysis of a Bad Presentation - Analysis of a Good Presentation			
UNIT–VIII		2	hrs
Group Discussions and Meetings - Participating in a Meeting - Chairing a Meeting - Analysis of an ill conducted meeting - Analysis of a well conducted meeting			
Reference Books			
1	Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.		
2	Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.		

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PS O3
	C120.1								2		3		1			
	C120.2								2		3		1			
	C120.3								2		3		1			
	C120.4								2		3		1			
	Avg.								2		3		1			



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		L	T	P	Cr.
B.Tech. (III Sem.)	VECTOR CALCULUS, TRANSFORMS & PARTIAL DIFFERENTIAL EQUATIONS				
	Course Code: 20BSC2101 (Common to ME & ECE)	3	0	0	3
Pre-requisites: Basic knowledge in Mathematics					
Course Objectives:					
1. To familiarize the techniques in partial differential equations					
2. To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications.					
Course Outcomes: At the end of the course, the student will be able to					
C201.1	: Extend calculus to vector functions and interpret vector integral theorems.				
C201.2	: Determine Laplace transforms, inverse Laplace transforms and solve linear ODEs.				
C201.3	: Calculate the Fourier series and Fourier transforms for certain functions.				
C201.4	: Solve the linear and non-linear partial differential equations.				
C201.5	: Identify solution methods for partial differential equations that model physical processes.				
UNIT – I					
		10		hrs	
Vector Calculus:					
Vector Differentiation: Gradient– Directional derivative – Divergence– Curl– Scalar Potential.					
Vector Integration: Line integral – Work done – Area– Surface and volume integrals – Vector integral theorems: Greens, Stokes and Gauss Divergence theorems (without proof) and problems on above theorems.					
UNIT – II					
		10		hrs	
Laplace Transforms: Laplace transforms – Definition and Laplace transforms of some certain functions– Shifting theorems – Transforms of derivatives and integrals – Unit step function –Dirac’s delta function -Periodic function – Inverse Laplace transforms– Convolution theorem (without proof). Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.					
UNIT – III					
		10		hrs	
Fourier series and Fourier Transforms:					
Fourier Series: Introduction– Periodic functions – Fourier series of periodic function – Dirichlet’s conditions – Even and odd functions –Change of interval– Half-range sine and cosine series.					
Fourier Transforms: Fourier integral theorem (without proof) – Fourier sine and cosine integrals – Sine and cosine transforms – Properties (article-22.5 in text book-1)– inverse transforms – Convolution theorem (without proof) – Finite Fourier transforms.					
UNIT – IV					
		10		hrs	
PDE of first order:					
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solutions of first order linear (Lagrange) equation and nonlinear (standard types) equations.					
UNIT – V					
		10		hrs	
Second order PDE and Applications:					
Second order PDE: Solutions of linear partial differential equations with constant coefficients – Non-homogeneous term of the type e^{ax+by} , $\sin(ax+ by)$, $\cos(ax +by)$, $x^m y^n$.					
Applications of PDE: Method of separation of Variables– Solution of One Dimensional Wave, Heat and two-dimensional Laplace equation.					

	Text Books															
1	B. S. Grewal, Higher Engineering Mathematics, 44th Edition, Khanna Publishers,															
2	B. V. Ramana, Higher Engineering Mathematics, 2007 Edition, Tata Mc. Graw Hill Education.															
	Reference Books															
1	Erwin Kreyszig Advanced Engineering Mathematics, 10th Edition, Wiley-India.															
2	Dean. G. Duffy Advanced Engineering Mathematics with MATLAB, 3 rd Edition, CRC Press, 2010.															
3	Peter O’ Neil, Advanced Engineering Mathematics, 7 th Edition, Cengage, 2011.															
4	Srimantha Pal, S C Bhunia, Engineering Mathematics, Oxford University Press															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PSO3
	C201.1	3	2													
	C201.2	3	2													
	C201.3	3	2													
	C201.4	3	2													
	C201.5	3	2													
	Avg.	3	2													



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
Department of Electronics & Communication Engineering

			L	T	P	Cr.									
B. Tech. (II & I Sem.)		ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE													
		Course Code: 20MC2101 (Common to ECE, ME & CE)				2000									
Pre-requisites:Knowledge of Indian culture and IPR															
Course Objectives:															
COB 1: To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.															
COB 2: To make the students understand the traditional knowledge and analyse it and apply it to their day to day life															
Course Outcomes:At the end of the course, the student will be able to															
C202.1	:	Understand the concept of Traditional knowledge and its importance.													
C202.2	:	Know the need and importance of protecting traditional knowledge													
C202.3	:	Know the various enactments related to the protection of traditional knowledge.													
C202.4	:	Understand the concepts of Intellectual property to protect the traditional knowledge.													
C202.5	:	Understand the traditional knowledge in different sectors.													
UNIT – I		Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge Vs western knowledge; traditional knowledge Vs Formal knowledge			07 hrs										
UNIT – II		The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.			05 hrs										
UNIT – III		The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.			07 hrs										
UNIT – IV		Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge			06 hrs										
UNIT – V		Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK			07 hrs										
Text Books															
1	Traditional Knowledge System in India, by Amit Jha, 2009.														
Reference Books															
1	Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.														
2	"Knowledge Traditions and Practices of India" Kapil Kapoor1, Michel Danino2.														
CO-PO/PSO Mapping Matrix															
CO	PO 1	PO	PO 3	PO	PO	PO	PO	P	P	PO	P	P	PS	PS	PSO

			2		4	5	6	7	O 8	O 9	10	O 11	O 12	O 1	O2	3
	C202.1	-	-	-	-	-	1	2	-	-	-	2	2	-	-	-
	C202.2	-	-	-	-	-	1	2	2	-	-	2	2	-	-	-
	C202.3	-	-	-	-	-	1	2	-	-	-	2	2	-	-	-
	C202.4	-	-	-	-	-	1	-	2	-	-	2	2	-	-	-
	C202.5	-	-	-	-	-	1	2	2	-	-	2	2	-	-	-
	Avg.	-	-	-	-	-	1	2	2		-	2	2	-	-	-



KALLAM HARANADREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)

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Kakinada

Department of Electronics & Communication Engineering

KHIT/ECE/UG/File No.3_1a

Academic Year: 2020-21

Date:

Regulations: R20

			L	T	P	Cr.
B.Tech. (III Sem.)	ELECTRONIC CIRCUIT ANALYSIS					
	Course Code:20PCC2121		3	0	0	3
Pre-requisites: Electronic Devices and Circuits, Network analysis						
Course Objectives: 1. Small signal high frequency BJT transistor amplifier Hybrid- π equivalent circuit and compare with low frequency parameters. 2. Learn and understand the purpose of cascading of single stage amplifiers and derive the overall voltage gain. 3. Concept of negative feedback amplifier characteristics and derive the characteristics. 4. Learn and understand the basic principle of oscillator circuits and perform the analysis of different oscillator circuits. 5. Compare and analyze different Power amplifiers and different tuned amplifiers and their frequency responses.						
Course Outcomes: At the end of the course, the student will be able to						
C203.1	:	Interpret the transistor configuration at different frequencies.				
C203.2	:	Design and develop different single stage and multi stage amplifiers.				
C203.3	:	Summarize the importance of negative feedback in amplifiers				
C203.4	:	Design the different types of oscillators and analyze their frequency response				
C203.5	:	Analyze the different types of power and tuned amplifiers and compare the min terms of efficiency.				
UNIT – I			10	hrs		
TRANSISTOR AMPLIFIERS ANALYSIS Two port devices and the Hybrid Model, Transistor Hybrid Model, Analysis of a transistor amplifier circuit using h-parameters, Conversion of h-parameters, Comparison of Transistor amplifier configurations. Simplified Common Emitter hybrid model, FET small signal model, Low frequency Common Source FET Amplifier, Transistor at high frequencies, Hybrid- π common emitter transistor model, High frequency analysis of CE amplifier (with & without resistive load), Single stage CE transistor amplifier response, Gain bandwidth product.						
UNIT – II			10	hrs		
MULTISTAGE AMPLIFIERS Introduction, Classification of Amplifiers, Distortion in amplifiers, frequency response of RC coupled amplifier, High input resistance transistor Circuits-Darlington pair, Biasing problem, and Bootstrapped Darlington circuit.						
UNIT – III			10	hrs		
FEEDBACK AMPLIFIERS Feedback principle and concept, Types of feedback, Feedback topologies, Characteristics of negative feedback amplifiers, General analysis of feedback amplifiers-input resistance and output resistance, Performance comparison of feedback amplifiers. Method of analysis of feedback amplifiers, Analysis feedback amplifier-Voltage series feedback, Current shunt feedback.						
UNIT – IV			10	hrs		
OSCILLATORS						

Introduction, Oscillator principle and condition for oscillation, Types of oscillators, RC phase shift oscillator using BJT, RC phase shift oscillator using BJT with cascade connection of high pass and low pass filters. Wien bridge oscillator using BJT, Generalized analysis of LC oscillators-load impedance, Voltage gain without feedback, feedback fraction, equation of the oscillator, Hartley and Colpitt's oscillators using BJT and their analysis and Crystal oscillators-quartz crystal construction.																
UNIT – V														10	hrs	
POWER AMPLIFIERS Classification of amplifiers, Class A Power Amplifiers and their analysis, Harmonic Distortions, Class B Push-pull amplifiers and their analysis, Complementary symmetry push pull amplifier, Class AB power amplifier, Class-C power amplifier. Tuned Amplifiers introduction, q-factor, small signal tuned amplifier, double tuned amplifiers, effect of cascading single tuned amplifiers on bandwidth, effect of cascading double tuned amplifiers on bandwidth.																
Text Books																
1	Jacob Millman, Christos C Halkias, “Integrated Electronics Analog and Digital Circuits and Systems”, Tata McGraw-Hill, Fifty Edition, 1991.															
2	R.L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuit Theory”, Pearson Publications, Eleventh Edition, 2013.															
Reference Books																
1	Salivahanan, N. Suresh Kumar, A. Vallavaraj, “Electronic Devices and Circuits”, Tata McGraw-Hill, Second Edition, 2008.															
2	Robert T. Paynter, “Introductory Electronic Devices and Circuits”, Pearson Education, Seventh Edition, 2006.															
3	Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, Oxford University Press, Fifth Edition, 2004.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O 3
	C203.1	3	3											2		
	C203.2	2	3	3										3		
	C203.3	2	3	2										3		
	C203.4	2	3	3										3		
	C203.5	3	3	2										2		
	Avg.	2.4	3	2.5										2.6		



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech.(IIISem.)	DIGITAL ELECTRONICS & LOGIC DESIGN					
	Course Code: 20PCC2122		3	0	0	3
Pre-requisites: Mathematics						
Course Objectives:						
1. To solve a typical number base conversion and analyze new error coding techniques.						
2. Theorems and functions of Boolean algebra and behavior of logic gates.						
3. To optimize logic gates for digital circuits using various techniques.						
4. Boolean function simplification using Karnaugh maps and Quine-Mc Cluskey methods.						
5. To understand concepts of combinational circuits.						
6. To develop advanced sequential circuits.						
Course Outcomes: At the end of the course, the student will be able to						
C204.1	:	Apply the Complements & Parity concepts for numbers systems and Hamming codes.				
C204.2	:	Compute K-map for minimization of logic functions.				
C204.3	:	Design the different combinational circuits				
C204.4	:	Design the different sequential circuits .				
C204.5	:	Design the different Finite State machines (Melay& Moore circuits) using flip-flops.				
UNIT – I					10	hrs
REVIEW OF NUMBER SYSTEMS & CODES:						
Representation of numbers of different radix, conversation from one radix to another radix,r-1’scompliments and r’s compliments of signed members. Gray code, 4 bit codes; BCD, Excess-3, 2421, 84-2-1codeetc.Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.						
BOOLEANTHEOREMSANDLOGICOPERATIONS:						
Boolean theorems, principle of complementation & duality, De Morgan theorems. Logic operations; Basic logic operations-NOT, OR, AND, Universal Logic operations, EX-OR,EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits.						
UNIT – II					10	hrs
MINIMIZATIONTECHNIQUES:						
Minimization and realization of switching functions using Boolean theorems, K Map (up to 6 variables) and tabular method (Quine-Mc Cluskey method) with only four variables and single function.						
COMBINATIONALLOGICCIRCUITSDESIGN:						
Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converters using Karnaugh method and draw the complete circuit diagrams.						
UNIT – III					8	hrs
COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI&LSI:						

Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder. INTRODUCTION OF PLD's: PLDs: PROM, PAL, PLA-Basics structures, realization of Boolean functions, Programming table.																
UNIT – IV												10	hrs			
SEQUENTIALCIRCUITS-I: Classification of sequential circuits(synchronous and asynchronous),operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers – Buffer register, shift register, bi-directional shift register, universal shift register.																
UNIT – V												11	hrs			
SEQUENTIALCIRCUITS-II: Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).																
Text Books																
1	Switching and finite automata theory, Zvi. Kohavi, Niraj. K. Jha 3 rd Edition, Cambridge UniversityPress,2009															
2	Digital Design, M.Morris Mano, MichaelDCiletti, 4 th Edition PHI Publication,2008.															
Reference Books																
1	Fundamentals of Logic Design by Charles H.RothJr,Jaico Publishers,2006															
2	Digital electronics by R SSedha.S.Chand& Company limited,2010															
3	Switching Theory and Logic Design by A.Anand Kumar,PHILearningpvtltd,2016															
4	Digital logic applications and design by John M Yarbough,Cengage learning,2006															
5	TTL74-Seriesdatabook.															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PSO3
	C204.1	3												3		
	C204.2	3	3	3										2		
	C204.3	2	3	3										2		
	C204.4	2	3	3										2		
	C204.5	2	3	2										2		
	Avg.	2. 4	3	2. 8										2.2		



**KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (III Sem.)	SIGNALS AND SYSTEMS					
	Course Code: 20PCC2123		3	0	0	3
Pre-requisites: Basic knowledge of integration, differentiation and complex numbers						
Course Objectives:						
1. To study about signals and systems.						
2. To analyze the spectral characteristics of signal using Fourier series and Fourier transforms.						
3. To understand the characteristics of systems.						
4. To introduce the concept of sampling process						
5. To know various transform techniques to analyze the signals and systems.						
Course Outcomes: At the end of the course, the student will be able to						
C205.1	:	Categorizing the fundamentals of various signals & systems and analyze the continuous- time signals				
C205.2	:	Analyze the spectral characteristics of signal using Fourier series and Fourier transforms				
C205.3	:	Define LTI systems and describe the signal transmission through linear systems				
C205.4	:	Distinguish between convolution and correlation operations and also various sampling techniques.				
C205.5	:	Apply the Laplace transforms & Z transforms to analyze CT and DT signals.				
UNIT – I					10	hrs
INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude- shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related Problems.						
UNIT – II					10	hrs
FOURIER SERIES AND FOURIER TRANSFORMS: Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet’s conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform. Related Problems.						
UNIT – III					10	hrs
ANALYSIS OF LINEAR SYSTEMS: Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.						
UNIT – IV					10	hrs
CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval’s theorem, Power density spectrum, Relation between						

Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering. SAMPLING THEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling, Related problems.																
UNIT – V														10	hrs	
LAPLACE TRANSFORMS: Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of LT's, Inverse Laplace transform, Relation between LT's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis. Z-TRANSFORMS: Concept of Z- Transform of a discrete sequence. Region of convergence in Z- Transform, constraints on ROC for various classes of signals, Inverse Z- transform, properties of Z- transforms. Distinction between Laplace, Fourier and Z transforms																
Text Books																
1	Signals, Systems & Communications - B.P. Lathi, BSPublications,2003.															
2	Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI,2nd Edn.,1997															
Reference Books																
1	Principles of Linear Systems and Signals – BP Lathi, Oxford University Press,2015															
2	Signals and Systems – T K Rawat, Oxford University press,2011															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	C205.1	2	3	3									1	2		
	C205.2	2	3	3										2		
	C205.3	2	3	2										2		
	C205.4	3	3	2										2		
	C205.5	3	3	2										3		
	Avg.	2.4	3	2.4										2.2		



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (III Sem.)	RANDOM VARIABLES AND STOCHASTIC PROCESSES					
	Course Code: 20PCC2124		3	0	0	3
Pre-requisites: Probability theory, Set theory, Calculus & Ordinary Differential Equations, Vector Calculus & Fourier Transforms and Signals & Systems						
Course Objectives:						
1. To give students an introduction to elementary probability theory, in preparation to learn the concepts of statistical analysis, random variables and stochastic processes. 2. To mathematically model the random phenomenon with the help of probability theory Concepts. 3. To introduce the important concepts of random variables and stochastic processes. 4. To analyze the LTI systems with stationary random process as input.						
Course Outcomes: At the end of the course, the student will be able to						
C206.1	:	Define fundamentals of probability theory based on random variable approach.				
C206.2	:	Identify different types of random variables and compute statistical averages of these random variables.				
C206.3	:	Identify different types of random variables and compute statistical averages of these random variables when multiple random variables are involved.				
C206.4	:	Characterize the random processes in time and frequency domains.				
C206.5	:	Analyze the LTI systems with random inputs.				
UNIT – I			10			hrs
THE RANDOM VARIABLE: Introduction, Review of Probability Theory, Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variables, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Conditional Distribution, Conditional Density, Properties.						
UNIT – II			10			hrs
OPERATION ON ONE RANDOM VARIABLE – EXPECTATIONS: Introduction, Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev's Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable: Monotonic Transformations for a Continuous Random Variable, Non-monotonic Transformations of Continuous Random Variable.						
UNIT – III			10			hrs
MULTIPLE RANDOM VARIABLES: Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem: Unequal Distribution, Equal Distributions. OPERATIONS ON MULTIPLE RANDOM VARIABLES: Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variables case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.						
UNIT – IV			10			hrs
RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, Concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second-order and Wide-Sense Stationarity, Nth-order and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.						
UNIT – V			10			hrs

RANDOM PROCESSES – SPECTRAL CHARACTERISTICS:

The Power Density Spectrum: Properties, Relationship between Power Density Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Density Spectrum and Cross-Correlation Function.

LINEAR SYSTEMS WITH RANDOM INPUTS: Random Signal Response of Linear Systems: System Response–Convolution, Mean and Mean-squared Value of System Response, Autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectral of Input and Output, Band pass, Band-Limited and Narrow band Processes, Properties.

Text Books

1	Probability, Random Variables & Random Signal Principles, Peyton Z. Peebles, TMH, 4th Edition, 2001.
2	Probability, Random Variables and Stochastic Processes, Athanasios Papoulis and S. Unnikrishna, PHI, 4th Edition, 2002.
3	Probability theory and stochastic processes, Y. Mallikharjuna Reddy, Universities Press, 4th Edition, 2002.

Reference Books

1	Schaum's Outline of Probability, Random Variables, and Random Processes, 1997.
2	An Introduction to Random Signals and Communication Theory, B.P. Lathi, International Textbook, 1968.
3	Probability Theory and Random Processes, P. Ramesh Babu, McGraw Hill, 2015.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C206.1	2	3											2		
C206.2	3	3											3		
C206.3	2	3											2		
C206.4	2	3											2		
C206.5	3	3											2		
Avg.	2.4	3											2.2		



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (III Sem.)		ELECTRONIC CIRCUIT ANALYSIS LAB				
		Course Code: 20PCC2125		0	0	3
						1.5
Pre-requisites: Basic knowledge of electronic components R, L, C, linear circuits and electric circuits						
Course Objectives:						
1. To study the frequency response of single stage and multi stage amplifiers.						
2. To make the student understand how the frequency response varies by applying negative & positive feedback on amplifiers.						
3. To study the working of Power amplifier.						
4. To study the working of oscillators.						
Course Outcomes: At the end of the course, the student will be able to						
C207.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C207.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C207.3	Demonstrate the working of various amplifiers and oscillators.					
C207.4	Simulate different electronic circuits and observe their characteristics using software MULTISIM / P-SPIICE / TINAPRO.					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Determination of f_T of a given transistor					
2	Voltage-Series Feedback Amplifier - Frequency response.					
3	Current-Shunt Feedback Amplifier – Frequency response.					
4	RC Phase Shift / Wien Bridge Oscillator					
5	Hartley/Colpitt’s Oscillator					
6	Two Stage RC Coupled Amplifier					
7	Darlington Pair Amplifier					
8	Bootstrapped Emitter Follower					
9	Class A Series-feed Power Amplifier					
10	Transformer-coupled Class A Power Amplifier					
11	Class B Push-Pull Power Amplifier					
12	Complementary Symmetry Class B Push-Pull Power Amplifier					
13	Single Tuned Voltage Amplifier					

	14	Double Tuned Voltage Amplifier														
	Reference Books:															
	1	Donald A. Neaman, “Electronic Circuit Analysis and Design”, Tata Mc Graw-Hill, Second Edition, 2001.														
	2	Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, Oxford University Press, Fifth Edition, 2004.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	P O 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	C207.1									3	2					
	C207.2								2	3	2					
	C207.3	2	2			3										3
	C207.4	3			2	3										2
	Avg.	2.5	2		2	3			2	3	2					2.5



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (III Sem.)	DIGITAL ELECTRONICS AND LOGIC DESIGN LAB					
	Course Code: 20PCC2126		3	0	0	1.5
Pre-requisites: Breadboard & ICs Working Models						
Course Objectives:						
1. To optimize logic gates for digital circuits using various techniques. 2. To understand the theorems and functions of Boolean algebra and behavior of logic gates. 3. To understand the concepts of combinational circuits 4. To develop the advanced sequential circuits. 5. To solve a typical number base conversion and analyze new error coding techniques.						
Course Outcomes: At the end of the course, the student will be able to						
C208.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
C208.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
C208.3	:	Verify functional tables of various combinational circuits.				
C208.4	:	Design and verify functional tables of various sequential circuits.				
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1.		Study the pin diagram and obtain truth table for the following relevant ICs 7400, 7402, 7404, 7408, 7432, 7486.				
2.		Study the pin diagram and obtain truth table for the following relevant ICs 7442, 7447, 7485, 74154, 7474, 7475, 7476, 7490, 7493, 74121				
3.		Verification of truth tables of Logic gates Two input (i)OR (ii)AND (iii)NOR (iv)NAND (v) Exclusive OR (vi) Exclusive NOR				
4.		Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit				
5.		Verification of functional table of 3 to 8 line Decoder/De-multiplexer				
6.		4 variable logic function verification using 8 to 1 multiplexer.				
7.		Design full adder circuit and verify its functional table.				
8.		Verification of functional tables of JK Edge triggered Flip-Flop (ii) JK Master Slave Flip-Flop (iii) D Flip-Flop				
9.		Design a four bit ring counter using D Flip-Flops/JK Flip Flop and verify output				
10.		Design a four bit Johnson's counter using D Flip-Flops/JK Flip Flops and verify output				

11.	Verify the operation of 4-bit Universal Shift Register for different Modes of operation	
12.	Draw the circuit diagram of MOD-8 ripple counter and construct a circuit using T-Flip-Flops and Test it with a low frequency clock and Sketch the output waveforms	

Reference Books:

1	Fundamentals of Logic Design by Charles H.Roth Jr,Jaico Publishers,2006
2	Digital electronics by R SSedha.S.Chand & Company Limited,2010
3	Switching Theory and Logic Design by A.Anand Kumar,PHILearningpvtltd,2016
4	Digital logic applications and design by John M Yarbough,Cengage Learning,2006
5	TTL74-Seriesdatabook.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
C208.1															
C208.2															
C208.3	3	2		2				2	3	2					2
C208.4	2	2		3				2	3	2					3
Avg.	2.5	2		2.5				2	3	2					2.5



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Kakinada
Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech.(III Sem.)		SIGNAL PROCESSING LAB				
		Course Code: 20PCC2127		0	0	3
						1.5
Pre-requisites: Basic knowledge of signal processing						
Course Objectives:						
1. To study about various signals and systems.						
2. To analyze the spectral characteristics of signal using Fourier series and Fourier transforms.						
3. To understand the characteristics of systems.						
4. To introduce the concept of sampling process						
Course Outcomes: At the end of the course, the student will be able to						
C209.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C209.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker					
C209.3	Demonstrate skills in evaluating various operations on signals to provide feasible solutions.					
C209.4	Analyze and relate the experimental observations on Transform Techniques.					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Basic Operations on Matrices					
2	Generation of Various Signals and Sequences (Periodic and A periodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.					
3	Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.					
4	Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal					
5	Convolution between Signals and sequences.					
6	Auto Correlation and Cross Correlation between Signals and Sequences					
7	Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.					
8	Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.					
9	Gibbs Phenomenon					
10	Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.					
11	Waveform Synthesis using Laplace Transform.					
12	Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function					
13	Sampling Theorem Verification.					



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (III Sem.)		SKILL ORIENTED COURSE - 1 (C PROGRAMMING – Code Tantra)				
		Course Code: 20SOC2101		1	0	2
Pre-requisites: Basic Engineering Mathematics						
Course Objectives:						
1. To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program						
2. To acquire knowledge of the operators, selection, control statements and repetition in C						
3. To learn about the design concepts of arrays, strings, and functions.						
4. To gain knowledge about pointers, dynamic memory allocation and know the significance of Preprocessor						
5. To be familiarized about File I/O and its operations						
Course Outcomes: At the end of the course, the student will be able to						
C210.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C210.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C210.3	Build the basic c programs using decision making and looping mechanisms.					
C210.4	Apply the concept of pointers and files.					
List of Experiments (Any of the 10 exercises are required to be conducted)						
1	Exercise 1: - o Understanding Variables and Keywords - o Data Types – Primitive, Derived, User defined, etc., - o Constants – integer, floating-point, character and string constants - o Understanding Type Qualifiers –signed, unsigned, short, long, etc, - o Understanding Symbolic Constants and their usage - o Understanding One's and Two's complement forms					
2	Exercise 2: - o Understanding Arithmetic operators - o Understanding Relational and Equality operators - o Understanding Logical operators - o Understanding Assignment operator - o Understanding Conditional or Ternary operator - o Understanding Bitwise operators					
3	Exercise 3: - o Usage of Preprocessor Directives – #include, #define, #ifdef, #if, #elif, #else, #endif, #undefine, ## - o Understanding the usage of I/O functions – scanf(), printf() - o Learning string I/O functions – gets(), puts() - o Working with additional formatting features of I/O Functions - o Revisiting the Basic Structure of a C program					
4	Exercise 4: - o Understanding selective statements–if, if-else, if-else-if, nested if-else, - o switch-case - o Exercises with selective statements – different programs - o Understanding iterative statements – while, do-while, for loops - o Exercises with iterative statements – different programs					

		- o Understanding unconditional control statements – break, continue, goto - o Extra problem solving exercises
5	Exercise 5:	- o Working with one-dimensional arrays - o Working with multi-dimensional arrays - o Arrays a deep dive - o Exercises with single and multi-dimensional arrays - o Understanding different sorting techniques – Bubble sort, Insertion sort and Selection sort - o Understanding initialization of arrays
6	Exercise 6:	- o Reading and printing of strings using getchar()and putchar() - o Reading and printing of strings using scanf()and printf() - o Reading and printing of strings using gets()and puts() - o Understanding initialization of character arrays - o Understanding initialization of character arrays - o Working with different string functions
7	Exercise 7:	- o Different types of functions – library and user defined functions - o How to declare, define and call a user defined function - o Understanding formal and actual arguments - o Understanding local and global variables - o Functions with different return types and arguments
8	Exercise 8:	- o Understanding scope and lifetime of a variable - o Working with automatic variables - o Working with extern variables - o Working with static variables - o Working with register variables
9	Exercise 9:	- o Understanding a recursive function - o Different types of recursions - o Problem solving using recursion–factorial, gcd, Fibonacci series - o Tower's of Hanoi problem - o Advantages and disadvantages of recursion
10	Exercise 10:	- o Introduction to pointers – understanding the usage of *and & - o Understanding declaration and usage of pointer variables - o Understanding the difference between call-by-value and call-by-address - o Working with dynamic memory allocation functions – malloc(), calloc(), realloc() and free() - o Working with one-dimensional arrays and pointers - o Working with multi-dimensional arrays and pointers
11	Exercise 11:	- o Understanding and working with structures - o Accessing structure members using dot(.) and arrow(->) operators - o Understanding initialization of structure variables - o Working with an array of structures - o Passing structures to functions - o Working with pointers to structures
12	Exercise 12:	- o Understanding streams and files - o Working with different file operations - o Opening and closing files - o Read and write operations using getc()and putc() - o Read and write operations using getw()and putw() - o Read and write operations using fscanf()and fprintf()

CO-PO/PSO Mapping Matrix																
	CO	P O 1	P O 2	PO 3	P O 4	P O 5	P O 6	PO 7	P O 8	P O 9	P O 10	P O 11	PO 12	PS O1	PS O2	PSO3
	C210.1	3	2			3										
	C210.2	2	3			3										
	C210.3									3			2			
	C210.4					3					2		3			
	Avg	2. 5	2. 5	-	-	3	-	-	-	3	2	-	2.5	-	-	



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	Cr.
B.Tech. (IV Sem.)	JAVA PROGRAMMING				
	Course Code: 20ESC2205	3	0	0	3
Pre-requisites: Object Oriented Programming					
Course Objectives:					
1. To learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries. 2. To learn how to extend Java classes with inheritance and dynamic binding. 3. To understand how to apply exception handling concepts. 4. To know the usage of threads and packages in java. 5. To familiarize on java applications using AWT.					
Course Outcomes: At the end of the course, the student will be able to					
C211.1	: Describe the fundamental concepts of java using classes' and objects.				
C211.2	: Apply inheritance to extend the classes and use interface concepts.				
C211.3	: Discuss the concepts of Strings and Exception handling.				
C211.4	: Explain multithreading concepts and packages in java.				
C211.5	: Develop java applets using AWT.				
UNIT – I		10		hrs	
Introduction: Introduction to java, data types, dynamic initialization, scope and life time, Operators, control statements, arrays, type conversion and casting. Classes and Objects: Concepts, methods, constructors, usage of static, access control, this keyword, garbage collection, parameter passing mechanisms, nested classes and inner classes.					
UNIT – II		10		hrs	
Inheritance: Basic concepts, Types of inheritances, access specifiers, usage of super key word, Overloading methods, method overriding, final methods and classes, abstract classes, dynamic method dispatch. Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces, Functional Interfaces Packages Introduction: Creating a Package, setting CLASS PATH, Access control protection, importing packages, Enumeration, Wrapper classes.					
UNIT – III		10		hrs	
Strings: Introduction, Class String, Methods for Comparison of Strings, Methods for Modifying Strings, Methods for Searching Strings, String Tokenizer class, Class String Buffer, Class String Builder. Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception subclasses.					
UNIT – IV		10		hrs	
Multithreading: Concepts of Multithreading, differences between process and thread, thread lifecycle, Thread class, Runnable interface, creating multiple threads, Synchronization, thread priorities, inter thread communication, daemon threads, dead locks, thread groups. Packages: Java.Util package and its classes and Interfaces-(Example Scanner class, Random class), Java.lang Package and its Classes, Java IO package-(Example Buffered Input Stream, Buffered Output Stream, Buffered Reader, Buffered Writer, File Reader, File Writer) Java. Time Package, Class Instant (java.time. Instant), Formatting for Date/Time in Java.					
UNIT – V		10		hrs	
Applets: Concepts of Applets, life cycle of an applet, creating applets, passing parameters to applets, Color class and Graphics Event Handling: Events, Event sources, Event classes, Event Listeners, using Delegation event model, handling events. AWT: AWT Components, windows, canvas, panel, File Dialog boxes, Layout Managers, Event handling					

	model of AWT, Adapter classes, Menu, Menubar. Introduction to Swings, Comparison of swings and AWT.															
	Text Books															
1	The Complete Reference Java, 8 th Edition, Herbert Schildt, TMH Publishing Company Ltd, 2017.															
2	JAVA onestepahead, First Edition, Anitha Seth, B.L. Juneja, Oxford, 2020.															
	Reference Books															
1	Java How to Program, Sixth Edition, H.M. Dietel and P.J. Dietel, Pearson Education/PHI, 2004.															
2	Introduction to Java programming, Tenth Edition, Y. Daniel Liang, Pearson Publication, 2015.															
	e-resources															
1	https://nptel.ac.in/courses/106/105/106105191/															
	CO-PO/PSO Mapping Matrix															
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C211.2	3	2	-	-	-	-	-	-	-	-	-	-			-
	C211.3	3	2	-	-	-	-	-	-	-	-	-	-			-
	C211.4	3	2	-	-	-	-	-	-	-	-	-	-			-
	C211.5	3	2	-	-	-	-	-	-	-	-	-	-			-
	C211.2	3	2	-	-	-	-	-	-	-	-	-	-			-
	Avg.	3	2	-	-	-	-	-	-	-	-	-	-			-



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Department of Electronics & Communication Engineering**

			L	T	P	Cr.
B. Tech. (II & II Sem.)	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS					
		Course Code: 20HSMC2101 (Common to CSE, IT, AIML, DS, AIDS & CE)	4	0	0	4
Pre-requisites:Basic knowledge of economics and finance						
Course Objectives:						
1. To understand the concept of Managerial Economics and Demand analysis 2. To familiarize about the Input Output relationship, Cost-Output relationship and Break even analysis. 3. To understand the Methods of Pricing in the different market structures and the Concept of Business Cycles. 4. To know different Accounting Systems and preparation of Financial Statements. 5. Equip knowledge about capital budgeting techniques to evaluate different investment Proposals.						
Course Outcomes:At the end of the course, the student will be able to						
C212.1	:	Describe the concepts related to demand in economics.				
C212.2	:	Explain the production function techniques with Cost Concepts				
C212.3	:	Explain the concept of price output relationship in different market structures and distinguish various forms of Business organizations				
C212.4	:	Prepare Financial Statements by using several accounting tools.				
C212.5	:	Evaluate various investment project proposals with the help of capital budgeting techniques				
UNIT – I	Definition of Managerial Economics –Scope of Managerial Economics and its relationshipwith other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.				13	hrs
UNIT – II	Theories of Production function- Law of Variable proportions- Iso quants and Iso costs and choice of least cost factor combination- Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs,Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakevenpoint(problems)-Managerial significance and limitations of Breakeven point.				13	hrs
UNIT – III	Market Structures: Perfect Competition, Monopoly, Monopolistic competition andOligopoly – Features – Price and Output Determination – Managerial Theories of firm: Marris and Williamson’s models – other Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Business Cycles: Meaning and Features – Phases of aBusiness Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company – State/Public Enterprises and their forms.				13	hrs

UNIT – IV		Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements-Ratio Analysis – Preparation of Funds flow and cash flow analysis (Problems)												12	hrs	
UNIT – V		Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods(payback period, accounting rate of return) and modern methods(Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)												13	hrs	
Text Books																
1	A R Aryasri, Managerial Economics and Financial Analysis, The McGraw – Hill Companies.															
2	Varshney R.L, K.L Maheswari, Managerial Economics, S. Chand & Company Ltd,															
Reference Books																
1	JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition.															
2	N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,															
3	MaheswariS.N, An Introduction to Accountancy, Vikas Publishing House Pvt Ltd															
e-resources		If any														
1	https://nptel.ac.in/courses/110/105/110105075/															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C212.1	-	-	-	-	-	-	-	-	-	2	3	2	-	-	-
	C212.2	-	-	-	-	-	-	-	-	-	2	3	2	-	-	-
	C212.3	-	-	-	-	-	-	-	-	2	2	3	3	-	-	-
	C212.4	-	-	-	-	-	-	-	-	-	2	3	2	-	-	-
	C212.5	-	-	-	-	-	-	-	-	-	2	3	1	-	-	-
	Avg.	-	-	-	-	-	-	-	-	2	2	3	2	-	-	-



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.	
B.Tech. (IV Sem.)		PULSE AND DIGITAL CIRCUITS					
		Course Code: 20PCC2217		3	0	0	3
Pre-requisites: Electronic Devices and Circuits, Switching Theory and Logic Design							
Course Objectives:							
1. To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.							
2. To study the design and analysis of various Multivibrators.							
3. To understand the functioning of different types of time-base Generators.							
4. To learn the working of logic families & Sampling Gates							
Course Outcomes: At the end of the course, the student will be able to							
C213.1	:	Analyze the various linear wave shaping circuits.					
C213.2	:	Analyze the various non-linear wave shaping circuits.					
C213.3	:	Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.					
C213.4	:	Design different multivibrators.					
C213.5	:	Interpret the different time base generators and also explain the principles of synchronization and sampling gates.					
UNIT – I					10	hrs	
LINEAR WAVE SHAPING							
High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; RL and RLC circuits and their response for step input.							
UNIT – II					12	hrs	
NON-LINEAR WAVE SHAPING							
Diode and its characteristics, Diode series clippers, Diode parallel clippers, Transistor clippers, two level clipping circuits and Emitter coupled clipper, Clamping operation, Clamping circuits using diode with different inputs, Clamping circuit theorem, Practical clamping circuits.							
UNIT – III					8	hrs	
SWITCHING CHARACTERISTICS OF DEVICES							
Diode as a switch, Diode switching times, Piecewise linear diode characteristics, Transistor as a switch, Transistor switching times (delay time, rise time, storage time and fall time), Break down voltage consideration of transistor, Design of transistor switch, Characteristics of logic family, Realization of Logic Gates using DTL, TTL, ECL and CMOS logic circuits, Comparison of logic families.							
UNIT – IV					10	hrs	
MULTIVIBRATORS							
Analysis and design of fixed bias, self-bias bistable multivibrator, Methods of Triggering using RC network & Diode, Analysis and design of collector coupled monostable multivibrator, Application of monostable multivibrator as a voltage to time converter, Analysis and design of collector coupled astable multivibrator, Expression for time period T, Astable Multivibrator as a voltage to frequency converter, Schmitt trigger using transistors, Hysteresis.							
UNIT – V					10	hrs	
TIME BASE GENERATORS AND SAMPLING GATES							
Time Base Generators							
General features of a time base signal, Methods of generating time base waveform, Errors and expressions for sweep speed error, displacement error and transmission error, Relation between e_s , e_d and e_t , Methods of generating time base waveform, Miller and Bootstrap time base generator-basic principles, Transistor Miller time base generator, Transistor Bootstrap time base generator, current time base generators.							
Sampling Gates							
Basic Operating Principles of Sampling Gates, Diode Unidirectional Sampling Gate and Two-Diode Bi-Directional Sampling Gate, Four-Diode gates, Six-Diode Gates, Reduction of Pedestal in Sampling Gates,							

	Applications of Sampling Gates.															
	Text Books															
1	Pulse, Digital and Switching Waveforms-J.Millman and H.Taub, McGraw-Hill, 2000.															
2	Pulse and Digital Circuits–A.AnandKumar, PHI, 2005.															
	Reference Books															
1	Pulse, Digital and Switching Waveforms-.Millman and H.Taub, Mothiki S Prakash Rao Mc Graw-Hill, Second Edition, 2007.															
2	Solid State Pulse circuits-DavidA.Bell, PHI, 4 th Edn. 2002.															
3	Pulse & Digital Circuits by VenkataRao, K, RamasudhaK, ManmadhaRao, G., Pearson, 2010.															
	CO-PO/PSO Mapping Matrix															
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PS O3
	C213.1	2		3										2		
	C213.2	2	3	3										2		
	C213.3	3	3	3										3		
	C213.4	3	3	3										2		
	C213.5	2		2										2		
	Avg.	2.4	3	2.8										2.2		



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	Cr.
B.Tech. (IV Sem.)	ELECTROMAGNETIC WAVES AND TRANSMISSION LINES				
	Course Code: 20PCC2218	3	0	0	3
Pre-requisites: Vector calculus, Cartesian co-ordinates, spherical & cylindrical systems					
Course Objectives:					
1. To Implement various concepts of transmission lines and impedance measurements 2. To understand the fundamentals of steady electric and magnetic fields using various laws 3. To apply the concept of static and time varying Maxwell equations and power flow using pointing theorem 4. To understand the Wave characteristics in different media for normal and oblique incidence					
Course Outcomes: At the end of the course, the student will be able to					
C214.1	: Find the Primary and Secondary constants of a transmission line.				
C214.2	: Analyze various impedance transformation techniques quantitatively and using Smith Chart.				
C214.3	: Apply the knowledge of electrostatics to find fields for different charge configurations.				
C214.4	: List out Maxwell equations to explain the time varying behavior of EM waves.				
C214.5	: Examine the characteristics of uniform plane wave and its propagation in different media.				
UNIT – I		10			hrs
Transmission Lines – I Types, Parameters, T& π Equivalent Circuits, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line, Lossless lines, distortion less lines, Illustrative Problems.					
UNIT – II		10			hrs
Transmission Lines – II Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. Low loss radio frequency lines and UHF Transmission lines, UHF Lines as Circuit Elements; Impedance Transformations, $\lambda/8$, $\lambda/4$ and $\lambda/2$ Lines –. Smith Chart – Construction and Applications, Quarter wave transformer, Single Stub Matching, Illustrative Problems.					
UNIT – III		10			hrs
Review of Co-ordinate Systems, Electrostatics Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss Law and Applications, Electric Potential, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial Capacitors, Illustrative Problems.					
UNIT – IV		10			hrs
Magneto Statics Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy. Illustrative Problems. Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Conditions at a Boundary Surface. Illustrative Problems.					
UNIT – V		10			hrs
EM Wave Characteristics Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossy dielectrics, lossless dielectrics, free space, wave propagation in good conductors, skin depth, Polarization & Types, Illustrative Problems. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection,					

	Surface Impedance. Poynting Vector and Poynting Theorem. Illustrative Problems.															
	Text Books															
1	Elements of Electromagnetic – Matthew N.O. Sadiku, Oxford Univ. Press, 3rd ed.,2001.															
2	Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI,2nd Edition,2000.															
	Reference Books															
1	Networks, Lines and Fields John D. Ryder, Second Edition, Pearson Education, 2015.															
2	Engineering Electromagnetic – William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006															
3	Electromagnetic Field Theory and Transmission Lines: G Sasi Bhushana Rao, Wiley India 2013															
4	Electromagnetic Field Theory and Transmission Lines –GSN Raju, Pearson Education 2006															
	WEB RESOURCES															
1	https://youtu.be/6FfKoLHtMiI															
2	https://youtu.be/IeE-xvjsEVI															
	CO-PO/PSO Mapping Matrix															
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O1	PS O2	PSO 3
	C214.1	2		2										3		
	C214.2	3	3	3										2		
	C214.3	2	3											2		
	C214.4	3	3	2										2		
	C214.5	2	3	3										2		
	Avg.	2.4	3	2.5										2.2		



KALLAM HARANADREDDY INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (IV Sem.)		ANALOG COMMUNICATIONS				
		Course Code: 20PCC2219		3	0	0
Pre-requisites: Calculus & Ordinary Differential Equations, Vector Calculus & Fourier Transforms and Signals & Systems						
Course Objectives:						
1. Familiarize with the fundamentals of analog communication systems.						
2. Familiarize with various techniques for analog modulation and demodulation of signals.						
3. Distinguish the figure of merits of various analog modulation methods.						
4. Develop the ability to classify and understand various functional blocks of radio transmitters and receivers.						
5. Familiarize with basic techniques for generating and demodulating various pulse modulated signals.						
Course Outcomes: At the end of the course, the student will be able to						
C215.1	:	Describe various Amplitude modulation and demodulation schemes and analyze their spectral characteristics.				
C215.2	:	Describe and analyze various modulation and demodulation techniques of DSB & SSB schemes with respect to various parameters.				
C215.3	:	Describe modulation and demodulation techniques of angle modulation schemes and analyze various parameters.				
C215.4	:	Describe various functional blocks of radio transmitters and receivers.				
C215.5	:	Analyze noise characteristics of various analog and Pulse modulation methods.				
UNIT – I					10	hrs
Amplitude Modulation: Introduction to communication system, Need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.						
UNIT – II					10	hrs
DSB & SSB Modulation: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Frequency domain description, Frequency discrimination method for generation of AMSSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems, FDM.						
UNIT – III					10	hrs
Angle Modulation: Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave. Generation of FM Waves, Detection of FM Waves: Balanced Frequency discriminator, zero crossing detector, Phase locked loop. Comparison of FM& AM.						
UNIT – IV					10	hrs
Transmitters & Receivers: Radio Transmitter-Classification of Transmitter, AM Transmitter, Effect of feedback on performance of AM Transmitter, FM Transmitter – Variable reactance type and phase modulated FM Transmitter, frequency stability in FM Transmitter. Radio Receiver - Receiver Types - Tuned radio frequency receiver, Super heterodyne receiver, RF section and Characteristics - Frequency						

		changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting. Communication Receivers, extensions of super heterodyne principle and additional circuits.															
		UNIT – V													10		hrs
		Noise: Review of noise and noise sources, noise figure, Noise in Analog communication Systems, Noise in DSB& SSB System, Noise in AM System, Noise in Angle Modulation Systems, Threshold effect in Angle Modulation System, Pre-emphasis & de-emphasis Pulse Modulation: Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation & demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing, TDM Vs FDM.															
		Text Books															
1		Principles of Communication Systems –H Taub & D. Schilling, Gautam Sahe, TMH, 3rd Edition, 2007.															
2		Principles of Communication Systems-Simon Haykin, JohnWiley, 2ndEdition, 2007.															
3		Modern Digital and Analog Communication Systems –B.P.Lathi, Zhi Ding,Hari Mohan Gupta, Oxford UniversityPress,4th Edition,2017															
		Reference Books															
1		Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.															
2		Communication Systems–R.P.Singh, SP Sapre, Second EditionTMH, 2007.															
3		Electronic Communication systems–Tomasi, Pearson, fourth Edition, 2007.															
CO-PO/PSO Mapping Matrix																	
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O 3	
	C215.1	2		2										3			
	C215.2	3	3	3										2			
	C215.3	2	3	2										2			
	C215.4	3	3	2										2			
	C215.5	2	3	3										2			
	Avg.	2.4	3	2.4										2.2			



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	Cr.
B.Tech. (IV Sem.)	JAVA PROGRAMMING LAB				
	Course Code: 20ESC2206	0	0	3	1.5

Pre-requisites: Object Oriented Programming

Course Objectives:

1. To gain knowledge of object-oriented paradigm in the Java programming language.
2. To learn the method of creating Multi-threaded programs and handle exceptions.
3. To learn Java features to create GUI applications & perform event handling.

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

C216.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C216.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C216.3	:	Develop java applications using fundamentals of Java programming for various problems.
C216.4	:	Develop Graphical User Interface applications using AWT Components.

List of Experiments

(Any of the 12 Exercises are required to be conducted)

1.	Exercise-1 (Basics)
	a) Write a JAVA program to display default value of all primitive data type of JAVA.
	b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate the discriminate D and basing on value of D, describe the nature of root.
	c) Five Bikers Compete in a race such that they drive at a constant speed which may or may not be the same as the other. To qualify the race, the speed of a racer must be more than the average speed of all 5 racers. Take a sin put the speed of each racer and print back the speed of qualifying racers.
2	Exercise-2 (Operations, Expressions, Control-flow, Strings)
	a) Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
	b) Write a JAVA program to sort for an element in a given list of elements using bubble sort.
3	Exercise-3 (Class, Objects)
	a) Write a JAVA program to implement class mechanism. Create a class, methods and invoke them inside main method.
	b) Write a JAVA program to implement constructor.

4	Exercise-4 (Methods)
	a) Write a JAVA program to implement construct or overloading.
	b) Write a JAVA program implement method overloading.
5.	Exercise-5(Inheritance)
	a) Write a JAVA program to implement Single Inheritance.
	b) Write a JAVA program to implement multi-level Inheritance.
	c) Write a java program for abstract class to find areas of different shapes.
6.	Exercise-6 (Inheritance-Continued)
	a) Write a JAVA program give example for “super” keyword.
	b) Write a JAVA program to implement Interface. What kind of Inheritance can be achieved.

7.	Exercise-7(Exception)
	a) Write a JAVA program that describes exception handling mechanism.
	b) Write a JAVA program Illustrating Multiple catch clauses.
8.	Exercise–8 (Run time Polymorphism)
	a) Write a JAVA program that implements Run time polymorphism.
	b) Write a Case study on run time polymorphism, inheritance those implements in above problem.
9.	Exercise–9 (User defined Exception)
	a) Write a JAVA program for creation of illustrating throw.
	b) Write a JAVA program for creation of illustrating finally.
	c) Write a JAVA program for creation of Java Built- in Exceptions.
	d) Write a JAVA program for creation of User Defined Exception.
10.	Exercise–10 (Threads)
	a) Write a JAVA program that creates threads by extending Thread class. First thread display “Good Morning “every 1 sec, the second thread displays “Hello “every 2 seconds and the third display“Welcome”every 3 seconds, (Repeat the same by implementing Runnable).
	b) Write a program illustrating I s A live and join().
11.	Exercise-11 (Threads continuity)
	Write a JAVA program on Producer Consumer Problem.
12.	Exercise–12 (Packages)
	a) Write a Java Program that creates a user-defined package and import that package in other example.
	b) Write a Java Program to read from a file using Buffered Reader class.
	c) Write a Java Program to write to a File using File Writer class.

13.	Exercise-13 (Applet)
	a) Write a JAVA program to paint like paint brush in applet.
	b) Write a JAVA program to display analog clock using Applet.
	c) Write a JAVA program to create different shapes and fill colors using Applet.
14.	Exercise-14 (Event Handling)
	a) Write a JAVA program that display the x and y position of the cursor movement using Mouse.
	b) Write a JAVA program that identifies key-up key-down event user entering text in an Applet.
15.	Exercise-15 (AWT, Swings)
	a) Write a JAVA program that displays various AWT components.
	b) Write a JAVA program to create a Login Form using swing Components

Reference Books:

1	The Complete Reference Java, 8 th Edition, HerbertSchildt, TMH Publishing Company Ltd, 2017.
2	JAVA one step ahead, First Edition, Anitha Seth, B.L.Juneja, Oxford, 2020.
3	Introduction to Java Programming, Tenth Edition, Y.Daniel Liang, Pearson Publication, 2015.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3

	C216.1	3	2		3				2	3	2					
	C216.2	3	2		3				2	3	2					
	C216.3	3	2		3				2	3	2					
	C216.4	3	2		3				2	3	2					
	Avg.	3	2		3				2	3	2					



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY

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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (IV Sem.)	PULSE AND DIGITAL CIRCUITS LAB					
	Course Code: 20PCC2220		0	0	3	1.5
Pre-requisites: Electronic Devices and Circuits, Switching Theory and Logic Design						
Course Objectives:						
1. To understand the response of linear circuits with different signals. 2. To learn about limiting and level shifting circuits, and their applications 3. To generate different types of non-sinusoidal waveforms 4. To learn about basics of sampling gates and their applications 5. To understand the basics of digital logic families						
Course Outcomes: At the end of the course, the student will be able to						
C217.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
C217.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
C217.3	:	To demonstrate the response of linear circuits, limiting and level shifting with different signals.				
C217.4	:	To generate different types of non-sinusoidal waveforms.				
List of Experiments (Any of the 10 experiments are required to be conducted)						
1.		Linear wave shaping (Diff. Time Constants, Differentiator, Integrator).				
2.		Non Linear wave shaping–Clippers.				
3.		Non Linear wave shaping–Clampers.				
4.		Transistor as a switch.				
5.		Study of Logic Gates & Some applications.				
6.		Sampling Gates.				
7.		AstableMultivibrator.				
8.		MonostableMultivibrator.				
9.		BistableMultivibrator.				
10.		Schmitt Trigger.				
11.		UJT Relaxation Oscillator.				
12.		Boot strap sweepcircuit.				

Reference Books:																
1	Pulse, Digital and Switching Waveforms-.Millman and H.Taub, Mothiki S Prakash Rao Mc Graw-Hill, Second Edition, 2007.															
2	Solid State Pulse circuits-DavidA.Bell, N PHI,4thEdn.,2002															
3	Pulse & Digital Circuits by VenkataRao,K,RamasudhaK,ManmadhaRao,G.,Pearson,2010															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	C217.1									2	2					
	C217.2								2	2	2					
	C217.3	2	2		3					2						3
	C217.4	3			2					2						2
	Avg.	2.5	2		2.5				2	2	2					2.5



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (IV Sem.)		ANALOG COMMUNICATIONS LAB				
		Course Code: 20PCC2221		0	0	3
						1.5
Pre-requisites: Electronic Devices & Circuits, Signals & Systems						
Course Objectives:						
1. To introduce the students about an overview of the principles, operation and application of the basic modulation and demodulation techniques.						
2. To enable the students understand the behavior of various transmitters and receivers.						
3. To simulate the various modulation and demodulation techniques using latest software tools.						
Course Outcomes: At the end of the course, the student will be able to						
C218.1	Compile the data, organize, and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C218.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C218.3	Analyze the characteristics of various modulation techniques by realizing through hardware.					
C218.4	Simulate the characteristics of various modulation techniques by using Software Tools.					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Amplitude Modulation - Modulation & Demodulation.					
2	AM - DSB SC - Modulation & Demodulation.					
3	Spectrum Analysis of Modulated signal using Spectrum Analyzer.					
4	Diode Detector.					
5	Pre-emphasis & De-emphasis.					
6	Frequency Modulation – Modulation & Demodulation.					
7	AGC Circuits.					
8	Verification of Sampling Theorem.					
9	Pulse Amplitude Modulation & Demodulation.					
10	PWM, PPM Modulation and Demodulation.					
11	PLL IC-565 as FM demodulator.					
12	Radio receiver characteristics.					
13	Radio Receiver/TV Receiver Demo kits or Trainers.					

	Reference Books:															
	1	Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.														
	2	Communication Systems–R.P. Singh, SP Sapre, Second EditionTMH, 2007.														
	3	Electronic Communication systems–Tomasi, Pearson, fourth Edition, 2007.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	P O 12	PSO 1	P S O 2	PSO 3
	C218.1	3	2							2	2					
	C218.2		2						2	2	2					2
	C218.3	2			3	3				2						3
	C218.4				2	3				2						
	Avg.	2.5	2		2.5	3			2	2	2					2.5



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (IV Sem.)		SKILL ORIENTED COURSE – II PYTHON PROGRAMMING				
		Course Code: 20SOC2201	1	0	2	2
Pre-requisites: Basic Engineering Mathematics						
Course Objectives:						
1. To learn about the computer systems, computing environments, developing of a computer program and Structure of a C Program.						
2. To acquire knowledge of the operators, selection, control statements and repetition in C.						
3. To learn about the design concepts of arrays, strings, and functions.						
4. To gain knowledge about pointers, dynamic memory allocation and know the significance of Preprocessor.						
5. To be familiarized about File I/O and its operations.						
Course Outcomes: At the end of the course, the student will be able to						
C219.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C219.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C219.3	Build simple python programs using basic operators, loops and decision making statements.					
C219.4	Describe the concepts of lists, functions and object oriented concepts of python.					
List of Experiments						
(Any of the 10 exercises are required to be conducted)						
1	Exercise 1: o Python Language Features o Variables and Assignment o Expressions, Statements and Indentation o Input and Output o Basics of Python Programming					
2	Exercise 2: o Data Types o Numbers and Strings o Understanding Relational and Equality operators o Lists, Sets and Tuples o Dictionaries o Type Conversion					
3	Exercise 3: o Arithmetic Operators o Comparison Operators and Assignment Operators o Bitwise Operators and Logical Operators o Membership Operators and Identity Operators					
4	Exercise 4: o Building Blocks of Algorithms o Pseudo Code and Flow Charts o Programming Language, Algorithmic Problem Solving, Simple o Strategies for Developing Algorithms					
5	Exercise 5: o if, if-else, if-elif-else statements					

		- o break, continue and pass statements - o Introduction to Number - o Number Type Conversion
	6	Exercise 6: - o Mathematical Functions and Random Number Functions - o Introduction to Strings - o String Operations - o Built-in String Methods - o Introduction to Lists - o Basic List Operations
	7	Exercise 7: - o Built-in List Functions - o List Methods - o Introduction to Tuples - o Basic Tuple Operations - o Introduction to PIP - o Namespace - o Using Python Packages
	8	Exercise 8: - o Introduction to Dictionaries and Basic Dictionary Operations - o Built-in Dictionary Functions - o Built-in Dictionary Methods - o Introduction to Sets and Basic Set Operations
	9	Exercise 9: - o Built-in Set Functions and Methods - o List Comprehensions - o Set Comprehensions - o Dictionary Comprehensions
	10	Exercise 10: - o Basics of Functions - o Parameters and Arguments - o Keyword Arguments and Default Arguments - o Variable-length arguments - o Anonymous Functions - o Working with multi-dimensional arrays and pointers - o Fruitful Functions
	11	Exercise 11: - o Global and Local Variables - o Function Composition and Recursion - o Exercises-Functions - o Creation of Modules - o Import Statement - o From import Statement
	12	Exercise 12: - o Classes - o Self-Variable - o Constructors - o Methods - o Inheritance - o try-finally Clause - o Raising an Exception - o User-Defined Exceptions - o Internet Access - o Dates and Times - o Multi-Threading - o Turtle Graphics - o Data Compression

		o Arrays o Stack o Queue														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C219.1	2				3					2		3			
	C219.2		2							3	2					
	C219.3	3									2		2			
	C219.4		3			3				3	2					
	Avg.	2.5	2.5			3				3	2		2.2			



**KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
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Chowdavaram, Guntur – 522019, Andhra Pradesh

Department of Electronics & Communication Engineering

			L	T	P	Cr.
B. Tech. (III & I Sem.)	PROFESSIONAL ETHICS & UNIVERSAL HUMAN VALUES					
	Course Code:20MC3101 (Common to ALL)	2	0	0	0	

Pre-requisites: Basic knowledge of ethics and Human values

Course Objectives:

- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values and Loyalty.
- To appreciate the rights of others.
- To create awareness on assessment of safety and risk.
- Provide depth knowledge on framing of the problem and determining the facts, provide depth Knowledge on codes of ethics.

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

C301.1	:	Understand ethical values needed for a human to survive in society.
C301.2	:	Explain ethics to be followed by an engineer by using moral development theories.
C301.3	:	Discuss the role of an engineer in social experimentation.
C301.4	:	Explain the responsibilities of an engineer to maintain safety.
C301.5	:	Recognize ethical issues in globalization and research.

UNIT – I	Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others–Living Peacefully –Caring –Sharing –Honesty –Courage-Cooperation–Commitment – Empathy – Self Confidence Character –Spirituality.	07	hrs
UNIT – II	Senses of ‘Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas –Moral autonomy –Kohlberg’s theory-Gilligan’s theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories – Valuing time –Cooperation –Commitment.	07	hrs
UNIT – III	Engineering As Social Experimentation –Framing the problem –Determining the facts –Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles –Utilitarian thinking respect for persons	06	hrs
UNIT – IV	Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety-Intellectual Property rights (IPR).	05	hrs
UNIT – V	Globalization –Cross-culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts –Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.	07	hrs

Text Books

1	“Engineering Ethics includes Human Values” by M.Govindarajan, S.Natarajan and, V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009
2	“Engineering Ethics” by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition,

		2009.														
	3	“Ethics in Engineering” by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill–2003.														
	Reference Books															
	1	“Professional Ethics and Morals” by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.														
	2	“Professional Ethics and Human Values” by Prof.D.R.Kiran.														
	3	“Indian Culture, Values and Professional Ethics” by PSR Murthy-BS Publication.														
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PS O3
	C301.1	-	-	-	-	-	-	-	3		-	-	1	-	-	-
	C301.2	-	-	-	-	-	-	2	3	2	-	-	1	-	-	-
	C301.3	-	-	-	-	-	-	2	3		-	-	1	-	-	-
	C301.4	-	-	-	-	-	-	2		2	-	-	1	-	-	-
	C301.5	-	-	-	-	-	-	2	3	2	-	-	1	-	-	-
	Avg.	-	-	-	-	-	-	2	3	2	-		1			



KALLAM HARANADREDDY INSTITUTE OF TECHNOLOGY

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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (V Sem.)	LINEAR AND DIGITAL IC APPLICATIONS					
	Course Code: 20PCC3116	3				3
Pre-requisites: 1. Switching Theory and Logic Design 2. Electronic Circuit Analysis 3. Pulse and Digital Circuits						
Course Objectives: 1. To understand the basic operation & performance parameters of differential amplifiers. 2. To learn the linear and non-linear applications of operational amplifiers. 3. To understand the analysis & design of different types of active filters using op-amps. 4. To learn the internal structure, operation and applications of different analog ICs. 5. To acquire skills required for designing and implementation of combinational and sequential logic circuits.						
Course Outcomes: At the end of the course, the student will be able to						
C302.1	: Discuss the internal operation of Op-Amp and its parameters & specifications.					
C302.2	: Classify various active filter configurations based on frequency response and construct using 741 Op-Amp.					
C302.3	: Operate 555 timers in different modes and study their applications. Determine the lock range and capture range of PLL and use in various applications of communications.					
C302.4	: Design and implementation of combinational logic ICs.					
C302.5	: Design and implementation of Sequential logic ICs.					
UNIT – I						
		10				hrs
INTRODUCTION: Operational Amplifier: Internal block diagram of various stages of op-amp and roll of each stage. Differential Amplifier using BJT's and with R_E DC and AC analysis, basic current mirror circuit. OP-Amp Block Diagram (Symbolic Representation), Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slew rate, CMRR, PSRR.etc,						
UNIT –II						
		10				hrs
LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS: Integrator and differentiator, Difference amplifier, Instrumentation amplifier, V to I, I to V converters. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers.						
UNIT -III						
		10				hrs
ACTIVE FILTERS: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters. TIMERS & PHASE LOCKED LOOPS: Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger; PLL - introduction, block schematic, principles and description of individual blocks, 565 PLL, Applications of PLL – frequency multiplication, frequency translation, AM, FM & FSK demodulators.						
UNIT -IV						
		10				hrs
Digital Integrated Circuits: Classification of Integrated Circuits, Comparison of Various Logic Families Combinational Logic ICs – Specifications and Applications of TTL-74XX & Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders,						

	Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.															
	UNIT – V													10	hrs	
	Sequential Logic IC’s and Memories: Familiarity with commonly available 74XX CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, ShiftRegisters.Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static& Dynamic RAMs.															
	Text Books															
	1	Op-amps & linear ICs- Ramakanth A.Gayakwad, PHI.2003.														
	2	Digital Fundamentals-Floyd and Jain, Pearson education, 8th edition 2005.														
	Reference Books															
	1	Linear Integrated Circuits –D. Roy Chowdhury, New Age International (P) Ltd, 2 nd Ed., 2003.														
	2	Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore, Cengage Learning/ Jaico, 2009.														
	3	Operational Amplifiers with Linear Integrated Circuits by K. Lal Kishore – Pearson, 2009.														
	4	Linear Integrated Circuits and Applications – Salivahanan, 2005.														
	5	Modern Digital Electronics – RP Jain – 4/e – Mc Graw Hill Education, 2010.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
	C302.1	2	3											2		
	C302.2		3													
	C302.3		3	2												
	C302.4			3										2		
	C302.5	2	3	3												
	Avg.	2	3	2.6										2		



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VSem.)		VLSI DESIGN				
		Course Code: 20PCC3117		3	0	0
Pre-requisites: Basic electronics devices						
Course Objectives: 1. Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered. 2. Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly. 3. Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process.						
Course Outcomes: At the end of the course, the student will be able to						
C303.1	:	Discuss the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be inter connected in silicon.				
C303.2	:	Understand three sets of design rules with which NMOS and CMOS designs may be fabricated.				
C303.3	:	Calculate the scaling factors determining the characteristics and performance of MOS circuits in silicon.				
C303.4	:	Explain the FPGA Architecture, Design flow and different testing techniques to detect the Fault.				
C303.5	:	Explain the Low Power CMOS Logic Circuits and know importance of low power consumption.				
UNIT – I					10	hrs
Introduction and Basic Electrical Properties of MOS Circuits: Introduction to IC technology, Fabrication process: nMOS, pMOS and CMOS. Ids, Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio, MOS inverter driven by another nMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits, Bi-CMOS Inverter, Comparison between CMOS and BiCMOS technology.						
UNIT – II					10	hrs
MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, 2µm Double Metal, Double Poly, MOS/BiCMOS rules, 1.2µm Double Metal, Double Poly CMOS rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.						
UNIT – III					10	hrs
Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance Calculations, The Delay Unit, Inverter Delays, driving large capacitive loads, Propagation Delays, Wiring Capacitances, Choice of layers. Scaling of MOS Circuits: Scaling models and scaling factors, Scaling factors for device parameters, Limitations of scaling, Limits due to sub threshold currents, Limits on logic levels and supply voltage due to noise and current density. Switch logic, Gate logic.						
UNIT – IV					10	hrs
FPGA Design: FPGA design flow, Basic FPGA architecture, FPGA Technologies, Introduction to FPGA Families. Design for Testability: Fault types and Models, Controllability and Observability, AdHoc Testable						

Design Techniques, Scan Based Techniques and Built-In Self Test techniques.																
UNIT – V														10	hrs	
Introduction to Low Power VLSI Design: Introduction to Deep submicron digital IC design, Low Power CMOS Logic Circuits: Over view of power consumption, Low–power design through voltage scaling, Estimation and optimization of switching activity, Reduction of switching capacitance.																
Text Books																
1	Essentials of VLSI Circuits and Systems-Kamran Eshraghian, Douglas and A.Pucknell and SholehEshraghian, Prentice-Hall of India Private Limited, 2005 Edition.															
2	CMOS Digital Integrated Circuits Analysis and Design-Sung-Mo Kang, Yusuf Leblebici, Tata Mc Graw-Hill Education, 2003.															
Reference Books																
1	Advanced Digital Design with the Verilog HDL, MichaelD. Ciletti, Xilinx Design Series, Pearson Education															
2	Analysis and Design of Digital Integrated Circuits in Deep submicron Technology,3 rd Edition, David Hodges.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	P O 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PSO3
	C303.1	2												2		
	C303.2	2	3											2		
	C303.3	2	3	2										2		
	C303.4	2	3	3										2		
	C303.5	2		3										2		
	Avg.	2	3	2.6										2		



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (V Sem.)		ANTENNA AND WAVE PROPAGATION				
		Course Code: 20PCC3118		3	0	0
Pre-requisites: Electromagnetic waves and transmission lines						
Course Objectives:						
1. Understand the applications of the electromagnetic waves in free space.						
2. Introduce the working principles of various types of antennas.						
3. Discuss the major applications of antennas with an emphasis on how antennas are employed to meet electronic system requirements.						
4. Understand the concepts of radio wave propagation in the atmosphere.						
Course Outcomes: At the end of the course, the student will be able to						
C304.1	:	Identify basic antenna parameters.				
C304.2	:	Quantify the parameters & fields radiated by various types of antennas.				
C304.3	:	Design and analyze antenna arrays.				
C304.4	:	Design and analyze wire antennas, reflector antennas, lens antennas, horn antennas and micro strip antennas.				
C304.5	:	Identify the characteristics of radio wave propagation.				
UNIT – I					10	hrs
ANTENNA FUNDAMENTALS: Introduction, Radiation Mechanism – single wire, 2 wires, dipoles, Current Distribution on a thin wire antenna. Antenna Parameters - Radiation Patterns, Patterns in Principal Planes, Main Lobe and Side Lobes, Beamwidths, Polarization, Radiation Intensity, Directivity, Gain, Antenna Apertures, Aperture Efficiency, Effective Height, illustrated Problems.						
UNIT – II					10	hrs
THIN LINEAR WIRE ANTENNAS: Retarded Potentials, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Evaluation of Field Components, Power Radiated, Radiation Resistance, Beamwidths, Directivity, Effective Area and Effective Height, Loop Antennas: Small Loops - D and R relations for small loops,						
UNIT – III					10	hrs
ANTENNA ARRAYS: Two element array, Principle of Pattern Multiplication, N element Uniform Linear Arrays – Broadside, End-fire Arrays, Binomial Arrays, Arrays with Parasitic Elements. Yagi-Uda Arrays, Folded Dipoles and their characteristics. NON-RESONANT RADIATORS: Introduction, Traveling wave radiators, Long wire antennas, Rectangular Patch Antennas – Geometry and Parameters, Impact of different parameters on characteristics. Helical Antennas – Geometry, basic properties.						
UNIT – IV					10	hrs
VHF, UHF AND MICROWAVE ANTENNAS: Reflector Antennas: Corner Reflectors. Parabolic Reflectors Geometry, characteristics, types of feeds, F/D Ratio, Spill Over, Back Lobes, Aperture Blocking, Cassegrain Feeds. Horn Antennas – Types, Optimum Horns, Lens Antennas – Geometry, Features, Dielectric Lenses and Zoning, Applications. ANTENNA MEASUREMENTS – Patterns, Set Up, Distance Criterion, Directivity, VSWR, Impedance and Gain Measurements (Comparison, Absolute and 3-Antenna Methods)						
UNIT – V					10	hrs
WAVE PROPAGATION: Concepts of Propagation – frequency ranges and types of propagations.						

Ground Wave Propagation–Characteristics, Fundamental Equation for Free- Space Propagation, Basic Transmission Loss Calculations, Space Wave Propagation– Mechanism, LOS and Radio Horizon, Tropospheric Wave Propagation –Radius of Curvature of path, Effective Earth’s Radius, Field Strength Calculations.																
Text Books																
1	Antennas and wave propagation-SisirKDas, Annapurna Das, TMH, 2013.															
2	Antenna Theory Analysis and Design, ConstantineABalanis, 4 th Edition.															
Reference Books																
1	Antennas–John D.Kraus, McGraw-Hill, 2ndEdition, 1988.															
2	Transmission and Propagation–E.V.D.Glazierand H.R.L.Lamont, The Services Text Book of Radio, vol.5, Standard Publishers Distributors, Delhi, 2009.															
3	Antennas and wave propagation, Prof GSN Raju, Pearsion Publications, First impression, 2016.															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	C304.1	2	3	2										2		
	C304.2	1	3	3										2		
	C304.3	2	3	2										1		
	C304.4	3	3	1										3		
	C304.5	2	3	3										2		
	Avg.	2	3	2.2										2		



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (V Sem.)			INFORMATION THEORY & CODING			
		Course Code: 20PEC3104A (Professional Elective–1)	3	0	0	3
Pre-requisites: Basics of random signal, probability						
Course Objectives:						
1. To acquire knowledge on concept of information.						
2. To understand the limits of Error free representation of Information Signals.						
3. To understand the concept of various theorems proposed by Shanon for efficient data compression and reliable transmission.						
4. To give idea on different coding techniques.						
5. To design Optimal Decoder for various Coding Schemes.						
Course Outcomes: At the end of the course, the student will be able to						
C305A.1	:	Acquire knowledge on concept of information.				
C305A.2	:	Aware the limits of Error free representation of Information Signals.				
C305A.3	:	Aware the concept of various theorems proposed by Shanon for efficient data compression and reliable transmission.				
C305A.4	:	Give idea on different coding techniques.				
C305A.5	:	Design Optimal Decoder for various Coding Schemes.				
UNIT – I			10	hrs		
Introduction to Information Theory: Concept of information, units, entropy, marginal, conditional and joint entropies, relation among entropies, mutual information, information rate. Source coding: Instantaneous codes, construction of instantaneous codes, Kraft’s inequality, coding efficiency and redundancy 9 II Noiseless coding theorem , construction of basic source codes, Shannon-Fano Algorithm, Huffman coding, Channel capacity – redundancy and efficiency of a channel, binary symmetric channel (BSC).						
UNIT – II			10	hrs		
Continuous Sources and Channels: Differential Entropy, Mutual information, Waveform channels, Gaussian channels, Shannon – Hartley theorem, bandwidth, SNR trade off, capacity of a channel of infinite bandwidth, Shannon’s limit.						
UNIT – III			10	hrs		
Perfect codes, Hamming codes, encoding and decoding Cyclic codes, polynomial and matrix descriptions, generation of cyclic codes, decoding of cyclic codes BCH codes, Construction and decoding, Reed Solomon codes.						
UNIT – IV			10	hrs		
Introduction to rings, fields, and Galois fields. Codes for error detection and correction – parity check coding – linear block codes – error detecting and correcting capabilities – generator and parity check matrices–Standard array and syndrome decoding.						
UNIT – V			10	hrs		
Convolutional Codes – encoding – time and frequency domain approaches, State Tree & Trellis diagrams – transfer function and minimum free distance – Maximum likelihood decoding of convolutional codes – The Viterbi Algorithm. Sequential decoding.						
Text Books						
1	P S Sathya Narayana, Concepts of Information Theory & Coding, Dynaram Publications, 2005.					
2	Simon Haykin: Digital Communication Systems, Wiley India, 2013. Semester VII, Course Hand- out Department of EC, RSET 11.					
3	Bose, Information theory coding and cryptography, 3/e McGraw Hill Education India, 2016.					
4	D.E.R. Denning, Cryptography and Data Security, Addison Wesley, 1983.					

	Reference Books															
	1	Kelbert&Suhov, Information theory and coding by examples, Cambridge University Press, 2013.														
	2	Shu Lin & Daniel J. Costello. Jr., Error Control Coding: Fundamentals and Applications, 2/e, Prentice Hall Inc., Englewood Cliffs, NJ, 2004.														
	3	J S Chitode, Information Theory and Coding, Technical Publications, Pune, 2009.														
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PS O 3
	C305A.1	2	2											2	2	
	C305A.2	2												2	2	
	C305A.3	2	3											2	2	
	C305A.4	2	3											2	2	
	C305A.5	2	3											2	2	
	Avg.	2	2.75											2	2	

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			L	T	P	Cr.
B.Tech. (V Sem.)		DIGITAL SYSTEM DESIGN USING HDL				
		Course Code: 20PEC3104B (Professional Elective-1)		3	0	0
Pre-requisites: Strong digital design knowledge						
Course Objectives: 1. Learn and understand the architectures of Field-programmable Gate Arrays. 2. Translate software application into hardware logic for FPGA architectures. 3. Design synthesizable systems based on industry-standard coding methods. 4. Build test benches and create data models to verify bit-true accurate designs.						
Course Outcomes: At the end of the course, the student will be able to						
C305B.1	:	Aware the architecture of FPGAs, tools used in modeling of digital design.				
C305B.2	:	Analyze and design basic digital circuits with combinatorial and sequential logic circuits using Verilog HDL.				
C305B.3	:	Model complex digital systems at several levels of abstractions.				
C305B.4	:	Design real time applications such as vending machine and washing machines etc.				
UNIT – I					10	hrs
Hardware Description Languages, FPGA Boards and Software Tools. Field-Programmable Gate Arrays: Transistor as a Switch, Logic Gates from Switches, FPGA Building Blocks, Layout of the Xilinx Artix-7 XC7A35T FPGA, Input/output Blocks, Configurable Logic Blocks, Interconnect Resources, Block RAM, DSP Slices, Clock Management, The XADC Block, High-Speed Serial I/O Transceivers, Peripheral Component Interconnect Express Interface, FPGA- Based Digital System Design Philosophy, How to Think While Using FPGAs, Advantages and Disadvantages of FPGAs, Usage Areas of FPGAs Introduction to Verilog: Verilog Fundamentals, Module Representation, Timing and Delays in Modelling, Hierarchical Module Representation, Test bench Formation in Verilog, Structure of a Verilog Test bench File, Displaying Test Results.						
UNIT – II					10	hrs
VERILOG DATA TYPES AND OPERATORS Data Types in Verilog, Net and Variable Data Types, Data Values, Naming a Net or Variable, Defining Constants and Parameters, Defining Vectors, Operators in Verilog, Arithmetic Operators, Concatenation and Replication Operators, Application on Data Types and Operators, FPGA Building Blocks Used in Data Types and Operators, Implementation Details of Vector Operations, Implementation Details of Arithmetic Operations.						
UNIT – III					10	hrs
COMBINATIONAL CIRCUITS Combinational Circuit Analysis, Logic Function Formation between Input and Output, Boolean Algebra, Gate-Level Minimization, Combinational Circuit Implementation, Truth Table-Based Implementation, Combinational Circuit Design. COMBINATIONAL CIRCUIT BLOCKS: Adders in Verilog, Comparators in Verilog, Decoders in Verilog, Encoders in Verilog, Multiplexers in Verilog, Parity Generators and Checkers in Verilog, Applications on Combinational Circuits, Implementing the Home Alarm System, Implementing the Digital Safe System, Implementing the Car Park Occupied Slot Counting System, FPGA Building Blocks Used in Combinational Circuits. DATA STORAGE ELEMENTS: Latches in Verilog, Flip-Flops in Verilog, Register, Memory, Read-Only Memory, ROM in Verilog, ROM Formation Using IP Blocks, Random Access Memory, Application on Data Storage Elements, FPGA Building Blocks used in Data Storage Elements.						
UNIT – IV					10	hrs
SEQUENTIAL CIRCUITS						

Sequential Circuit Analysis, State Table, State Diagram, State Representation in Verilog, Timing in Sequential Circuits, Synchronous Operation, Asynchronous Operation, Shift Register as a Sequential Circuit, Shift Registers in Verilog, Multiplication and Division Using Shift Registers, Counter as a Sequential Circuit, Synchronous Counter, Asynchronous Counter, Counters in Verilog, Frequency Division Using Counters, Sequential Circuit Design, Applications on Sequential Circuits																	
UNIT – V														10	hrs		
DIGITALINTERFACING Universal Asynchronous Receiver/Transmitter(UART) in Verilog, UART Applications, Serial Peripheral Interface (SPI) in Verilog, SPI Application, Inter- Integrated Circuit (I2C) in Verilog, I2C Application, Video Graphics Array (VGA) in Verilog, VGA Application, Universal Serial Bus (USB) Receiving Module in Verilog, USB Keyboard Application, Ethernet, FPGA Building Blocks Used in Digital Interfacing. ADVANCED APPLICATIONS: Vending Machine, Digital Clock, Moving Wave via LEDs, Translator, Air Freshener Dispenser, Obstacle-Avoiding Tank, Intelligent Washing Machine, Non- Touch Paper Towel Dispenser, Car Parking Sensor System. Digital Table Tennis Game.																	
Text Books																	
1	CemUnsalan, BoraTar “Digital System Design with FPGA Implementation Using Verilog and VHDL” McGraw-Hill Education, 2017.																
2	Design through Verilog HDL–T.R. Padmanabhan and B. BalaTripuraSundari, WSE, IEEE Press, 2004.																
Reference Books																	
1	Advanced Digital Design with Verilog HDL–Michael D. Ciletti, PHI, 2005.																
2	Fundamentals of Logic Design with Verilog –Stephen. Brown and ZvonkoVranesic, TMH, 2005.																
3	A Verilog Primer–J. Bhasker, BSP, 2003.																
CO-PO/PSO Mapping Matrix																	
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	
	C305B.1	2												3			
	C305B.2	2		2										3			
	C305B.3	2												3			
	C305B.4	2	3	2										3			
	C305B.5													3			
	Avg.	2	3	2										3			



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (V Sem.)	DATA STRUCTURES AND ALGORITHMS					
	Course Code: 20PEC3104C (Professional Elective– 1)		3	0	0	3
Pre-requisites: Basic C programming						
Course Objectives:						
1. Explain the systematic methods of efficiently organizing and accessing data in data structures and algorithms. 2. Identify the properties and structural patterns in data structures. 3. Apply abstract data types to the design of data structures. 4. Analyze algorithms using a mathematical notation and experimental studies. 5. Perform comparative analysis of the typical data structures and algorithms						
Course Outcomes: At the end of the course, the student will be able to						
C305C.1	:	Demonstrate analytical comprehension of concepts such as abstract data types.				
C305C.2	:	Analyze various generic programming techniques,				
C305C.3	:	Compare various sorting algorithms and perform their efficiency analysis.				
C305C.4	:	Demonstrate the ability to analyze, design, apply and use data structures and algorithms to solve engineering problems and evaluate their solutions.				
C305C.5	:	Demonstrate the ability of using generic principles for data representation & manipulation with a view for efficiency, maintainability, and code-reuse.				
UNIT – I			10			hrs
Data Structures Basics: Structure and Problem Solving, Data structures, Data structure Operations, Algorithm: complexity, Time- space trade-off. Linked List: Introduction, Linked lists, Representation of linked lists in Memory, traversing a linked list, Searching a linked list, Memory allocation and Garbage collection, insertion into linked list, Deletion from a linked list, Types of linked list.						
UNIT – II			10			hrs
Stack and Queue: Introduction, Array Representation of Stack, Linked List Representation of stack, Application of stack, Queue, Array Representation of Queue, Linked List Representation of Queue. Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Sequential and Other Representations of Trees, Tree Traversal.						
UNIT – III			10			hrs
Graphs: Matrix Representation of Graphs, List Structures, Other Representations of Graphs, Breadth First Search, Depth First Search, Spanning Trees. Directed Graphs Types of Directed Graphs; Binary Relation as a Digraph; Euler's Digraphs; Matrix Representation of Digraphs. Applications of Graphs: Topological Sorting, Shortest-Path Algorithms – Weighted Shortest Paths – Dijkstra's Algorithm, Minimum spanning tree- Prim's Algorithm, Introduction to NP- Completeness.						
UNIT – IV			10			hrs
Searching and Sorting Techniques: Sorting Techniques – Bubble sort, Merge sort, Selection sort, Heap sort, Insertion Sort, Searching Techniques – Sequential Searching, Binary Searching, Search Trees. Elementary Algorithms: Notation for Expressing Algorithms; Role and Notation for Comments; Example of an Algorithm; Problems and Instances; Characteristics of an Algorithm; Building Blocks of Algorithms; Procedure and Recursion – Procedure, Recursion; Outline of Algorithms; Specification Methods for Algorithms.						
UNIT – V			10			hrs

Mathematical Functions and Notations: Functions and Notations; Modular Arithmetic / Mod Function; Mathematical Expectation in Average Case Analysis; Efficiency of an Algorithm; Well Known Asymptotic Functions and Notations; Analysis of Algorithms – Simple Examples; Well Known Sorting Algorithms – Insertion sort, Bubble sort, Selection sort, Shell sort, Heap sort. Divide and Conquer: Divide and Conquer Strategy; Binary Search; Max. And Min.; Merge sort; Quick sort. Greedy Method: Greedy Method Strategy; Optimistic Storage on Tapes; Knapsack Problem; Job Sequencing with Deadlines; Optimal Merge Pattern; Single Source Shortlist Paths. Dynamic Programming: Dynamic Programming Strategy; Multistage Graphs; All Pair Shortest Paths; Travelling Salesman Problems. Backtracking Strategy, 8-Queens Problem, Sum of Subsets, Knapsack Problem.																
Text Books																
1		Data structures and Algorithm Analysis in C++, M.A.Weiss, 3rd Edition, Addison- Wesley, 2005..														
2		Data structures in C++, Malik D.S, 2nd Edition, Cengage Learning, 2009.														
3		Data structures, Richard F.Gilberg and Behrouz A.Forouzan, 2nd Edition, Cengage Learning, 2007.														
Reference Books																
1		Data Structures and Algorithms: Concepts–Techniques and Applications, G. A.V. Pai, 1st Edition, Mc Graw Hill Education, 2017.														
2		Classic Data Structures, Debasis Samanta, 2nd Edition, PHI, 2009.														
3		Data structures, Seymour Lipschutz, 1st Edition, McGraw Hill Education, 2014.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C305C.1	2	2													
	C305C.2	2	2													
	C305C.3	2	2													
	C305C.4	2	2													
	C305C.5	2														
	Avg.	2	2													



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			L	T	P	Cr.	
B.Tech. (V Sem.)		Computer Architecture and Organization					
		Course Code:20PEC3104D (Professional Elective– 1)		3	0	0	3
Pre-requisites: Digital Logic Design							
Course Objectives:							
1. To understand the architecture of a modern computer with its various processing units. Also, the performance measurement of the computer system.							
2. To understand the various instructions, addressing modes							
3. To understand the concept of I/O organization.							
4. To understand the memory management system of computer.							
To understand the concept of processing unit.							
Course Outcomes: At the end of the course, the student will be able to							
C305D.1	:	Aware the architecture of modern computer.					
C305D.2	:	Analyze the Performance of a computer using performance equation.					
C305D.3	:	Aware of different instruction types.					
C305D.4	:	Calculate the effective address of an operand by addressing modes.					
C305D.5	:	Aware the concepts of I/O Organization and Memory systems.					
UNIT – I					10	hrs	
Basic Structure of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.							
Machine Instruction and Programs:							
Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types,							
UNIT – II					10	hrs	
Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation. Component of Instructions: Logic Instructions, Shift and Rotate Instructions							
Type of Instructions: Arithmetic and Logic Instructions, Branch Instructions, Addressing Modes, Input/output Operations							
UNIT – III					10	hrs	
INPUT/OUTPUT ORGANIZATION: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)							
UNIT – IV					10	hrs	
THE MEMORY SYSTEMS: Basic memory circuits, Memory System Consideration, Read-Only Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Introduction about Cache Memories							
Secondary Storage: Magnetic Hard Disks, Optical Disks.							
UNIT – V					10	hrs	
Processing Unit: Fundamental Concepts: Register Transfers, performing an Arithmetic or Logic Operation, Fetching A Word from Memory, Execution of Complete Instruction, Hardwired Control.							
Text Books							
1	Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th Edition, Mc Graw Hill, 2011.						
2	Computer Architecture and Organization, John P. Hayes, 3rd Edition, Mc Graw Hill, 2002.						
Reference Books							
1	Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI						

2	Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson, 2012.
3	Fundamentals of Computer Organization and Design, - Sivarama Dandamudi Springer Int. Edition, 2003.
4	“Computer Organization and Design: The Hardware/Software Interface” by David A. Patterson and John L. Hennessy, 1998.
5	J .P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C305D.1	2	2												2	
C305D.2			3											2	
C305D.3	2	2	3											3	
C305D.4	3	3	3											3	
C305D.5		3												2	
Avg.	2.3	2.5	3											2.4	



**KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
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Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

			L	T	P	Cr.
B.Tech. (V Sem.)	SIMULATION AND MATHEMATICAL MODELING					
	Course Code: 20PEC3104E (Professional Elective–1)		3	0	0	3
Pre-requisites: Linear algebra, Differential equations						
Course Objectives:						
1. To introduce various system modeling and simulation techniques and highlight their applications in different areas						
2. It includes modelling, design, simulation, planning, verification and validation.						
Course Outcomes: At the end of the course, the student will be able to						
C305E.1	:	Solve real world problems which cannot be solved strictly by mathematical approaches.				
C305E.2	:	Aware the principles within mathematical modelling of material science.				
C305E.3	:	Demonstrate the mathematical components in mechanical and thermal analyses.				
C305E.4	:	Be able to describe the conditions in numerical code for solving stress loading problems.				
UNIT – I				10	hrs	
Introduction to Simulation When simulation is the appropriate tool and when it is not appropriate; Advantages and disadvantages of Simulation; Areas of application; Systems and system environment; Components of a system; Discrete and continuous systems; Model of a system; Types of Models; Discrete- Event System Simulation; Steps in a Simulation Study. The basics of Spreadsheet simulation, Simulation example: Simulation of queuing systems in a spreadsheet. General Principles, Simulation software: Concepts in Discrete-Event Simulation: The Event-Scheduling / Time- Advance Algorithm, World Views, Manual simulation Using Event Scheduling; List processing.						
UNIT – II				10	hrs	
Mathematical Models Statistical Models in simulation – Concepts, Discrete Distribution, Continuous Distribution, Poisson Process, Empirical Distributions, Queuing Models – Characteristics, Notation, Queuing Systems, Markovian Models, Generation of Pseudo Random numbers, Properties of random numbers, Techniques for generating random numbers, Testing random number generators, Generating Random-Variates, Inverse Transform technique, Acceptance- Rejection technique, Composition & Convolution Method.						
UNIT – III				10	hrs	
Analysis of Simulation Data Input modelling: Data Collection; Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, fitting a non-stationary Poisson process, selecting input models without data, Multivariate and Time-Series input models. Estimation of Absolute Performance: Types of simulations with respect to output analysis; Stochastic nature of output data; Absolute measures of performance and their estimation; Output analysis for terminating simulations; Output analysis for steady-state simulations.						
UNIT – IV				10	hrs	
Verification, Calibration, and Validation Optimization: Model building, verification and validation; Verification of simulation models; Calibration and validation of models, Optimization via Simulation Simulation of computer systems and case studies Simulation tools, Model input, high level computer system simulation, comparison of systems via simulation, simulation programming techniques, development of simulation models.						
UNIT – V				10	hrs	
Case Studies						

	City traffic simulation, Indoor air quality simulation of a building, machine health simulation (DC motor health).															
	Text Books															
	1	Discrete Event System Simulation, Jerry Banks and JohnS. CarsonII, 5thEdition, Pearson, 2010.														
	2	Simulation Modelling and Analysis, AverilM.Law, 4th Edition, McGraw Hill, 2007.														
	3	Introduction to probability models, Sheldon M. Ross, 7th Edition, Academic Press, 2000.														
	Reference Books															
	1	Simulation, Sheldon M. Ross, 5th Edition, Elsevier, 2012.														
	2	System Modelling and Simulation – An Introduction, Frank L. Severance, Wiley, 2001.														
	3	System Simulation, Geoffrey and Gordon, 2nd Edition, PHI, 2002.														
	4	Handbook of simulation: Principles, Methodology, Advances, Applications and Practice, Jerry Banks, 1st Edition, Wiley, 1998.														
	CO-PO/PSO Mapping Matrix															
	CO	PO 1	P O 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PSO 2	PSO 3
	C305E.1	2	2													
	C305E.2	2	3													
	C305E.3	2	3													
	C305E.4	2	3													
	C305E.5	2	3													
	Avg.	2	2.8													



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (V Sem.)		BASIC ELECTRONIC DEVICES AND CIRCUITS				
		CourseCode:20OEC3104A (OpenElective–1 for other than ECE)	3	0	0	3
Pre-requisites: Intermediate Physics and Mathematics						
Course Objectives:						
1. Understand the operation and principles of P-N diode.						
2. Understand various types of rectifiers and filters.						
3. Know the working of BJT.						
4. Know the need for transistor biasing and stabilization.						
5. Know the working of FET and other Transistors.						
Course Outcomes: At the end of the course, the student will be able to						
C306A.1	:	Explain the basic concepts of semiconductor physics and P N Junction diode characteristics.				
C306A.2	:	Discuss the construction, operation, electrical characteristics of different diodes and the application of diodes as rectifiers with and without filters.				
C306A.3	:	Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.				
C306A.4	:	Explain the transistor biasing, stabilization and compensation techniques.				
C306A.5	:	Analyze the Small Signal model ofBJT and FET amplifiers.				
UNIT – I			10	hrs		
P N JUNCTION DIODE CHARACTERISTICS: Insulators, Semiconductors and Metals–Classification using Energygap, Intrinsic and Extrinsic Semiconductors. P-N Junction Diode - Formation of P-N Junction, Biased P-N Junction – Forward Bias, Reverse Bias, V-I Characteristics of Diode -Forward Bias, Reverse Bias, Energy Band Diagram of PN Junction Diode.						
UNIT – II			10	hrs		
RECTIFIERS: Basic Rectifier setup, Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Inductive and Capacitive Filters, L– Section and π - Section, Comparison of rectifier parameters with and without filter.						
UNIT – III			10	hrs		
BIPOLAR JUNCTION TRANSISTOR (BJT): Bipolar Junction Transistor – Types, Symbols and Operation, Transistor Configurations - CB, CE andCC, Transistor as a switch, Transistor as an Amplifier, Characteristics of Transistor in Common Base Configuration, Common Emitter and Common Collector Configurations-Input and outputcharacteristics, Early effect, Transistor parameters, Current amplification factor, Relation among α , β ,and γ , Comparison of CB, CE and CC Configurations.						
UNIT – IV			10	hrs		
BJT BIASING AND THERMAL STABILITY: Need for Biasing, Operating Point, Load Line Analysis - D.C. Load Line, A.C. Load Line, Biasing Methods, Bias Stability, Fixed Bias and Self Bias, Stabilization against variations in V_{BE} , I_c and β ,Thermal Runaway,Thermal Stability.						
UNIT – V			10	hrs		
FET: FET Types and Symbols-JFET and MOSFET/IGFET, JFET:N-Channel and P-Channel Construction, Operation,Characteristics-Drain and Transfer,Parameters-Drain Resistance,Amplification factor, Transconductance, Pinch-off voltage, MOSFET - Types - Depletion MOSFET –N Channel and P Channel, Enhancement MOSFET-N-Channel and P-Channel,Construction,Operation,Characteristics-Transfer and Drain Characteristics for Depletion and Enhancement Modes, Analysis of MOSFETs, Comparison between JFET and MOSFET.						
Text Books						

	1	Electronic Devices and Circuits-J.Millman, C.Halkias, Tata Mc-GrawHill, Second Edition,2007.														
	2	Electronic Devices and Circuits-K.LalKishore,BS Publications,Fourth Edition, 2016.														
	Reference Books															
	1	Integrated Electronics-J.Millman, C.Halkias, Tata Mc-GrawHill,Second Edition, 2009.														
	2	Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-GrawHill, 4thEdition, 2008.														
	3	Electronics devices & circuit theory-RobertL.Boylestad and LouiNashelsky, Pearson/PrenticeHall, Tenth Edition, 2009.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C306A.1	2	2													
	C306A.2	2	3													
	C306A.3	2	2													
	C306A.4	2	3													
	C306A.5	2	3													
	Avg.	2	2.6													



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech.(IIISem.)	DIGITAL ELECTRONICS & LOGIC DESIGN					
	Course Code: 20OEC3104B		3	0	0	3
Pre-requisites: Mathematics						
Course Objectives: 1. To solve a typical number base conversion and analyze new error coding techniques. 2. Theorems and functions of Boolean algebra and behavior of logic gates. 3. To optimize logic gates for digital circuits using various techniques. 4. Boolean function simplification using Karnaugh maps and Quine-Mc Cluskey methods. 5. To understand concepts of combinational circuits. 6. To develop advanced sequential circuits.						
Course Outcomes: At the end of the course, the student will be able to						
C306B .1	:	Apply the Complements & Parity concepts for numbers systems and Hamming codes.				
C306B .2	:	Compute K-map for minimization of logic functions.				
C306B .3	:	Design the different combinational circuits.				
C306B .4	:	Design the different sequential circuits.				
C306B .5	:	Design the different Finite State machines (Melay& Moore circuits) using flip-flops.				
UNIT – I					10	hrs
REVIEW OF NUMBER SYSTEMS & CODES: Representation of numbers of different radix, conversation from one radix to another radix,r-1’scompliments and r’s compliments of signed members. Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1codeetc.Error detection & correction codes: parity checking, even parity, odd parity, Hamming code. BOOLEAN THEOREMS AND LOGIC OPERATIONS: Boolean theorems, principle of complementation & duality, De Morgan theorems. Logic operations; Basic logic operations-NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits.						
UNIT – II					10	hrs
MINIMIZATION TECHNIQUES: Minimization and realization of switching functions using Boolean theorems, K Map (up to 6 variables) and tabular method (Quine-Mc Cluskey method) with only four variables and single function. COMBINATIONAL LOGIC CIRCUITS DESIGN: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converters using Karnaugh method and draw the complete circuit diagrams.						
UNIT – III					8	hrs
COMBINATIONAL LOGIC CIRCUITS DESIGN USING MSI & LSI:						

Design of encoder, decoder, multiplexer and de-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of Priority encoder, 4-bit digital comparator and seven segment decoder. INTRODUCTION OF PLD's: PLDs: PROM, PAL, PLA-Basics structures, realization of Boolean functions, Programming table.																
UNIT – IV												10	hrs			
SEQUENTIAL CIRCUITS-I: Classification of sequential circuits(synchronous and asynchronous),operation of NAND & NOR Latches and flip-flops; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip- flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers – Buffer register, shift register, bi-directional shift register, universal shift register.																
UNIT – V												11	hrs			
SEQUENTIAL CIRCUITS-II: Finite state machine; state diagrams, state tables, reduction of state tables. Analysis of clocked sequential circuits Mealy to Moore conversion and vice-versa. Realization of sequence generator, Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).																
Text Books																
1	Switching and finite automata theory, Zvi. Kohavi, Niraj. K. Jha 3 rd Edition, Cambridge UniversityPress,2009															
2	Digital Design, M.Morris Mano, MichaelDCiletti,4 th Edition PHI Publication,2008.															
Reference Books																
1	Fundamentals of Logic Design by Charles H.RothJr, Jaico Publishers, 2006.															
2	Digital electronics by R SSedha.S.Chand& Company limited, 2010.															
3	Switching Theory and Logic Design by A.Anand Kumar, PHI Learning pvt ltd, 2016.															
4	Digital logic applications and design by John M Yarbough, Cengage learning, 2006.															
5	TTL74-Seriesdatabook.															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PSO3
	C306B.1	3														
	C306B.2	3	3	3												
	C306B.3	2	3	3												
	C306B.4	2	3	3												
	C306B.5	2	3	2												
	Avg.	2. 4	3	2. 8												



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (V Sem.)	SIGNALS AND SYSTEMS					
	Course Code: 20OEC3104C (Open Elective – 1 for other than ECE)		3	0	0	3
Pre-requisites: Intermediate Physics and Mathematics						
Course Objectives:						
1. To explain about signals and perform various operations on it and to summarize the sampling						
2. To build Trigonometric and Exponential Fourier series of various signals						
3. To develop Fourier transforms for various signals.						
4. To solve Laplace transforms and z-transforms for various signals.						
5. To examine sampling effect on signals						
Course Outcomes: At the end of the course, the student will be able to						
C306C.1	: Define basic signals and its operations.					
C306C.2	: Identify Trigonometric and Exponential Fourier Series of signals.					
C306C.3	: Develop Fourier Transforms for various signals.					
C306C.4	: Solve Laplace Transform and z-Transform for various signals.					
C306C.5	: Examine sampling effect on signals.					
UNIT – I						
		10	hrs			
CLASSIFICATION OF SIGNALS: Analog, Discrete, Digital, Deterministic & Random, Periodic & Aperiodic, Even & Odd, Energy & Power signals. Basic Operations on Signals: Time-Shifting, Time-Scaling, Time-Reversal, Amplitude Scaling and Signal Addition. Elementary Signals: Unit Step, Unit Ramp, Unit Parabolic, Impulse, Sinusoidal function, Exponential function, Gate function, Triangular function, Sinc function and Signum function.						
UNIT – II						
		10	hrs			
FOURIER SERIES: Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet conditions, Trigonometric Fourier Series and Exponential Fourier Series, Conversion of Exponential Fourier Series from Trigonometric Fourier series.						
UNIT – III						
		10	hrs			
FOURIER TRANSFORMS: Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of periodic signals. Properties of Fourier Transform, Introduction to Hilbert Transform.						
UNIT – IV						
		10	hrs			
LAPLACE TRANSFORMS AND Z- TRANSFORMS:						
Laplace Transforms: Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of Region of Convergence (ROC), Properties of Laplace transforms.						
Z-Transforms: Concept of Z-transform of a discrete sequence, Region of convergence in Z- Transform, inverse Z-transform, properties of Z-Transforms.						
UNIT – V						
		10	hrs			
SAMPLING: Sampling theorem, Types of Sampling: Impulse Sampling, Natural and flat-top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.						
Text Books						
1	B.P. Lathi, “Signals, Systems and Communications”, BS Publications, 2008.					
2	Simon Haykin and Van Veen, Wiley, “Signals and Systems”, Second Edition, 2003.					



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			L	T	P	Cr.
B.Tech. (V Sem.)		DIGITAL IMAGE PROCESSING				
		CourseCode:20OEC3104D (OpenElective–1 for other than ECE)	3	0	0	3
	Pre-requisites: 1.Signal & Systems					
	Course Objectives:					
	1. To understand fundamental concepts of digital image processing.					
	2. To understand image enhancement techniques.					
	3. To understand image restoration and compression techniques.					
	4. To understand color image processing.					
	5. To understand image segmentation techniques.					
	Course Outcomes: At the end of the course, the student will be able to					
	C306D.1	:	Understand fundamental concepts of digital image processing.			
	C306D.2	:	Understand image enhancement techniques.			
	C306D.3	:	Understand image restoration and compression techniques.			
	C306D.4	:	Understand color image processing.			
	C306D.5	:	Understand image segmentation techniques.			
	UNIT – I	Fundamentals of Digital Images			10	hrs
	Introduction to image processing, Types of digital images, Fundamental steps in image processing, Components of an Image processing system, Applications of digital image processing. Digital Image Fundamentals: Image sampling and quantization, Relationships between pixels.					
	UNIT – II	Intensity Transformations and Spatial Filtering			12	hrs
	Image enhancement in the spatial domain: Some basic gray level transformation, Histogram processing, Enhancement using arithmetic and logic operations, Basics of spatial filters, smoothening and sharpening spatial filters.					
	UNIT – III	Image Restoration and Compression			8	hrs
	IMAGE RESTORATION: Degradation: Introduction, Types of noises, Image restoration techniques, restoration filters in frequency domain. IMAGE COMPRESSION: Fundamentals, Image compression models, Image Formats, Containers, and compression standards. Basic Compression Methods: Huffmann Coding, Arithmetic Coding, bit-plane coding.					
	UNIT – IV	Image compression			10	hrs
	COLOR IMAGE PROCESSING: Color Fundamentals, Color Models- RGB, CMY and CMYK color models, HIS Color model. Basics of Full-Color Image processing, Color transformations, color complements, color slicing, Histogram Processing, Color Image smoothing and Sharpening.					
	UNIT – V	Color image processing			10	hrs
	IMAGE SEGMENTATION: Fundamentals, Point detection, Line detection, Edge Detection, Thresholding, Region-based segmentation, Segmentation using morphological watersheds.					
	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, 9 thEdition, Indian Reprint, 2002.				

2	B.Chanda, D.Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2009.															
3	e-RESOURCES: https://nptel.ac.in/courses/117105079															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	P O 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PS O 3
	C306D.1	3	2													
	C306D.2	3	2													
	C306D.3	3	2													
	C306D.4	3	2													
	C306D.5	3	2													
	Avg.	3	2													



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Department of Electronics & Communication Engineering



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (V Sem.)		LINEAR AND DIGITAL IC APPLICATIONS LAB				
		Course Code: 20PCC3119		0	0	3
	Pre-requisites: 1. Electronic Circuit Analysis 2. Pulse and Digital Circuits 3. Switching Theory and Logic Design					
	Course Objectives: To learn design, testing and characterizing of circuit behavior with digital and analog ICs.					
	Course Outcomes: At the end of the course, the student will be able to					
	C307.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
	C307.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
	C307.3	Acquire the basic knowledge about Operational amplifiers and its applications and to generate various waveforms using op-amps.				
	C307.4	Design and implementation of different combinational logic circuits.				
	List of Experiments (Any of the 10 experiments are required to be conducted)					
	1	Study of OPAMPs–IC741–functioning, parameters and Specifications.				
	2	OPAMP Applications–Adder, Subtractor, Comparator Circuits.				
	3	Integrator and Differentiator Circuits.				
	4	Waveform Generator using single OP-AMP with variable duty cycle.				
	5	Active Filter Applications–LPF,HPF(first order)				
	6	Active Filter Applications–BPF, Band Reject (Wideband) and Notch Filters.				
	7	IC555Timer–Monostable Operation Circuit, stable Operation Circuit.				
	8	Design Schmitt Trigger Circuits–using Single OP-AMP with Reference voltage.				
	9	PLL Operation and Estimation of Capture and Lock range.				
	10	Realization of logic gates.				
	11	Design and implementation of full adder.				
	12	Design and implementation of Decoder.				
	13	Design and implementation of multiplexer.				

	14	Design and implementation of flip-flops.
	15	Design and implementation of 4-bit synchronous counter.
	Reference Books:	
	1	Linear Integrated Circuits–D. Roy Chowdhury, New Age International (P) Ltd, 2 nd Ed., 2003.
	2	Modern Digital Electronics – RP Jain – 4/e – Mc Graw Hill Education, 2010.
CO-PO/PSO Mapping Matrix		
	CO	PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 P O 1 2 PS O1 PS O2 PS O3
	C307.1	
	C307.2	
	C307.3	
	C307.4	
	Avg.	

		1	2	3	4	5	O 6	7	8	9	10	11	12	O1	O2	O3
	C308.1									3	2					
	C308.2								2	3	2					3
	C308.3	3	2		2	3										2
	C308.4	2	2		2	3										
	Avg.	2.5	2		2	3			2	3	2					2.5



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B. Tech. (V Sem.)	COMMUNITY SERVICE PROJECT					
		Course Code: 20PROJ3101		0	8	4

At the completion of the above course, the learner will be able to

C309.1: Demonstrate the capability to participate in community-engaged services/ activities for promoting the well being of society.

C309.2: Gain knowledge through field practice and experiential learning.

C309.3: Gain first-hand understanding of the policies, regulations, organizational structures, processes, and programmes that guide the socio economic development process.

C309.4: Know the ways of transforming the society through technology and systematic programme implementation.

C309.5: Construct coherent written and present effective oral forms of communication.

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
C309. 1						3	3								
C309. 2					3										
C309. 3						3					2				3
C309. 4	3														2
C309. 5										3					
Avg.	3				3	3	3			3	2				2.5



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VI Sem.)	SUMMER INTERNSHIP-1					
	Course Code:20PROJ3102		0	0	0	3

Course Objectives:

1. Gain knowledge through field practice and experiential learning (PO5).
2. To Apply knowledge of engineering techniques, tools and resources on the project appropriate to the internship program (PO1, PO2).
3. To Understand the implication of solutions provided on society and environment (PO 6 and 7).
4. Learning of professional ethics and develop ability to work effectively as a member and leader in teams. (PO 8 and 9).
5. Communicate effectively (oral and written communication, report writing, presentation skills). (PO 10).

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

C310.1	:	Gain knowledge through field practice and experiential learning (PO5).
C310.2	:	Apply knowledge of engineering techniques, tools and resources on the project appropriate to the internship program (PO1, PO2).
C310.3	:	Understand the implication of solutions provided on society and environment (PO 6 and 7).
C310.4	:	Learning of professional ethics and develop ability to work effectively as a member and leader in teams. (PO 8 and 9).
C310.5	:	Communicate effectively (oral and written communication, report writing, presentation skills). (PO 10).
C310.6	:	Identify and address their own educational needs in a changing world in ways sufficient to maintain their competence. (PO 12).

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C310.1					3										2
C310.2	3	2													
C310.3						3	3								
C310.4								3	3						3
C310.5										3					
C310.6												3			
Avg.	3	2			3	3	3	3	3	3		3			2.5



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (V Sem.)		SKILL ORIENTED COURSE-III IOT FUNDAMENTALS: CONNECTING THINGS				
		Course Code:20SOC3102		1	0	2
Pre-requisites: Switching Theory & Logic Design						
Course Objectives:						
1. To understand the fundamentals of Internet of Things.						
2. To build a small low-cost embedded system using Arduino / Raspberry Pi or equivalent boards.						
3.To apply the concept of Internet of Things in the real-world scenario.						
Course Outcomes: At the end of the course, the student will be able to						
C311.1	:	Design a portable IoT using Arduino/ equivalent boards and relevant protocols.				
C311.2	:	Develop web services to access/control IoT devices.				
C311.3	:	Deploy an IoT application and connect to the cloud.				
C311.4	:	Analyze applications of IoT in real time scenario.				
C311.5	:	Design IoT based system.				
UNIT – I					8	hrs
IoT Fundamentals: Connecting Things, Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT.						
UNIT – II					8	hrs
Introduction, Things, Connections, Elements of IoT Hardware Components - Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class processor, Arm Cortex-M0 Processor Architecture, Block Diagram.						
UNIT – III					8	hrs
Microcontrollers: The Spark Fun Inventors Kit, Packet Tracer 7 and the IOT, IoT Application Development, Communication, IoT Applications, Sensing, Actuation, I/O interfaces. Software Components- Programming APIs, Communication Protocols-MQTT, ZigBee.						
UNIT – IV					8	hrs
Introduction, Programming, The Raspberry Pi Single Board Computer (SBC), Building Models of IOT Systems in Packet Tracer, Solution framework for IoT applications Implementation of Device integration, Data acquisition and integration, Device data storage Unstructured data storage on cloud/local server.						
UNIT – V					8	hrs
Introduction, Connecting Things to the Network, Fog and Cloud Computing, The Cisco IOT System, Industrial IoT Applications, IoT System in the Real World, becoming a global Problem Solver, design a Solution, Create an IOT System, The Business Aspects of IoT Systems.						
Text Books						
1	Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017.					
2	The Definitive Guide to the ARM Cortex-M0 by Joseph Yiu, 2011.					
3	Vijay Madiseti, Arshdeep Bahga, Internet of Things, “A Hands on Approach”, University Press, 2015.					
Reference Books						
1	Cypress Semiconductor/PSoc4 BLE (Bluetooth Low Energy) Product Training Modules.					
2	Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and					

		Use Cases”, CRC Press, 2017.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O 3
	C311.1	3														
	C311.2			2		3										
	C311.3												2			
	C311.4												3			
	C311.5					3				3	2					
	Avg.	3	-	2	-	3	-	-	-	3	2	-	2.5			



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (VI Sem.)		MICROPROCESSORS AND MICROCONTROLLERS				
		Course Code:20PCC3208 (Common to ECE and EEE)			3	0 0 3
Pre-requisites: 1.Switching Theory & Logic Design 2. Computer Architecture and Organization						
Course Objectives: 1. To acquire knowledge on microprocessors. 2. To select processors based on requirements. 3. To acquire knowledge on microcontrollers. 4. To acquire the knowledge on interfacing various peripherals, configure and develop programs To interface peripherals/sensors. 5.To acquire knowledge on ARM Cortex processors and debug.						
Course Outcomes: At the end of the course, the student will be able to						
C312.1	:	Explain the basic architecture and various activities of 8086.				
C312.2	:	Write assembly language programs with 8086 Microprocessor.				
C312.3	:	Explain the basic Architecture & Programming concepts of 8051 Microcontroller.				
C312.4	:	Analyze various peripherals and their interfacing with 8086 Micro Processor.				
C312.5	:	Explain the features & basic architecture of ARM Microcontrollers.				
UNIT – I					10	hrs
Introduction: Basic Microprocessor architecture, Microprocessor Unit versus Microcontroller Unit, CISC and RISC architectures. 8086 Architecture: Main features, pin diagram, internal architecture, Interrupts Classification, interrupt response, Interrupt Vector Table of 8086.						
UNIT – II					10	hrs
8086 Programming: Program development steps and Tools, Instruction set, Addressing Modes, Assembler Directives, writing arithmetic and sorting Programs with an assembler.						
UNIT – III					10	hrs
Intel 8051 Microcontroller: Architecture, Pin diagram, Input/output ports and circuits, memory organization, counters/timers, serial data input/output, interrupts. Assembly language programming: Instruction set, addressing modes, simple arithmetic and sorting programs, program development tools.						
UNIT – IV					10	hrs
8086 Interfacing: Basic Architecture & Pin Diagrams Of: 8237a DMA Controller, 8251 USART, 8259 PIC, A/D and D/A Convertors. 8051 interfacing: Basic Architecture of: Stepper motor interface, Traffic light controls, keyboard Interfacing.						
UNIT – V					10	hrs
ARM Processors: ARM Architecture, ARM Cortex-M3 Processor Architecture, Functional Description, ARM Cortext-M3 programming – Software delay, Programming techniques, subroutines and parameter passing, parallel I/O, Nested Vectored Interrupt Controller.						
Text Books						
1	Microprocessors and Interfacing – Programming and Hard ware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition.					
2	Advanced Microprocessor and Peripherals”-2.A.K Ray, K.M. Bhurchandhi, Tata McGraw Hill Publications, 2000.					
Reference Books						

1	Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.
2	The 8051 Microcontrollers and Embedded systems using Assembly and C, Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. Mc Kinlay; Pearson 2-Edition, 2011.
3	Microprocessors and Microcontrollers by N. Senthil Kumar, M. Saravanan and S. Jeevananthan, Oxford University Press, Seventh Impression 2013.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C312.1	2												2		
C312.2	3	3	2												
C312.3	2												2		
C312.4	3	3	2										2		
C312.5	2												2		
Avg.	2.4	3	2										2		



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (VI Sem.)		DIGITAL SIGNAL PROCESSING				
		Course Code: 20PCC3219		3	0	0
Pre-requisites: Knowledge on signals and systems						
Course Objectives:						
1. To describe signals mathematically and understand how to perform mathematical operations on signals.						
2. Know the importance of FFT algorithm for computation of Discrete Fourier Transform.						
3. Understand the various implementations of digital filter structures.						
4. Learn the FIR and IIR Filter design procedures.						
5. Learn the concepts of DSP Processors.						
Course Outcomes: At the end of the course, the student will be able to						
C313.1	:	Classify different types of discrete signals & systems and apply Z-Transform technique to solve difference equations.				
C313.2	:	Compute DFT using FFT algorithms and derive DFT properties for DSP operations.				
C313.3	:	Design and implement different IIR filters for specific applications.				
C313.4	:	Design and implement different FIR filters for specific applications.				
C313.5	:	Analyze the architecture of DSP Processor & ARM processor.				
UNIT – I					10	hrs
INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, Invertability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, Review of Z transforms, solution of difference equations using Z-transforms.						
UNIT – II					10	hrs
DISCRETE FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms (FFT)-Radix-2decimationin time and decimation in frequency FFT Algorithms, Inverse FFT.						
UNIT – III					10	hrs
DESIGN OF IIR DIGITAL FILTERS & REALIZATIONS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems.						
UNIT – IV					10	hrs
DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS: Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques, Comparison of IIR & FIR filters, Basic structures of FIR systems, Lattice structures, Lattice-ladder structures.						
UNIT – V					10	hrs
INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator, Modified bus structures and memory access schemes in DSPs, Multiple Access Memory, Multi ported memory, VLIW architecture, Pipelining, Special addressing modes, On-Chip Peripherals.						
ARCHITECTURE OF TMS320C5X: Introduction, Bus Structure, Central Arithmetic LogicUnit,Auxiliary Register ALU, Index Register, Block Move Address Register, Parallel Logic Unit,On-chip memory, On-chip peripherals.						
Text Books						
1	Digital Signal Processing, Principles, Algorithms and Applications: John G. Proakis, Dimitris G.Manolakis, Pearson Education/PHI, 2007.					
2	Discrete Time Signal Processing– A.V.Oppenheim and R.W.Schaffer, PHI, 2002.					

	Reference Books															
1	Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill, 2006.															
2	DSP Primer-C.BrittonRorabaugh, Tata McGraw Hill, 2005.															
3	Digital Signal Processors – Architecture, Programming and Applications, B. Venkata Ramani, M.Bhaskar, Tata McGraw Hill, 2002.															

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO3
	C313.1	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
	C313.2	2	3	2	-	-	-	-	-	-	-	-	-	2	-	-
	C313.3	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-
	C313.4	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-
	C313.5	2	-	-	-	-	-	-	-	-	-	-	-	2	-	-
	Avg.	2	3	2										2		



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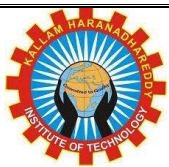
Department of Electronics & Communication Engineering

		L	T	P	Cr.
B.Tech. (VI Sem.)	DIGITAL COMMUNICATIONS				
	Course Code: 20PCC3220	3	0	0	3
Pre-requisites: Intermediate Physics and Mathematics					
Course Objectives:					
1. Understand various digital modulation techniques and able to analyze various systems for their performance in terms of probability of error.					
2. Study the concepts of information theory and need for source coding.					
3. Study Block codes, cyclic codes and convolution codes.					
4. Understand pulse digital modulation systems such as PCM, DPCM and DM .					
Course Outcomes: At the end of the course, the student will be able to					
C314.1	:	Explain the basic components of digital communication systems along with the concepts of PCM and DM.			
C314.2	:	Discuss various digital modulation techniques.			
C314.3	:	Analyze error performance of digital modulation techniques.			
C314.4	:	Analyze various source coding techniques.			
C314.5	:	Compute and analyze Block codes, cyclic codes and convolution codes.			
UNIT – I				12	hrs
Elements of digital communication systems, advantages of digital communication systems, Elements of PCM: Sampling, Quantization & Coding, Quantization error, Companding in PCM systems. Differential PCM systems (DPCM). Delta modulation, its draw backs, adaptive delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.					
UNIT – II				12	hrs
Introduction, ASK, FSK, PSK, DPSK, QPSK, M-ary:-PSK, FSK.					
UNIT – III				12	hrs
Base band signal receiver, probability of error, matched filter, probability of error using matched filter, coherent reception, non-coherent detection of FSK ,calculation of error probability of ASK, BPSK, BFSK, QPSK.					
UNIT – IV				10	hrs
INFORMATIONTHEORY: Discrete messages, amount of information and its properties. Average information, Entropy and its properties. Information rate, Mutual information and its properties.					
SOURCECODING: Introductions, Advantages, Shannon'stheorem, Shanon-Fanocoding, Huffman coding, efficiency calculations, channel capacity of discrete channel, capacity of a Gaussian channel, bandwidth–S/N tradeoff.					
UNIT – V				12	hrs
LINEARBLOCKCODES: Introduction, Matrix description of Linear Block codes, Error detection and error correction capabilities of Linear block codes, Binary cyclic codes.					
CONVOLUTIONCODES: Introduction, encoding of convolution codes, time domain approach, transform domain approach.					
Text Books					
1	Digital Communications, SimonHaykin,JohnWiley,2005				
2	Digital and Analog Communication Systems, SamShanmugam, JohnWiley, 2005.				
Reference Books					

1	Principles of Communication Systems, H.TaubandD.Schilling, TMH, 2003.
2	Digital Communications, John Proakis, TMH, 1983. Communication Systems Analog &Digital, Singh &Sapre, TMH, 2004.
3	Modern Digital and Analog Communication Systems, B.P.Lathi, ZhiDing, HariMohanGupta, Oxford University Press,4th Edition,2017.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PS O3
C314.1	3	3	3										2		
C314.2	2	3	3										2		
C314.3	2	3	2										3		
C314.4	3	3											2		
C314.5	2	3	2										2		
Avg.	2.4	3	2.5										2.2		



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VI Sem.)	MICROWAVE & RADAR ENGINEERING					
	Course Code: 20PEC3204A (Professional Elective-2)		3	0	0	3
Pre-requisites: Electromagnetic fields and transmission lines						
Course Objectives:						
1. Waveguide components and applications are introduced. 2. Different types of microwave tubes and principle of working are demonstrated. 3. Classification and applications of various microwave solid state devices are discussed. 4. The basics of Radar systems are explained. 5. Types of Radars and applications are detailed.						
Course Outcomes: At the end of the course, the student will be able to						
C315A.1	:	Discuss fundamental characteristics of waveguides and the basic properties of waveguide components.				
C315A.2	:	Analyze The function, design and integration of the major microwave components, oscillators, power amplifier.				
C315A.3	:	Analyze the function, design, and integration of the major microwave components oscillators and power amplifier.				
C315A.4	:	Aware the Basic Principle of radar and determination of range of the system.				
C315A.5	:	Discuss different types of radars: CW, FM-CW, MTI and pulse Doppler radars.				
UNIT – I			10			hrs
MICROWAVE TRANSMISSION LINES: Introduction Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides –TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Mode Characteristics –Phase and Group Velocities, Wavelengths and Impedance Relations, Impossibility of TEM mode. Related Problems.						
UNIT – II			10			hrs
MICROWAVE TUBES: O-type tubes (Qualitative treatment only): 2 Cavity Klystrons –Structure, Velocity Modulation Process and Applegate Diagram, Bunching Process, Applications, Reflex Klystrons – Structure, Applegate Diagram and Principle of working. Structure and Working TWT. M-type Tubes: Introduction, Cross-field effects, Magnetrons– Different Types, 8 cavity Cylindrical Travelling Wave Magnetron– Hull Cut-off Condition, PI-mode Operation, Separation of PI-Mode, o/p characteristics.						
UNIT – III			10			hrs
WAVEGUIDE COMPONENTS AND MICROWAVE MEASUREMENTS Waveguide Components and Applications (Qualitative treatment only): Scattering Matrix–S-Matrix Calculations for – 2 port Junction, E-plane and H-plane Tees, Magic Tee, Directional couplers. Ferrite Components– Faraday Rotation, S-Matrix Calculations for Gyrator, Isolator, Circulator. Gunn Diode – Principle, RWH Theory, Characteristics. Microwave Measurements: Description of Microwave Bench – Different Blocks and their Features, Microwave Power Measurement – Bolometer Method. Measurement of Attenuation, Frequency, Q-factor, VSWR, Impedance Measurement.						
UNIT – IV			10			hrs

FUNDAMENTALS OF RADAR:Basics of Radar: Introduction, Maximum Unambiguous Range, simple Radar Range Equation, Radar Block Diagram and Operation, Prediction of Range Performance, Modified Radar Range Equation, SNR, Types of Radar: CW and Frequency Modulated Radar: Doppler Effect, CW Radar – Block Diagram, Applications of CW radar. FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.																
UNIT – V														10	hrs	
MTI, PULSE DOPPLER RADAR AND TRACKING RADAR MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Blind Speeds, Limitations to MTI Performance, MTI versus Pulse Doppler Radar. Tracking Radar: Mono pulse Tracking Radar – Amplitude Comparison and Phase Comparison of Mono pulse.																
Text Books																
1	Microwave Devices and Circuits– Samuel Y. Liao, PHI, 3 rd Edition, 1994.															
2	Microwave and Radar Engineering- M.Kulkarni, Umesh Publications, 3 rd Edition															
	Reference Books															
1	Microwave Principles–Herbert J.Reich, J.G.Skalnik, P.F.Ordung and H.L.Krauss, CBS Publishers and Distributors, New Delhi, 2004.															
2	Radar Principles–Peebles, Jr.P.Z. Wiley, New York, 1998.															
3	Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PS O3
	C315A.1	3	3												2	
	C315A.2	3	2	3											2	
	C315A.3	1	3	3											3	
	C315A.4	3	1												2	
	C315A.5	2	2												2	
	Avg.	2.4	2.2	3											2.2	



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Department of Electronics & Communication Engineering

			L	T	P	Cr.	
B.Tech. (VI Sem.)		ANALOG IC DESIGN					
		Course Code: 20PEC3204B (ProfessionalElective–2)		3	0	0	3
Pre-requisites: Signals and Systems, Analog Circuits							
Course Objectives:							
1. To study the fundamentals of analog circuits and MOS device models.							
2. To gain knowledge on various on figurations of MOS transistors.							
3. To study the characteristics of noise and frequency response of the amplifier.							
4. To learn the concepts of Op-Amp frequency compensation techniques of Op-Amp Circuits.							
5. To learn the concepts of comparators.							
Course Outcomes: At the end of the course, the student will be able to							
C315B.1	:	Realize the concepts of Analog MOS device models.					
C315B.2	:	Design different configuration of Amplifier and current mirror circuits.					
C315B.3	:	Analyze the characteristics of frequency response of the amplifier and its noise.					
C315B.4	:	Analyze the performance of the stability and frequency compensation techniques of Op-Amp Circuits.					
C315B.5	:	Construct comparators.					
UNIT – I					10	hrs	
Basic MOS Device Physics General Considerations, MOS I/V Characteristics, Second Order effects, MOS Device models. Short Channel Effects and Device Models, Single Stage Amplifiers –Basic Concepts, Common Source Stage, Source Follower, Common Gate Stage, and Case code Stage.							
UNIT – II					10	hrs	
Differential Amplifiers Single Ended and Differential Operation, Basic Differential Pair, Common Mode Response, Differential Pair with MOS loads, Gilbert Cell. Passive and Active Current Mirrors–Basic Current Mirrors, Case code Current Mirrors, Active Current Mirrors.							
UNIT – III					10	hrs	
Frequency Response of Amplifiers General Considerations, Common Source Stage, Source Followers, Common Gate Stage, Cascode Stage, Differential Pair, Noise – Types of Noise, Representation of Noise in circuits, Noise In single stage amplifiers, Noise in Differential Pairs.							
UNIT – IV					10	hrs	
Feedback Amplifiers General Considerations, Feedback Topologies, Effect of Loading, Operational Amplifiers–General Considerations, One Stage Op Amps, Two Stage Op Amps, Gain Boosting, Common –Mode Feedback, Input Range limitations, Slew Rate, Power Supply Rejection.							
UNIT – V					10	hrs	
Comparators: Characterization of comparator, two stage, open loop comparators, other open loop comparators, including key performance of open loop comparators discrete time comparators.							
Text Books							
1	Design of Analog CMOS Integrated Circuits, B.Razavi, “2ndEdition, McGrawHill Edition 2016.						
2	Analysis and Design of Analog Integrated Circuits, Paul. R. Gray &Robert G. Meyer, Wiley, 5 th Edition, 2009.						
Reference Books							

1	Analog Integrated Circuit Design, T.C. Carusone, D.A. Johns & K. Martin, 2 nd Edition, Wiley, 2012.
2	CMOS Analog Circuit Design, P.E. Allen & D.R. Holberg, 3rd Edition, Oxford University Press, 2011.
3	CMOS Circuit Design, Layout, and Simulation, R. Jacob Baker, 3rd Edition, Wiley, 2010.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C315B.1	2												2		
C315B.2	2	2											2		
C315B.3	2	3	2										2		
C315B.4	2	2	3										2		
C315B.5	2		3										2		
Avg.	2	2.3	2.6										2		



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech.(VI Sem.)		BUSINESS INTELLIGENCE & ANALYTICS				
		Course Code: 20PEC3204C (Professional Elective– 2)		3	0	0
Pre-requisites: Linear algebra, Probability and Statistics						
Course Objectives: To make students to extract insights from large volumes of data in various forms, by employing statistical mathematics techniques for drawing conclusions about that information.						
Course Outcomes: At the end of the course, the student will be able to						
C315C.1	:	Aware the essentials of data analytics and the corresponding terminologies.				
C315C.2	:	Determine the relevance of data to business.				
C315C.3	:	Familiar with the steps involved in the analytics process.				
C315C.4	:	Aware the uses statistical and graphical analysis to bring insights out from the data.				
C315C.5	:	Aware the uses BI tools to present data in the form of Dash boards and reports.				
UNIT – I					10	hrs
Essentials of Data analysis - Data Collection, Data Cleansing, Data Exploration, Statistical Analysis, Reporting, Decision Statistical Methods: Arithmetic mean, The Arithmetic mean of grouped Data, The Median, The mode The variance and standard deviation, Interpretation of SD, Chebyshev's Lemma or Rule (for sample), Skew ness and Kurtosis, Skew ness and its measurement, Kurtosis and its measurements. Probability Distribution & Statistical Inference: Elements of Probability, Random Variable, Probability distribution/density functions (Normal, Binomial, Poisson), Point Estimate, Interval Estimate, Testing of hypothesis.						
UNIT – II					10	hrs
Visualization: Comparison, Distribution, Relationship, Composition, Visual Charts – Bar chart, Column chart, variable width column chart, Line chart, Column histogram, Line histogram, Scatter chart, stacked column chart, stacked 100% column chart, waterfall chart, pie chart, stacked area chart, 3D area chart, stacked 100% area chart, Bubble chart, Geometric Forms, Pictorial Diagrams, Pareto Diagrams Applications: Graphical representation of data from Battery health monitoring, Indoor Air Quality, CO2 emissions by country/region (Practice using MS-Excel &R/Python)						
UNIT – III					10	hrs
Time series Analysis: Characteristics Movements in a time series; Time series models, Measurement of Trend Secular Trend, Seasonal Movements, Cyclical Movements Irregular Movements, Long Cycles. Applications: Analyze the trends of population growth, global temperatures, solar radiation, wind patterns. (Practice using MS-Excel &R/Python).						
UNIT – IV					10	hrs
Business Intelligence and Analytics: What is Business Intelligence and Analytics? The need for BI and analytics, how to determine requirements, Using the BI tools for extracting insights for data driven decisions Microsoft Power BI - Part I: Understanding key concepts in business intelligence, data analysis and data visualization. Getting Started with Power BI and Analytics-Creating account, Power BI Desktop, Working with Data-Connect, Import, Shape and Transform data, Creating Visualization, Author Reports and Schedule automated refresh of reports, Publishing Data to BI online, Using Quick Insights, Use natural language queries, Create real-time dashboards, Create custom visualizations which can be re-usable in reports and dashboards, Sharing dash board effectively based on needs.						
UNIT – V					10	hrs

Microsoft Power BI-Part II: Exploring live connection to data with Power BI, connecting directly to data bases, Introduction to Power BI Development API, Leveraging custom visuals in Power BI, Introduction to DAX.																
Text Books																
1	Statistics Concepts and applications, Nabendu Pal & Sahadeb Sarkar, PHI Learning Pvt. Ltd., 2008.															
2	Effective Data Visualization, The Right Chart for the Right Data, 1st Edition, Dr. Stephanie D. H. Evergreen, Sage Publications.															
Reference Books																
1	Applied Microsoft Power BI Bring your data to life, Teo Lachev, 2015.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C315C.1	3	2													2
	C315C.2	3	2													2
	C315C.3	3	2													2
	C315C.4	2	2													2
	C315C.5	3	2													2
	Avg.	2.8	2													2



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VI Sem.)		ROBOTICS AND AUTOMATION				
		Course Code: 20PEC3204D (Professional Elective– 2)	3	0	0	3
Pre-requisites: Fundamentals of Microprocessors and Microcontrollers						
Course Objectives:						
To impart knowledge about basic mathematics related to industrial robots for their control, design and application in robotics & automation Industries.						
Course Outcomes: At the end of the course, the student will be able to						
C315D.1	:	Perform kinematic and dynamic analysis with simulation.				
C315D.2	:	Design controls for a simple robot.				
C315D.3	:	Integrate mechanical and electrical hardware for areal prototype of robotic device.				
C315D.4	:	Select a robotic system for given industrial application.				
C315D.5	:	AI in Robotics Applications in unmanned systems.				
UNIT – I				10	hrs	
Introduction to Robotics Types and components of a robot, classification of robots Study components of an industrial robot (PUMA, KUKA, FANUC, MTAB, UR, etc.) and its DH parameters.						
UNIT – II				10	hrs	
Robot Kinematics, Dynamics and Sensors Kinematic Modeling: Translation and Rotation Representation, Coordinate transformation, DH parameters, Forward and inverse kinematics, Jacobin, Singularity, and Statics. Dynamic Modeling: Forward and inverse dynamics, Equations of motion using Euler-Lagrange formulation, Newton Euler formulation. Sensor: Contact and Proximity, Position, Velocity, Force, Tactile etc. Introduction to Cameras, Camera calibration, Geometry of Image formation, Euclidean / Similarity / Affine / Projective transformations, Vision applications in robotics.						
UNIT – III				10	hrs	
Actuators: Electric, Hydraulic and Pneumatic; Transmission: Gears, Timing Belts and Bearings, Parameters for selection of actuators. Robot Control: Independent joint control, PD and PID feedback, actuator models ,nonlinearity of manipulator models, issues in nonlinear control, force feedback, hybrid control, Motion Planning, Obstacle avoidance, configuration space, road map methods, graph search algorithms, potential field methods.						
UNIT – IV				10	hrs	
Control Hardware and Interfacing and Case Study Embedded systems: Micro controller Architecture and integration with sensors, actuators, components, Programming Applications for Industrial robot-programming in–VALII, Case Study: Bin Picking in Industrial Warehouse.						
UNIT – V				10	hrs	
AI in Robotics Applications in unmanned systems, defense, medical, industries, Robotics and Automation for Industry4.0 Robot safety and social robotics.						
Text Books						
1	Introduction to Robotics–Mechanics and Control, JohnJ. Craig, 3 rd Edition, Pearson Prentice Hall, 2004.					
2	Industrial Robots, Groover M.P. and Ashish Dutta, McGraw Hill, 2012.					

	3	Robots Dynamics& Control, Spong M. W.and Vidyasagar M.,John Wiley & Sons (Asia) Pte Ltd.														
	Reference Books															
	1	Introduction to Robotics: Analysis, Control, Applications, SaeedB.Niku, 3rd Edition, Wiley, 2019.														
	2	Robotics Engineering, R. Klafter, PHI.														
	3	Robotics, Subir K. Saha, McGraw Hill.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	P O 12	PS O1	PS O2	PSO3
	C315D.1	2	2													2
	C315D.2	3	3													2
	C315D.3	2	2													2
	C315D.4	3	3													2
	C315D.5	2	3													2
	Avg.	2.4	2.6													2

			2	3	4	O 5	6	O 7	O 8	O 9	O 10	O 11	O 12	S O 1		3
	C315E.1	2	2													2
	C315E.2	2	3													2
	C315E.3	2	2													2
	C315E.4	2	3													2
	C315E.5	2	3													2
	Avg.	2	2.6													2



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (VI Sem.)		PULSE AND DIGITAL CIRCUITS				
		Course Code: 20OEC3204A (Open Elective – 2 for other than ECE)		3	0	0
Pre-requisites: Electronic Devices and Circuits, Switching Theory and Logic Design						
Course Objectives:						
1. To understand the concept of wave shaping circuits, Switching Characteristics of diode and transistor.						
2. To study the design and analysis of various Multivibrators.						
3. To understand the functioning of different types of time-base Generators.						
4. To learn the working of logic families & Sampling Gates.						
Course Outcomes: At the end of the course, the student will be able to						
C316A.1	:	Design and analyze the various linear wave shaping circuits.				
C316A.2	:	Design and analyze the various non-linear wave shaping circuits.				
C316A.3	:	Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.				
C316A.4	:	Design and analyze the different multivibrators.				
C316A.5	:	Interpret the different time base generators and also explain the principles of synchronization and sampling gates.				
UNIT – I					10	hrs
Linear Wave Shaping: Highpass, lowpass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs. RC network as differentiator and integrator; RL and RLC circuits and their response for step input.						
UNIT – II					08	hrs
Non-Linear Wave Shaping: Diode and its characteristics, Diode series clippers, Diode parallel clippers, Transistor clippers, two level clipping circuits and Emitter coupled clipper, Clamping operation, Clamping circuits using diode with different inputs, Clamping circuit theorem, and Practical clamping circuits.						
UNIT – III					12	hrs
Switching Characteristics of Devices: Diode as a switch, Diode switching times, Piecewise linear diode characteristics, Transistor as a switch, Transistor switching times (delay time, rise time, storage time and fall time), Break down voltage consideration of transistor, Design of transistor switch, Characteristics of logic family, Realization of Logic Gates using DTL, TTL, ECL and CMOS logic circuits, Comparison of logic families.						
UNIT – IV					10	hrs
MULTIVIBRATORS: Analysis and design of fixed bias, self-bias bistable multivibrator, Methods of Triggering using RC network & Diode, Analysis and design of collector coupled monostable multivibrator, Application of monostable multivibrator as a voltage to time converter, Analysis and design of collector coupled astable multivibrator, Expression for time period T, Astable Multivibrator as a voltage to frequency converter, Schmitt trigger using transistors, Hysteresis.						
UNIT – V					8	hrs
TIME BASE GENERATORS AND SAMPLING GATES:						
Time Base Generators: features of a time base signal, Methods of generating time base waveform, Errors and expressions for sweep speed error, displacement error and transmission error, Relation between e_s , e_d and e_t , Methods of generating time base waveform, Miller and Bootstrap time base generator-basic principles, Transistor Miller time base generator, Transistor Bootstrap time base generator, current time base generators.						

Sampling Gates: Basic Operating Principles of Sampling Gates, Diode Uni directional Sampling Gate and Two-DiodeBi-Directional Sampling Gate, Four-Diode gates, Six-Diode Gates,Reduction of Pedestalin Sampling Gates, Applications of Sampling Gates.																
Text Books																
1	Pulse, Digital and SwitchingWaveforms-J.MillmanandH.Taub, McGraw-Hill.															
2	Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.															
Reference Books																
1	Pulse, Digital and SwitchingWave forms-J.MillmanandH.Taub, MothikiSPrakashRao, McGraw-Hill, Second Edition, 2007.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	PO 12	PSO 1	PS O2	PSO3
	C316A.1	3														
	C316A.2	3	2	2												
	C316A.3	3														
	C316A.4	2														
	C316A.5	2														
	Avg.	2.6	2	2												



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY

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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VISem.)	FUNDAMENTALS OF MICROPROCESSORS AND MICROCONTROLLERS					
	Course Code: 20OEC3204B (Open Elective – 2 for other than ECE)		3	0	0	3
Pre-requisites: 1. Switching Theory & Logic Design 2. Computer Architecture and Organization						
Course Objectives: 1. To acquire knowledge on 8086 Microprocessor. 2. To select processors based on requirements. 3. To acquire the knowledge on interfacing various peripherals. 4. To acquire knowledge on 8051 Microcontroller. 5. To acquire knowledge on PIC & ARM Cortex processors.						
Course Outcomes: At the end of the course, the student will be able to C316B.1 : Explain the basic architecture and various activities of 8086 C316B.2 : Write assembly language programs with 8086 Microprocessor C316B.3 : Analyze various peripherals and their interfacing with 8086 Micro Processor C316B.4 : Explain the basic Architecture & Programming concepts of 8051 Microcontroller C316B.5 : Explain the features & basic architecture of PIC Microcontrollers						
UNIT – I			10	hrs		
Introduction to 8086 Microprocessor – Architecture of 8086 – Bus interface unit, Execution Unit, Register Organization of 8086 – Memory organization of 8086 – pin diagram /description of 8086, addressing modes.						
UNIT – II			08	hrs		
Program development steps, Assembler Directives, Instruction set-, Data Transfer Instructions, Arithmetic Instructions, Bit Manipulation Instructions, String Instructions, Program Execution Transfer Instructions (Branch & Loop Instructions), Processor Control Instructions, Iteration Control Instructions, Interrupt instructions.						
UNIT – III			12	hrs		
Minimum and Maximum mode operations of 8086, Read and write cycle timing diagrams. Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, interfacing seven segment displays, Intel 8257 DMA controller, A/D and D/A converters.						
UNIT – IV			10	hrs		
Overview of 8051 Micro Controller– Difference between microprocessor and microcontroller, Architecture– Register set–Addressing modes– Memory Organization–I/O ports–Timers/counters.						
UNIT – V			8	hrs		
Introduction, Features of PIC Microcontroller, Memory Organization, Architecture of the PIC16F877, instruction set of the PIC16F877.						
Text Books						
1	Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rd Edition.					
2	The 8051 Microcontroller & Embedded Systems Using Assembly and C by Kenneth J. Ayala, Dhananjay V. Gadre, Cengage Learning, India Edition.					
Reference Books						
1	The Intel Microprocessors-Architecture, Programming, and Interfacing by Barry B. Brey, Pearson, Eighth Edition-2012.					
2	Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.					
3	Microprocessors and Microcontrollers by Senthil Kumar, Saravanan and S. Jeevananthan, Oxford University Press, Seventh Impression 2013 E-Resources: https://nptel.ac.in/courses/108105102					

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CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	P S O 1	PS O2	PS O3
	C316B.1	3														
	C316B.2	3		2		2										
	C316B.3	2														
	C316B.4	2				2										
	C316B.5	2		2												
	Avg.	2.4		2		2										



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VI Sem.)	PRINCIPLES OF COMMUNICATIONS					
	Course Code: 20OEC3204C (Open Elective – 2 for other than ECE)		3	0	0	3
Pre-requisites: Signals and Systems						
Course Objectives:						
1. Learn simple systems for generating and demodulating AM, DSB, SSB and VSB signals 2. Learn the concepts in Angle modulation for the design of communication systems 3. Study simple systems for generating and demodulating frequency modulated signals 4. Learn the concepts of random process and various types of noise. 5. Study the performance of the communication system in presence of noise. 6. Learn pulse modulation and sampling techniques						
Course Outcomes: At the end of the course, the student will be able to						
C316C. 1	:	Analyze the performance of analog modulation schemes in time and frequency domains.				
C316C. 2	:	Analyze the performance of angle modulated signals.				
C316C. 3	:	Characterize analog signals in time domain as random processes and noise				
C316C. 4	:	Determine the performance of analog communication systems in terms of SNR.				
C316C. 5	:	Analyze pulse amplitude modulation, pulse position Modulation, sampling, Quantization, Encoding and TDM systems.				
UNIT – I			10	hrs		
Amplitude modulation: Introduction, Amplitude Modulation: Time & Frequency – Domain description, switching modulator, Envelop detector. Double side band-suppressed carrier modulation: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver. Single side-band and vestigial sideband methods of modulation: SSB Modulation & demodulation, VSB Modulation & demodulation, Frequency-Division Multiplexing.						
UNIT – II			08	hrs		
Angle modulation: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals. Phase-Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super Heterodyne Receiver.						
UNIT – III			12	hrs		
Random variables & process: Introduction, Probability, Conditional Probability, Random variables, Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross-correlation functions. Noise: Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth, Noise Figure.						
UNIT – IV			10	hrs		
Noise in analog modulation: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, Pre-emphasis and						

De-emphasis in FM.																
UNIT – V															8	hrs
Digital representation of analog signals: Introduction, Sampling, Quantization, Encoding, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves.																
Text Books																
1	Principles of Communication Systems – HTaub & D. Schilling, Gautam Sahe, TMH, 2007, 3 rd Edition.															
2	Communication Systems – B.P. Lathi, BS Publication, 2006.															
Reference Books																
1	M. Tekalp, ” Digital Video Processing”, Prentice Hall International															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PS O3
	C316C.1	3														
	C316C.2	3														
	C316C.3	3	2													
	C316C.4	2	2													
	C316C.5	2	2													
	Avg.	2.6	2													



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VI Sem.)		IMAGE & VIDEO PROCESSING				
		Course Code: 20OEC3204D (Open Elective – 2 for other than ECE)	3	0	0	3
Pre-requisites:Signals and Systems, Digital signal processing						
Course Objectives: 1. The goal of this course is to provide the knowledge of concepts of signal processing. 2. To teach various transforms for signal processing and speech generation. 3. The subject also provides basics of video processing, digital video generation and video format changing and motion estimation.						
1. To understand the image formation and fundamentals. 2. To apply the various image transformation techniques. 3. To analyze the image degradation and restoration. 4. To Apply the Image Segmentation, Morphology on images. 5. To Analyze the Color Image processing techniques.						
Course Outcomes: At the end of the course, the student will be able to						
C316D.1	:	Learn the Image Transforms				
C316D.2	:	Learning processing filtering techniques				
C316D.3	:	Learn the image segmentation and compression techniques				
C316D.4	:	Learn the fundamentals of video processing				
C316D.5	:	Leartheestimationofmotionin2D				
UNIT – I			10	hrs		
Basic steps of Image processing system, sampling and quantization of an Image –Basic relationship between pixels, Image Transforms: 2–D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms						
UNIT – II			8	hrs		
Image Enhancement: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering: Smoothing Spatial filters, Sharpening Spatial Filters. Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering.						
UNIT – III			12	hrs		
Image Segmentation: Segmentation concepts, point, line and edge detection, Thresholding, region based segmentation, Color fundamentals, color models, pseudo color image processing, and basics of full color image processing, color transformations, smoothing and sharpening. Image compression: Image compression fundamentals – coding Redundancy, spatial and temporal redundancy. Compression models: Lossy and Lossless, Huffmann coding, JPEG standards.						
UNIT – IV			10	hrs		
Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models: 3D motion models, Geometric Image formation, Photometric Image formation, sampling of video signals, filtering operations						
UNIT – V			8	hrs		
2-D Motion Estimation:Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding						
Text Books						
1	GonzalezandWoods, DigitalImageProcessing,3 rd Edition,Pearson					

2	Yaowang,JoemOstarmannandYa–quiZhang,VideoProcessingandCommunication,1 st Edition, PHI															
Reference Books:																
1	1. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 9 th Edition, Indian Reprint, 2002.															
2	2. B.Chanda, D.Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2009.															
3	e-RESOURCES: https://nptel.ac.in/courses/117105079															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	P O 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PS O 3
	C316D.1	3														
	C316D.2	3	2													
	C316D.3	3	2													
	C316D.4	2														
	C316D.5	2														
	Avg.	2. 6	2													



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VI Sem.)		MICROPROCESSOR ANDMICROCONTROLLERSLAB				
		Course Code:20PCC3211 (Common to ECE & EEE)	0	0	3	1.5
Pre-requisites: Programming fundamentals						
Course Objectives: In this course, student will understand working of instructions by practicing programs of 8086, 8051, ARM and develop applications by interfacing devices.						
Course Outcomes: At the end of the course, the student will be able to						
C317.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C317.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C317.3	Simulate Assembly Language Programs and also to observe the features of various Circuits Interfaced to 8086 Micro Processor.					
C317.4	SimulateAssemblyLanguageProgramson8051MicroControllerandalsoobservethefeaturesof various Circuits Interfaced to 8051 Micro Controller.					
List of Experiments (Any of the 12 experiments are required to be conducted)						
	PART-A: 8086 ASSEMBLYLANGUAGE PROGRAMMING AND INTERFACING					
1	Addition of n-BCD numbers.					
2	16-Bit Multiplication					
3	16- Bit Division					
4	Program to arrange the sequence in Ascending Order					
5	Program to arrange the sequence in Descending Order					
6	Program for Factorial of given n-numbers					
7	Interfacing ADC to 8086					
8	Interfacing DAC to 8086					
	PART-B: 8051 ASSEMBLY LANGUAGE PROGRAMMING AND INTERFACING					
9	Finding number of 1's and number of 0's in a given 8-bit number					
10	Average of given n-numbers.					
	.					
11	Program and verify Timer/ Counter in 8051.					
12	Interfacing Traffic Light Controller to 8051.					
	PART-C: ARM CORTEX M3 PROCESSOR USING KEIL MDK ARM					

13	Write an assembly program to multiply of two 16-bit binary numbers.	
14	Write an assembly program to find the sum of first 10 integers numbers.	
15	Write a program to toggle LED every second using timer interrupt	

Reference Books:

1	Microprocessors and Microcontrollers-Architecture, Programming and System Design by Krishna Kant, PHI Learning Private Limited, Second Edition, 2014.
2	Microprocessors and Microcontrollers by N. Senthil Kumar, M. Saravanan and S. Jeevananthan, Oxford University Press, Seventh Impression 2013

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C317.1									3	2					
C317.2								2	3	2					
C317.3	3	2		2	3										3
C317.4	2			3											2
Avg.	2.5	2		2.5	3			2	3	2					2.5



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech (VI Sem.)	DIGITAL SIGNAL PROCESSING LAB					
	Course Code: 20PCC3221					0 0 3 1.5

Pre-requisites: Knowledge on MATLAB Commands

Course Objectives:

1. Understand the generation of the signals.
2. Understand the operations on discrete signals i.e., linear convolution DFT,FFT.
3. Design IIR and FIR filters using window techniques.

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

C318.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C318.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C318.3	Perform generation and operations of digital signals.
C318.4	Implement digital FIR and IIR filters.

List of Experiments

(Any of the 10 experiments are required to be conducted)

1	Generation of discrete time signals for discrete signals.
2	To verify the Linear Convolution using MATLAB
3	To verify the Circular Convolution for discrete signals using MATLAB
4	To verify Discrete Fourier Transform(DFT)
5	To verify Inverse Discrete Fourier Transform (IDFT)
6	To verify Fast Fourier Transform(FFT)
7	To verify Inverse Fast Fourier Transform(IFFT)
8	Frequency Response of IIR LPF(Analog & Digital)
9	Frequency Response of IIR HPF(Analog & Digital)
10	To Design FIR (LPF&HPF)using Rectangular window
11	To Design FIR (LPF&HPF)using Bartlett window
12	Auto correlation and cross correlation of given sequences.

ReferenceBooks:

1	https://mrcet.com/downloads/ECE/DSP%20Lab%20Manual.pdf
2	https://www.scribd.com/document/403467288/DSP-lab-manual-pdf

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3

	C318.1	-	-	-	-	-	-	-	-	3	2	-	2	-	-	-
	C318.2	-	-	-	-	-	-	-	2	3	2	-	2	-	-	-
	C318.3	2	2	-	3	3	-	-	-	-	-	-	-	-	-	3
	C318.4	3	2	-	2	3	-	-	-	-	-	-	-	-	-	2
	Avg.	2.5	2		2.5	3			2	3	2					2.5



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VI Sem.)	ADVANCED COMMUNICATIONS LAB					
	Course Code: 20PCC3222		0	0	3	1.5
	Pre-requisites: Analog communications					
	Course Objectives:					
	1. Understand pulse digital modulation systems such as PCM, DPCM and DM					
	2. Understand various digital modulation techniques and able to analyze various systems for their performance in terms of probability of error					
	3. Study cyclic codes					
	Study digital modulation techniques such as ASK, PSK, FS.					
	Course Outcomes: At the end of the course, the student will be able to					
C319.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
C319.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
C319.3	:	Determine the performance of different Block codes				
C319.4	:	Determine parameters of different wave guide components				
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Time division multiplexing.					
	Part A: Multiplexing					
	Part B: Demultiplexing					
2	Phase shift keying.					
	Part A: Modulation					
	Part B: Demodulation					
3	Frequency shift keying.					
	Part A: Modulation					
	Part B: Demodulation					
4	Differential phase shift keying					
	Part A: Modulation					
	Part B: Demodulation					
5	Amplitude shift keying.					
	Part A: Modulation					
	Part B: Demodulation					
6	Binary cyclic codes					
	Part A: Coding					

		Part B: Decoding													
	7	Pulse code modulation													
		Part A: Modulation													
		Part B: Demodulation													
	8	Delta modulation													
		Part A: Modulation													
		Part B: Demodulation													
	9	Two-Cavity klystron characteristics													
	10	Reflex klystron characteristics													
	11	Gunn diode characteristics													
	12	Attenuation measurement													
	13	Directional coupler characteristics													
	14	Scattering parameters of circulator													
	15	Scattering parameters of magic tee													
	16	VSWR measurement													
Reference Books:															
	1	Principles of Communication Systems, H. Taub and D. Schilling, TMH, 2003.													
	2	Digital Communications, John Proakis, TMH, 1983.													
	3	Communication Systems, Analog& Digital, Singh & Sapre, TMH, 2004.													
CO-PO/PSO Mapping Matrix															
CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O 3
C319.1	-	-	-	-	-	-	-	-	3	2					-
C319.2	-	-	-	-	-	-	-	2	3	2					-
C319.3	2	2	2	2		-	-	-	-	-					3
C319.4	3	2	2	2		-	-	-	-	-					2
Avg.	2.5	2	2	2				2	3	2					2.5



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VI Sem.)		SKILL ORIENTED COURSE-IV EMPLOYABILITY SKILLS				
		Course Code: 20SOC3202	1	0	2	2
Pre-requisites: Basic knowledge of Mathematics and Written Skills						
Course Objectives:						
1. Quantitative Aptitude skills and Reasoning Skills.						
2. Adapts positive attitude and appropriate body language and interprets the core competencies to succeed in professional and personal life.						
3. To learn skills for effective discussions & teamwork and to assess and improve personal grooming Course.						
Course Outcomes: At the end of the course, the student will be able to						
C320.1	:	solve a variety of basic mathematics problems, honing their quantitative aptitude skills.				
C320.2	:	Apply mathematical skills to tackle diverse challenges, empowering them to navigate both professional and personal spheres with adept reasoning and efficiency				
C320.3	:	Assess critically their grooming habits and implement strategies to enhance their appearance and self-presentation effectively				
C320.4	:	Interpret the core competencies by fostering a confident and polished presence conducive to success in professional and personal life				
C320.5	:	Demonstrate the ability to deliver impactful presentations with effective body language, while also mastering group discussion and interview skills, ensuring confident and persuasive communication in professional settings.				
UNIT – I					8	hrs
Quantitative Aptitude:						
Numbers systems, Ratio and Proportion, HCF and LCM, Problems on ages, Averages, Percentages, clocks, calendars, Partnership, Profit and Loss, Simple Interest and compound Interest, Time and Work, Time and Distance, Pipes and Cisterns, Mensuration.						
UNIT – II					10	hrs
Reasoning Skills						
Number Series, Analogy, Odd Man out, Letter Series, Analogy, Odd man out, Directions Sense Test, Coding and decoding, Symbols and Notations, Blood relations – Syllogisms - Seating arrangement, Analytical Reasoning, Permutations and Combinations, Probability, statistics, Data Interpretation, Data Sufficiency, Logical Connectives, Venn Diagrams, Cubes, Ordering and Sequencing, Puzzles, Ranking Problems. Cause and Effect Problems, Statements, and Course of Action Problems						
UNIT – III					6	hrs
Skills – 1:						
Soft Skills: An Introduction – Definition and Significance of Soft Skills; Process, Importance and Measurement of Soft Skill Development. Self-Discovery: Discovering the Self; Setting Goals; Beliefs Values, Attitude, Virtue. Goal Setting-Vision Vs Mission Vs Goals, SMART Technique to Goal Setting SWOT Analysis. Self Esteem: Types of Self Esteem, Causes of Low Self Esteem, Merits of Positive Self Esteem and Steps to build a positive Self Esteem; Art of Compromise, Learn to Say:‘I Don’t Know’ Being organized, Showing Self-awareness, Self-Assessment for Attainable Career Objectives. Attitude & Confidence: Attitude vs. skills vs. knowledge, Attitude vs. behavior, Developing Positive Attitude and Confidence; Fear- Public Speaking, Steps to Overcome Fear, developing Positive Thinking and Attitude Driving out Negativity; Meaning and Theories of Motivation; Enhancing Motivation Levels, Adjusting Your Attitude-Arrogance has no Place in the Workplace, Cultural Sensitivity in the Workplace						

	Corporate Culture: Learning How to Fit in. Motivational Talk: Team Work, Team vs. Group, Stages in Team Building, Mistakes to Avoid and Lessons to Learn.		
	Skills – II: Interpersonal Communication: Interpersonal relations; communication models, process and barriers; team communication; developing interpersonal relationships through effective communication; essential formal writing skills; corporate communication styles – assertion, persuasion, negotiation. Listening: Listening Vs Hearing, Possible reasons for why people do not Listen at times, Active Listening Vs Passive Listening, Listening effect on relationships. Public Speaking: Skills, Methods, Strategies and Essential tips for effective public speaking. Group Discussion: Importance, Planning, Elements, Skills assessed; Effectively disagreeing, Initiating, Summarizing and Attaining the Objective. Non-Verbal Communication: Importance and Elements; Body Language-Postures, gestures, eye contact. Teamwork and Leadership Skills: Concept of Teams; Building effective teams; Concept of Leadership and honing Leadership skills. Presentation Skills: Types, Content, Audience Analysis, Essential Tips – Before, During and After, Overcoming Nervousness. Etiquette and Manners: Social and Business. Time Management – Concept, Essentials, Tips.		
	UNIT – IV	6	hrs
	Personality Development: Meaning, Nature, Features, Stages, Models; Learning Skills; Adaptability Skills. Decision-Making and Problem-Solving Skills: Meaning, Types and Models, Group and Ethical Decision-Making, Problems and Dilemmas in application of these skills. Conflict Management: Conflict - Definition, Nature, Types and Causes; Methods of Conflict Resolution. Stress Management: Stress - Definition, Nature, Types, Symptoms and Causes; Stress Analysis Models and Impact of Stress; Measurement and Management of Stress. Leadership and Assertiveness Skills: A Good Leader; Leaders and Managers; Leadership Theories; Types of Leaders; Leadership Behaviour; Assertiveness Skills. Emotional Intelligence: Meaning, History, Features, Components, Intrapersonal and Management Excellence; Strategies to Enhance Emotional Intelligence.		
	UNIT – V	8	hrs
	Group Discussions (GD): Stages of a GD, GD Vs Debate, Skills assessed in a GD, Blunders to be avoided, Dos & Don'ts, GD-Practice: Conducting practice sessions and Brain Storming Sessions, Evaluation, feedback on their performance Resume Preparation: Resume Templates, Steps followed for resume preparation, Common mistakes in a resume; Covering letter Campus Placements Skills: Stages of Campus Placement, Skills assessed in Campus Placements, Changing scenario and its Challenges & How to get ready, Motivational Talk on Positive Thinking; Beliefs, Thoughts, Actions, Habits & Results (Success); Interview Skills: Types of Interview, Interviewer and Interviewee – in-depth perspectives; Before, During and After the Interview; Tips for Success, Dress code and Grooming, Dos & Don'ts, Skills assessed in an Interview, Mistakes to be avoided, How to equip oneself to excel; How to handle the Typical Interview Questions; Mock Interviews: Unconventional HR questions, Practice sessions with Feedback, Simulated Testing: Previous model papers of companies, Business Terminology: Financial Terms such as Debt, Equity, Share, Working Capital, Turnover, Net worth etc; Vision, Mission, Objectives, Goals, Targets Course Outcomes: After studying this course the student should be able to (i) solve aptitude and reasoning problems (ii) apply the soft skills in dealing the issues related to employability (iii) successful in getting employment in campus placement interview		
	Text Books		
	1	B.K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.	
	2	S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.	
	3	R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.	
	Reference Books		
	1	Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.	
	2	Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.	
	3	Wren and Martin, "English grammar and Composition", S. Chand publications	

		4	David F. Beer, David A. McMurrey, “A Guide to Writing as an Engineer”, ISBN : 978-1-118-30027-5 4th Edition, 2014, Wiley.														
		5	Philip Carter, "The Complete Book Of Intelligence Test", John Willey & Sons Ltd.														
	CO-PO/PSO Mapping Matrix																
		CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	P O 7	P O 8	P O 9	PO 10	PO 11	PO 12	PS O 1	PS O 2	PSO 3
		C320.1	3														
		C320.2	3														
		C320.3						2									
		C320.4												2			
		C320.5										3					
		Avg.	3	-	-	-	-	2	-	-	-	3	-	2			



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
Department of Electronics & Communication Engineering

			L	T	P	Cr.
B. Tech (IV & I Sem)	MANAGEMENT AND ORGANISATIONAL BEHAVIOUR					
		Course Code: 20HSMC4101 (Common to ALL)	3	0	0	3
Pre-requisites: Basic Knowledge of Business Administration						
Course Objectives:						
i.To familiarize with the process of management, principles, leadership styles and basic concepts on Organisation.						
ii.To know how to apply basic knowledge of statistics in quality control and to study about the inventory management.						
iii.To provide conceptual knowledge on functional management that is on Human resource management and Marketing management.						
iv.To provide basic insight into Strategic Management and corporate planning with SWOT analysis.						
v.To know about the contemporary management practices in the globalised era.						
Course Outcomes: At the end of the course, the student will be able to						
C401.1	:	The student will acquire the knowledge on management functions, global leadership and organizational structure.				
C401.2	:	Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments.				
C401.3	:	The learner is able to think in strategically through contemporary management practices.				
C401.4	:	The learner can develop positive attitude through personality development and can equip with motivational theories				
C401.5	:	The student can attain the group performance and grievance handling in managing the organizational culture.				
UNIT – I	Introduction: Management and organizational concepts of management and organization- Nature and Importance of Management, Functions of Management, System approach to Management - Taylor’s Scientific Management Theory, Fayol’s Principles of Management, Leadership Styles, Social responsibilities of Management. Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, MBO, Process and concepts.					10 hrs

UNIT – II	Functional Management: Human Resource Management (HRM) Concepts of HRM, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Wage and Salary Administration Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. Marketing Management: Concepts of Marketing, Marketing mix elements and marketing strategies.	09	hrs
UNIT – III	Strategic Management: Strategic Management and Contemporary Strategic Issues: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and implementation, Generic Strategy alternatives, Bench Marking and Balanced Score Card as Contemporary Business Strategies.	10	hrs
UNIT – IV	Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow’s Theory of Human Needs, Douglas McGregor’s Theory X and Theory Y, Herzberg’s Two-Factor Theory of Motivation.	10	hrs
UNIT – V	Group Dynamics: Types of Groups, Stages of Group Development, Group Behaviour and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.	09	hrs

Text Books

- 1 Subba Rao P., Organizational Behaviour, Himalaya Publishing House. Mumbai
- 2 L.M. Prasad, Principles and Practice of Management.

Reference Books

- 1 Fred Luthans Organizational Behaviour, TMH, New Delhi.
- 2 Robins, Stephen P., Fundamentals of Management, Pearson, India.
- 3 Kotler Philip & Keller Kevin Lane: Marketing Management 12/e, PHI, 2007
- 4 Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2007
- 5 Kanishka Bedi, Production and Operations Management, Oxford University Press, 2007.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C401.1	-	-	-	-	-	-	-	-	3	2		2	-	-	-
C401.2	-	-	-	-	-	-	-	-	3	2	1	2	-	-	-
C401.3	-	-	-	-	-	-	-	-	3	2	-	2	-	-	-
C401.4	-	-	-	-	-	-	-	-	3	2	1	2	-	-	-
C401.5	-	-	-	-	-	-	-	-	3	2	-	2	-	-	-
Avg.	-	-	-	-	-	-	-	-	3	2	1	2	-	-	-



**KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)**

Approved by AICTE, New Delhi & Permanently Affiliated to JNTUK Kakinada
Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)		OPTICAL COMMUNICATION				
		Course Code: 20PEC4110A (Professional Elective-3)	3	0	0	3
Pre-requisites: Digital Communication						
Course Objectives:						
1. The properties of optical fiber that affect the performance of a communication link and types of fiber materials with their properties and the losses occur in fibers.						
2. The principles of single and multi-mode optical fibers and their characteristics						
3. Working of semiconductor lasers, and differentiates between direct modulation and external Electro-optic modulation.						
4. Analyze the operation of LEDs, laser diodes, and PIN photo detectors (spectral properties, bandwidth, and circuits) and apply in optical systems.						
5. Analyze and design optical communication systems and to carry out the fiber measurements.						
Course Outcomes: At the end of the course, the student will be able to						
C402A.1	:	Explain the light propagation mechanism through a fiber.				
C402A.2	:	Describe the attenuation and dispersion mechanisms in an optical fiber.				
C402A.3	:	Design the fiber alignment mechanisms and determine joint loss				
C402A.4	:	Choose optical sources and photo detectors required for the development of better light wave systems.				
C402A.5	:	Design an optical link and measure attenuation and dispersion of an optical fiber.				
UNIT – I			10	hrs		
Overview of optical fiber communication - Historical development, The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission, Total Internal Reflection, Acceptance angle, Numerical Aperture, Skew rays, V-number, Mode coupling, Step Index fibers, Graded Index fibers, Single mode fibers- Cutoff wavelength, Mode Field Diameter, Effective Refractive Index.						
UNIT – II			10	hrs		
Glass, Halide, Active glass, Chalgenide glass, Plastic optical fibers. Signal distortion in optical fibers- Attenuation, Absorption, Scattering and Bending losses, Information capacity determination, Group delay, Types of Dispersion:- Material dispersion, Wave-guide dispersion, Polarization-Mode dispersion, Intermodal dispersion, Pulse broadening in Graded index fiber.						
UNIT-III			10	hrs		
Connectors-Connector types, Single mode fiber connectors, Connector return loss, Fiber Splicing- Splicing techniques, Splicing single mode fibers, Fiber alignment and joint loss- Multimode fiber joints, single mode fiber joints.						
UNIT –IV			10	hrs		
LEDs, Structures, Quantum efficiency, Power bandwidth product. Injection Laser Diodes- Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, Resonant frequencies, Reliability of LED & amp; ILD, Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors.						
UNIT – V			10	hrs		
Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling. Optical system design - Point-to- point links- Component choice and considerations, Link power budget, Rise time budget with examples, Line coding in Optical links, WDM-Necessity & amp; Principles, Measurement of Attenuation and Dispersion.						
Text Books						

	1	Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.														
	2	Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.														
	Reference Books															
	1	Fiber Optic Communications – D.K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Pearson Education,2005.														
	2	Fiber Optic Communications – Joseph C. Palais, 4th Edition, Pearson Education, 2004.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	P O 11	PO 12	PS O1	PS O 2	PS O3
	C402A.1	2	3												3	
	C402A.2	3	2												3	
	C402A.3		2	3											2	
	C402A.4	3	2												2	
	C402A.5		3	3											2	
	Avg.	2.6	2.4	3											2.4	



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY

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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)	DIGITAL IC DESIGN					
	Course Code: 20PEC4110B (Professional Elective-3)	3	0	0	3	
Pre-requisites : STLD, VLSI						
Course Objectives:						
1. To acquire knowledge on the Hardware description language of VHDL 2. To model the digital system design blocks using VHDL. 3. To acquire knowledge on the implementation and design of combinational and sequential digital logic circuits. 4. To acquire knowledge on designing MOS logic circuits. 5. To acquire knowledge on Sequential MOS logic circuits.						
Course Outcomes: At the end of the course, the student will be able to						
C402B.1	: Write the programs in dataflow, behavioral and structural modeling of VHDL					
C402B.2	: Explain the digital system blocks using VHDL.					
C402B.3	: Analyze and design various combinational and sequential digital logic circuits					
C402B.4	: Explain the design of combinational MOS logic circuits					
C402B.5	: Explain the design of sequential MOS logic circuits.					
UNIT – I		10				hrs
Hardware Description Languages VHDL: Introduction to VHDL, entity declaration, architecture, data-flow, behavioral and structural style of modeling's, data types, data objects, configuration declaration, package, generic operators and identifiers, PROCESS, IF, CASE& LOOP statements, VHDL libraries. Verilog HDL: Introduction to Verilog HDL, data types, data operators, module statement, wire statement, if- else statement, case-end case statement, Verilog syntax and semantics (qualitative approach).						
UNIT – II		10				hrs
Combinational Logic Design Parallel binary adder, carry look ahead adder, BCD adder, Multiplexers and demultiplexers and their use in combinational logic design, ALU, digital comparators, parity generators, code converters, priority encoders. (Qualitative approach of designing and modeling the mentioned combinational logic circuits with relevant digital ICs using HDL).						
UNIT – III		10				hrs
Sequential Logic Design Registers, applications of shift registers, ripple counter, synchronous counters, synchronous sequential circuits, hazards in sequential circuits. (Qualitative approach of designing and modeling the mentioned sequential logic circuits with relevant digital ICs using HDL).						
UNIT – IV		10				hrs
Combinational MOS Logic Circuits Introduction, MOS logic circuits with depletion NMOS loads: two-input NOR gate, generalized NOR structure with multiple inputs, transient analysis of NOR gate, two-input NAND gate, generalized NAND structure with multiple inputs, transient analysis of NAND gate, CMOS logic circuits: CMOS NOR gate, CMOS NAND gate, complex logic circuits, complex CMOS logic gates, AOI and OAI gates, Pseudo-NMOS gates, CMOS full-adder circuit, CMOS transmission gates (Pass Gates), complementary pass-transistor logic.						
UNIT – V		10				hrs

Sequential MOS Logic Circuits Introduction, behavior bistable elements, SR latch circuit, clocked latch and flip-flop circuits: clockedSR latch, clocked JK latch, master-slave flip-flop, CMOS D-latch and Edge- triggered flip-flop,Schmitttrigger circuit, basic principles ofpass transistor circuits.																
Text Books																
1	Modern Digital Electronics–R.P.Jain-Fourth Edition–Tata McGraw Hill Education Private Limited,2010.															
2	CMOS Digital Integrated Circuits-Analysis and Design–Sung-MoKang & Yusuf Leblebici-Tata McGraw Hill Publishing Company Limited, 2006.															
Reference Books																
1	IntroductiontoVLSISystems:ALogic,CircuitandSystemPerspective–Ming-BOLin,CRC Press,2011.															
2	DigitalIntegratedCircuits–ADesignPerspective,JanM.Rabaey,AnanthaChandrakasanBorivojeNikolic,2 nd Ed.,PHI.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO 3
	C402B.1	2	3	2										2		
	C402B.2	2	3	1										2		
	C402B.3	2	2											2		
	C402B.4	2		2										2		
	C402B.5	2												2		
	Avg.	2	2.6	1.6										2		



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (VII Sem.)	AUGMENTED REALITY					
	Course Code: 20PEC4110C (Professional Elective-3)		3	0	0	3
Pre-requisites: Digital Image Processing						
Course Objectives:						
1. To understand fundamentals in Augmented Reality.						
2. To understand Human Senses and their Relationship to Output/Input Devices.						
3. To understand tracking and navigation methods.						
4. To demonstrate software architecture and applications of AR.						
5. To acquire knowledge in human factors, legal and social considerations.						
Course Outcomes: At the end of the course, the student will be able to						
C402C.1	:	Aware fundamentals in Augmented Reality.				
C402C.2	:	Aware Human Senses and their Relationship to Output/Input Devices.				
C402C.3	:	Aware tracking and navigation methods.				
C402C.4	:	Demonstrate software architecture and applications of AR.				
C402C.5	:	Acquire knowledge In human factors, legal and social considerations				
UNIT – I					10	hrs
Introduction to Augmented Reality Definition and Scope, a brief history of Augmented Reality, Examples, Other related fields: Virtual Reality, Mixed Reality Continuum, Ubiquitous Computing. Understanding Virtual Space: Defining visual space and content, defining position and orientation in three dimensions, navigation.						
UNIT – II					10	hrs
Understanding Human Senses and their Relationship to Output/Input Devices The mechanics of sight – visual pathway, spatial vision and depth cues, The mechanics of hearing, mechanics of feeling, Multimodal displays, Visual perception, Requirements and Characteristics, Spatial display model, Visual displays.						
UNIT – III					10	hrs
Tracking Sensors for tracking position, orientation and motion–Tracking, calibration and registration, coordinate systems, characteristics of tracking technology, Stationary tracking systems, Mobile sensors, optical tracking, sensor fusion, Computer vision for augmented reality – market tracking, multiple-camera infrared tracking, natural feature tracking by detection, incremental tracking, simultaneous localization and mapping, outdoor tracking devices to enable navigation and interaction – 2D versus 3D interaction and navigation, the importance of a manual interface, hand and gesture tracking, whole body tracking, gaming and entertainment interfaces, navigating with mind.						
UNIT – IV					10	hrs
Architectures and Applications Software architectures – R application requirements, software engineering requirements, Distributed object systems, dataflow, scene graphs, developer support. Applications of Augmented and Virtual Reality: Gaming and Entertainment, Architecture and construction, Health and medicine, Aerospace and defense, education, information control and big data visualization, Tele-robotics and telepresence.						
UNIT – V					10	hrs
Human Factors, Legal and Social Considerations						

	Human factor considerations, legal and social considerations, The future of AR – what may drive business cases, an AR developer’s wish list, taking AR outdoors, interfacing with smart objects, confluence of VR and AR, augmented humans, AR as dramatic medium, AR as social computing platform.															
	Text Books															
	1	Augmented Reality – Principles and Practice, Dieter Schmalstieg and Tobias Höllerer, 1 st Edition, Addison-Wesley.														
	2	Practical Augmented Reality – guide to the technologies, applications, and human factors for AR and VR, Steve Aukstakalnis, 1st Edition, Addison-Wesley.														
	Reference Books															
	1	Handbook of Virtual Environments: Design, Implementation, and Applications, Kelly S. Hale and Kay M. Stanney, 2nd Edition, CRC Press.														
	2	Designing Virtual Systems: The Structured Approach, Gerard Jounghyun Kim, Springer.														
	CO-PO/PSO Mapping Matrix															
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO 3
	C402C.1	3	1											2	2	
	C402C.2	2												2	2	
	C402C.3	2	3											2	2	
	C402C.4	3												2	2	
	C402C.5	3	2											2	2	
	Avg.	3	2											2	2	



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Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (VII Sem.)	AUGMENTED REALITY					
	Course Code: 20PEC4110C (Professional Elective-3)		3	0	0	3
Pre-requisites: Digital Image Processing						
Course Objectives:						
1. To understand fundamentals in Augmented Reality.						
2. To understand Human Senses and their Relationship to Output/Input Devices.						
3. To understand tracking and navigation methods.						
4. To demonstrate software architecture and applications of AR.						
5. To acquire knowledge in human factors, legal and social considerations.						
Course Outcomes: At the end of the course, the student will be able to						
C402C.1	:	Aware fundamentals in Augmented Reality.				
C402C.2	:	Aware Human Senses and their Relationship to Output/Input Devices.				
C402C.3	:	Aware tracking and navigation methods.				
C402C.4	:	Demonstrate software architecture and applications of AR.				
C402C.5	:	Acquire knowledge In human factors, legal and social considerations				
UNIT – I					10	hrs
Introduction to Augmented Reality Definition and Scope, a brief history of Augmented Reality, Examples, Other related fields: Virtual Reality, Mixed Reality Continuum, Ubiquitous Computing. Understanding Virtual Space: Defining visual space and content, defining position and orientation in three dimensions, navigation.						
UNIT – II					10	hrs
Understanding Human Senses and their Relationship to Output/Input Devices The mechanics of sight – visual pathway, spatial vision and depth cues, The mechanics of hearing, mechanics of feeling, Multimodal displays, Visual perception, Requirements and Characteristics, Spatial display model, Visual displays.						
UNIT – III					10	hrs
Tracking Sensors for tracking position, orientation and motion–Tracking, calibration and registration, coordinate systems, characteristics of tracking technology, Stationary tracking systems, Mobile sensors, optical tracking, sensor fusion, Computer vision for augmented reality – market tracking, multiple-camera infrared tracking, natural feature tracking by detection, incremental tracking, simultaneous localization and mapping, outdoor tracking devices to enable navigation and interaction – 2D versus 3D interaction and navigation, the importance of a manual interface, hand and gesture tracking, whole body tracking, gaming and entertainment interfaces, navigating with mind.						
UNIT – IV					10	hrs
Architectures and Applications Software architectures – R application requirements, software engineering requirements, Distributed object systems, dataflow, scene graphs, developer support. Applications of Augmented and Virtual Reality: Gaming and Entertainment, Architecture and construction, Health and medicine, Aerospace and defense, education, information control and big data visualization, Tele-robotics and telepresence.						
UNIT – V					10	hrs
Human Factors, Legal and Social Considerations						

	Human factor considerations, legal and social considerations, The future of AR – what may drive business cases, an AR developer’s wish list, taking AR outdoors, interfacing with smart objects, confluence of VR and AR, augmented humans, AR as dramatic medium, AR as social computing platform.															
	Text Books															
1	Augmented Reality – Principles and Practice, Dieter Schmalstieg and Tobias Höllerer, 1 st Edition, Addison-Wesley.															
2	Practical Augmented Reality – guide to the technologies, applications, and human factors for AR and VR, Steve Aukstakalnis, 1st Edition, Addison-Wesley.															
	Reference Books															
1	Handbook of Virtual Environments: Design, Implementation, and Applications, Kelly S. Hale and Kay M. Stanney, 2nd Edition, CRC Press.															
2	Designing Virtual Systems: The Structured Approach, Gerard Jounghyun Kim, Springer.															
	CO-PO/PSO Mapping Matrix															
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO 3
	C402C.1	3	2											2		
	C402C.2	3												2		
	C402C.3	3	2											2		
	C402C.4	3												2		
	C402C.5	3	2											2		
	Avg.	3	2											2		



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY

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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. VII (Sem.)		ADVANCED COMPUTER ARCHITECTURE				
		Course Code: 20PEC4110D (Professional Elective-3)	3	0	0	3
Pre-requisites: Computer Architecture & Organization						
Course Objectives:						
1. Understand the Concept of Parallel Processing and its applications.						
2. Implement the Hardware for Arithmetic Operations.						
3. Analyze the performance of different scalar Computers.						
4. Develop the Pipelining Concept for a given set of Instructions.						
5. Distinguish the performance of pipelining and non-pipelining environmental processor.						
Course Outcomes: At the end of the course, the student will be able to						
C402D.1	:	Know the types of computers, and new trends and developments in computer architecture.				
C402D.2	:	Aware pipelining, instruction set architectures, memory addressing.				
C402D.3	:	Aware exploiting ILP using dynamic scheduling, multiple issue, and speculation.				
C402D.4	:	Aware the various techniques to enhance a processors ability to exploit Instruction-level parallelism(ILP), and its challenges.				
C402D.5	:	Aware multi-threading by using ILP and supporting thread-level parallelism(TLP).				
UNIT – I			10			hrs
Fundamentals of Computer Design Fundamentals of Computer design, Changing faces of computing and task of computer designer, Technology trends, Cost price and their trends, Measuring and reporting performance, Quantitative principles of computer design, Amdahl’s law, Instruction set principles and examples- Introduction, Classifying instruction set -Memory addressing-type and size of operands, Operations in the instruction set.						
UNIT – II			10			hrs
Pipelines Introduction, Basic RISC instruction set, Simple implementation of RISC instruction set, Classic five stage pipe lined RISC processor, Basic performance issues in pipelining, Pipeline hazards, Reducing pipeline branch penalties, Memory Hierarchy Design- Introduction, Review of ABC of cache, Cache performance, Reducing cache miss penalty, Virtual memory.						
UNIT – III			10			hrs
Instruction Level Parallelism the Hardware Approach Instruction-Level parallelism , Dynamic scheduling ,Dynamic scheduling using Tomasulo’s approach, Branch prediction, high performance instruction delivery-hardware based speculation.						
UNIT – IV			10			hrs
ILP Software Approach Basic compiler level techniques, Static branch prediction, VLIW approach, Exploiting ILP, Parallelism at compile time, Cross cutting issues Hardware vs Software.						
UNIT – V			10			hrs
Multi Processors and Thread Level Parallelism, Inter Connection and Networks, Intel Architecture Multi Processors and Thread Level Parallelism: Multi Processors and Thread level Parallelism-Introduction, Characteristics of application domain, Systematic shared memory architecture, Distributed shared – memory architecture, Synchronization Inter Connection and Networks- Introduction, Interconnection network media, Practical issues in inter						

connecting networks, Examples of inter connection, Cluster, Designing of clusters. Intel Architecture – Intel IA-64IL Pin embedded and mobile markets Fallacies and pitfalls.																
Text Books																
1	JohnL. Hennessy, David A. Patterson–Computer Architecture: A Quantitative Approach, 3 rd Edition, An Imprint of Elsevier.															
2	Computer Architecture and Parallel Processing– KaiHwang, FayeA.Brigs., Mc Graw Hill.															
Reference Books																
1	JohnP. Shenand MiikkoH .Lipasti–ModernProcessor Design: Fundamentals of Super Scalar Processors															
2	Advanced Computer Architecture – A Design Space Approach – Dezso Sima, Terence Fountain, Peter Kacsuk , Pearson Ed															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PS O3
	C402D.1	2	2											2	2	
	C402D.2	2	3											2	2	
	C402D.3	2	2											2	2	
	C402D.4	2	3											2	2	
	C402D.5	3	2											2	2	
	Avg.	2.2	2.5											2	2	



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (VII Sem.)		DSP PROCESSORS AND ARCHITECTURES				
		Course Code: 20PEC4110E (Professional Elective-3)	3	0	0	3
Pre-requisites: Signals and systems.						
Course Objectives:						
1. To learn and understand the basic concepts of Signals and its Transformation & conversions						
2. To study the basic building blocks of DSP and Pipelining models.						
3. Analyse the Addressing Modes of DSP Processors and pipeline process						
4. Apply basic DSP algorithms for various filters and analyse it.						
5. Analyse of Interfacing Memory and I/O Peripherals of Programmable DSP Devices						
Course Outcomes: At the end of the course, the student will be able to						
C402E.1	:	Explain the basic concepts of Signals and its Transformation & conversions.				
C402E.2	:	Discuss the basic building blocks of DSP and Pipelining models.				
C402E.3	:	Analysing the Addressing Modes of DSP Processors and its pipeline process.				
C402E.4	:	Aware DSP algorithms for various filters and analyse it.				
C402E.5	:	Analyse of Interfacing Memory and I/O Peripherals of Programmable DSP Devices.				
UNIT – I			12	hrs		
Introduction to Digital Signal Processing: Review of a digital signal-processing system, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear Time Invariant Systems, Digital filters IIR and FIR, Decimation and interpolation. Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic range and precision, Sources of error in DSP implementations, ADC and DAC conversion errors, DSP computational errors, Compensating filter.						
UNIT – II			10	hrs		
Architectures for Programmable DSP Devices: Basic Architectural features, DSP computational building blocks, Bus architecture and memory, Data addressing capabilities, Address generation unit, Programmability and program execution, Speed issues, Features for external interfacing. 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			10	hrs		
Programmable Digital Signal Processors: Commercial DSP 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			10	hrs		
Implementations of Basic DSP Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing, 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			8	hrs		
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.						
Text Books						

	1	Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.														
	2	DSP Processor Fundamentals, Architectures & Features - Lapsley et al. S. Chand & Co,2000.														
	Reference Books															
	1	Digital Signal Processors, Architecture, Programming and Applications – B. VenkataRamani and M. Bhaskar, TMH, 2004.														
	2	Digital Signal Processing –Principles, Algorithms Applications by J.G. Proakis&D.G.Manolokis, PHI, 2005.														
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O 3
	C402E.1	3	2													2
	C402E.2	3	2													2
	C402E.3	2	3													2
	C402E.4	3	2													2
	C402E.5	2	2													2
	Avg.	2. 6	2.2													2



**KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)		CELLULAR AND MOBILE COMMUNICATION				
		Course Code: 20PEC4111A (Professional Elective-4)	3	0	0	3
Pre-requisites: Fundamentals of Signals and basics of Communication systems						
Course Objectives:						
1. Analyze and design wireless and mobile cellular systems.						
2. Understand impairments due to multipath fading channel and be able to simulate standards to stochastic channel models for various environments.						
3. Evaluate the fundamental techniques to overcome the different fading effects.						
4. Interpret current and proposed cellular technologies.						
5. Able to work in advanced research wireless and mobile cellular programs.						
Course Outcomes: At the end of the course, the student will be able to						
C403A.1	:	Demonstrate cellular mobile system design concepts in wireless mobile communication				
C403A.2	:	Design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel Interference types				
C403A.3	:	Interpret Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units				
C403A.4	:	Aware the concepts of Handoff, dropped calls and cell splitting, Intersystem handoff				
C403A.5	:	Imbibe knowledge about Wireless Systems and Standards GSM channels, multiplex access scheme, TDMA, CDMA.				
UNIT – I					10	hrs
Cellular Mobile Radio Systems: Introduction to Cellular Mobile System, uniqueness of mobile radio environment, operation of cellular systems, consideration of the components of Cellular system, Hexagonal shaped cells, Analog and Digital Cellular systems. Cellular Concepts: Evolution of Cellular systems, Concept of frequency reuse, frequency reuse ratio, Number of channels in a cellular system, Cellular traffic: trucking and blocking, Grade of Service; Cellular structures: macro, micro, pico and femto cells; Cell splitting, Cell sectoring.						
UNIT – II					10	hrs
Interference: Types of interferences, Introduction to Co-Channel Interference, real time Co-Channel interference, Co-Channel measurement, Co-channel Interference Reduction Factor, desired C/I from a normal case in omni directional Antenna system, design of Antenna system, antenna parameters and their effects, diversity receiver, non-co channel interference-different types.						
UNIT -III					10	hrs
Frequency Management, Channel Assignment and Antennas: Frequency Management and Channel Assignment: Numbering and grouping, setup access and paging channels, channel assignments to cell sites and mobile units: fixed channel and non-fixed channel assignment, channel sharing and borrowing, overlaid cells. 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.						
UNIT – IV					10	hrs
Handoff Strategies: Concept of Handoff, types of handoff, handoff initiation, delaying handoff, forced handoff, Mobile assigned handoff, intersystem handoff, vehicle locating methods, dropped call rates and the revaluation.						
UNIT – V					10	hrs

Digital Cellular Networks: GSM architecture, GSM channels, multiplex access scheme, TDMA, CDMA.	
Text Books	
1	Theodore. S. Rapport, Wireless Communications, Pearson Education, 2 nd Edition, 2010
2	Open Dalal, Wireless communication, Oxford University Press, 2010.
3	Kaveh Pahlvan, Prashant Krishnamurthy, Principle of wireless networks, A United Approach, Pearson Education, 2004.
4	Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2005

Reference Books	
1	Lee, Wireless and Mobile Communications, McGraw Hill, 3 rd Edition, 2006.
2	Jon W. Mark and Weihua Zhqung, Wireless Communication and Networking, PHI, 1st Edition, 2005.
3	R. Blake, Wireless Communication Technology", Thompson Asia Pvt .Ltd., 1 st Edition, 2004.

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PS O3
	C403A.1	2	2											2	2	
	C403A.2	2	2											2	2	
	C403A.3	2	2											2	2	
	C403A.4	2	2											2	2	
	C403A.5	2	2											2	2	
	Avg.	2	2											2	2	



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Department of Electronics & Communication Engineering

		L	T	P	Cr.
B.Tech. (VII Sem.)	VLSI TESTING & TESTABILITY				
	Course Code: 20PEC4111B (Professional Elective-4)	3	0	0	3
Pre-requisites: Electronic Devices and Circuits and Physics					
Course Objectives:					
1.To provide a broad understanding of fault diagnosis.					
2. To illustrate the frame work of test pattern generation.					
3.To understand design for testability in Digital Design.					
Course Outcomes: At the end of the course, the student will be able to					
C403B.1	: To acquire the knowledge of fundamental concepts in fault and fault diagnosis				
C403B.2	: Test pattern generation using LFSR and CA				
C403B.3	: Design for testability rules and techniques for combinational circuits				
C403B.4	: Introduce scan architectures				
C403B.5	: Design for testability rules and techniques for sequential circuits				
UNIT – I					
		10	hrs		
Need for testing, the problems in digital Design testing, the problems in Analog Design testing, the					

	problems in mixed analog/digital design testing, design for test, printed-circuit board (PCB) testing,softwaretesting, Fault in Digital Circuits: General Introduction, Controllability and Observability, Fault Models, stuckatfaults, bridgingfaults, CMOS technologyconsiderations, intermittent faults															
	UNIT – II													10	hrs	
	GeneralIntroduction, to test pattern generation, Test Pattern generation for combinational logiccircuits,Manualtestpatterngeneration,automatictestpatterngeneration,Booleandifferencemethod,Roth’sD-algorithm,DevelopmentsfollowingRoth’sD-algorithm,Pseudorandomtestpatterngeneration.															
	UNIT – III													10	hrs	
	Pseudorandom test pattern generators, Design of test pattern generator using Linear feedback shiftregisters(LFSRs)and cellularautomata(CAs).															
	UNIT – IV													10	hrs	
	Design for Testability for combinational circuits: Basic Concepts of testability, controllability andobservability, the Reed Muller’s expansion techniques, use of control logic and syndrome testabledesign.															
	UNIT – V													10	hrs	
	Making sequential circuits testable, testability insertion, full scan DFT Technique-Full scan insertion,flip-flopstructures,Fullscandesignandtest,scanarchitectures fullscandesign,shadowregisterDFT,partialscan methods, multiplescan design,other scandesigns.															
	Text Books															
1	FaultTolerantandFaultTestableHardwareDesign, ParagK.Lala,1984,PHI.															
2	VLSITestingdigitalandMixedanalogue/digitalTechniques, StanleyL.Hurst,IEECircuits,Devicesand Systems, Series 9, 1998.															
	Reference Books															
1	Digital Systems Testing and Testable Design, MironAbramovici, Melvin A. Breuer and Arthur D.Friedman,Jaico Books															
2	EssentialsofElectronicTesting, BushnellandVishwaniD.Agarwal,Springers.															
3	DesignfortestforDigitalIC’sandEmbeddedCoreSystems, AlfredL.Crouch,2008,PearsonEducation.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	P S O 1	P S O 2	PSO3
	C403B.1	2		3										2		
	C403B.2	2	2	2										2		
	C403B.3	2		3										2		
	C403B.4	2		3										2		
	C403B.5	2	3	3										2		
	Avg.	2	2.5	2.8										2		



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			L	T	P	Cr.
B.Tech. (VII Sem.)			DATA ACQUISITION SYSTEMS			
		Course Code: 20PEC4111C (Professional Elective-4)	3	0	0	3
Pre-requisites: Analog communications and Digital logic circuits						
Course Objectives:						
1. To understand and learn single and multi-channel Data Acquisition System.						
2. To acquire basic skills on capturing experimental data.						
3. To understand and learn digital to analog and analog to digital conversion techniques.						
4. To understand and learn data convertor techniques and applications.						
5. To understand and learn monolithic data convertors and error budget of Data Acquisition System						
Course Outcomes: At the end of the course, the student will be able to						
C403C.1	:	Aware single and multichannel Data Acquisition System				
C403C.2	:	Acquire basic skills on capturing experimental data.				
C403C.3	:	Aware digital to analog and analog to digital conversion techniques.				
C403C.4	:	Aware data convertor techniques and applications.				
C403C.5	:	Aware monolithic data convertors and error budget of Data Acquisition System.				
UNIT – I			10	hrs		
INTRODUCTION: Objective of a Data Acquisition System, single channel Data Acquisition System, Multi-channel Data Acquisition System, Components used in Data Acquisition System Converter Characteristics-Resolution-Non-linearity, settling time, Monotonicity.						
UNIT – II			10	hrs		
ANALOG TO DIGITAL CONVERTERS (ADCS): Classification of A/D converters, Parallel feedback –Successive approximation –Ramp comparison –Dual slope integration ADCS. NON-LINEAR DATA CONVERTERS (NDC): Basic NDC configurations – Some common NDACS and NADCS–Programmable non-linear ADCS–NADC using optimal sized ROM.						
UNIT – III			10	hrs		
DIGITAL TO ANALOG CONVERTERS (DACs): Principles and design of –Parallel R–2R, weighted resistor, inverted ladder, D/A decoding –Codes other than ordinary binary. Data Converter Applications: DAC applications–Digitally programmable V/I source–Arbitrary waveform generators –Digitally programmable gain amplifiers –Analog multipliers/ dividers –Analog delay lines.						
UNIT – IV			10	hrs		
MONOLITHIC DATA CONVERTERS: Typical study of monolithic DACs and ADCS. Interfacing of DACs and ADCS to a Microprocessor.						
UNIT – V			10	hrs		
ERROR BUDGET OF DACS AND ADCS: Error sources, error reduction and noise reduction techniques in Data Acquisition System. Error budget analysis of Data Acquisition System, case study of a DAC and an ADC.						
Text Books						
1	Data Acquisition Techniques Using PCs by Howard Austerlitz					
2	Linear Integrated Circuits by D. Roy Choudhury, Shail B. Jain					
Reference Books						
1	Op Amps and Linear Integrated Circuits by Ramakant A .Gayakwad					
2	Practical Data Acquisition for Instrumentation and Control Systems by John Park and Steve Mackay					
e-resources						

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O1	P S O 2	PSO 3
	C403C.1	2	2											2	2	
	C403C.2	2	2											2	2	
	C403C.3	2	2											2	2	
	C403C.4	2	2											2	2	
	C403C.5	2	2											2	2	
	Avg.	2	2											2	2	



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Department of Electronics & Communication Engineering

			L	T	P	Cr.	
B.Tech. (VII Sem)		EMBEDDED SYSTEMS					
		Course Code: 20PEC4111D (Professional Elective-4)		3	0	0	3
Pre-requisites: Digital logic circuits and Fundamentals of Microprocessors and microcontrollers							
Course Objectives:							
1. To study the basic concepts of an embedded system							
2.To learn Different steps involved in the design and development to firmware for embedded systems							
3.To explain internals of Real Time operating system and the fundamentals of RTOS based embedded firmware design is discussed							
4.To learn fundamental issues in hardware software co-design							
5.To understand Embedded system implementation and testing tools							
Course Outcomes: At the end of the course, the student will be able to							
C403D.1	:	Aware the basic concepts of an embedded system					
C403D.2	:	Learn hardware components required for an embedded system and the design approach of an embedded hardware					
C403D.3	:	Explain various embedded firmware design approaches on embedded environment					
C403D.4	:	Aware the Real time operating system					
C403D.5	:	Aware how to integrate hardware and firmware of an embedded system using real time operating system					
UNIT – I					10	hrs	
Introduction: Embedded System-Definition, classification of embedded systems, major application areas of embedded systems, purpose of embedded system, the typical embedded system. Core of the embedded system, types of core in embedded system Types of Memories in embedded system, Sensors and Actuators, communication interfacing, other devices.							
UNIT – II					10	hrs	
Embedded Hardware Design: Analog and digital electronic components, I/O port types and examples, Serial communication device ports with examples. Parallel device ports with examples, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.							
UNIT – III					10	hrs	
Embedded Firmware Design Embedded Firmware design approaches, Embedded Firmware development languages, interrupts, types of interrupts with examples. ISR concept, Interrupt sources, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.							
UNIT – IV					10	hrs	
Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads. Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization.							
UNIT – V					10	hrs	
Embedded System Implementation and Testing: The integrated development environment, Types of files generated on cross-compilation, Deassembler, Simulators, Emulators, Debugging, Target hardware debugging, Embedded Software development process and tools, Compilers and Linkers, debugging tools.							
Text Books							
1	Embedded Systems Architecture, Tammy Noergaard, Elsevier Publications, 2013.						
2	Embedded Systems, Shibu. K.V, Tata Mc Graw Hill Education Private Limited, 2013.						

	Reference Books															
	1	Embedded System Design, Frank Vahid, Tony Givargis, John Wiley Publications, 2013.														
	2	Embedded Systems, Lyla B. Das, Pearson Publications, 2013														
	e-resources															
	1. https://nptel.ac.in/courses/106/105/106105077/															
	2. http://aima.cs.berkeley.edu/															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	PS O2	PSO3
	C403D.1	3	2	3											2	
	C403D.2	3	2												2	
	C403D.3	3													2	
	C403D.4	2	2	3											2	
	C403D.5	3	2	3												
	Avg.	2.8	2	3											2	



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)	BIO-MEDICAL SIGNAL PROCESSING					
	Course Code: 20PEC4111E (Professional Elective-4)		3	0	0	3
Pre-requisites: Signals and systems and stochastic process						
Course Objectives:						
1.To understand the types of Biomedical Signals						
2.To understand the Biomedical Sensors						
3.To analyze the Biomedical Signals						
4.To analyze the non-stationary Biomedical Signals						
5.To understand the Application of Biomedical equipment						
Course Outcomes: At the end of the course, the student will be able to						
C403E.1	: Aware the types of Biomedical Signals					
C403E.2	: Aware the Biomedical Sensors					
C403E.3	: Analyze the Biomedical Signals					
C403E.4	: Analyze the non-stationary Biomedical Signals					
C403E.5	: Aware the Biomedical equipment					
UNIT – I			10			hrs
Acquisition, Generation of Bio-signals, Origin of bio-signals, Types of bio signals, Study of diagnostically significant bio-signal parameters.						
UNIT – II			10			hrs
Electrodes for bio-physiological sensing and conditioning, Electrode-electrolyte interface, polarization, electrode skin interface and motion artefact, biomaterial used for electrode, Types of electrodes (body surface, internal, array of electrodes, microelectrodes), Practical aspects of using electrodes, Acquisition of bio-signals (signal conditioning) and Signal conversion (ADCs and DACs) Processing, Digital filtering.						
UNIT – III			10			hrs
Biomedical signal processing by Fourier analysis, Biomedical signal processing by wavelet (time frequency) analysis, Analysis (Computation of signal parameters that are diagnostically significant).						
UNIT – IV			10			hrs
Classification of signals and noise, Spectral analysis of deterministic, stationary random signals and non-stationary signals, Coherent treatment of various biomedical signal processing methods and applications.						
UNIT – V			10			hrs
Principal component analysis, Correlation and regression, Analysis of chaotic signals Application areas of Bio-Signals analysis Multiresolution analysis (MRA) and wavelets, Principal component analysis (PCA), Independent component analysis (ICA). Pattern classification – supervised and unsupervised classification, Neural networks, Support vector Machines, Hidden Markov models. Examples of biomedical signal classification examples.						
Text Books						
1	W.J.Tompkins, Biomedical Digital Signal Processing, Prentice Hall, 1993.					
2	Eugene N Bruce, Biomedical Signal Processing and Signal Modeling, John Wiley & Sons Publication, 2001.					
Reference Books						
1	Myer Kutz, Biomedical Engineering and Design Handbook, Volume I, McGraw Hill, 2009					
2	DC Reddy, Biomedical Signal Processing, McGraw Hill, 2005.					

3	KatarzynJ.Blinowska, Jaroslaw Zygierecz, Practical Biomedical Signal Analysis using MATLAB, 1 st Edition, CRC Press, 2011.															
e-resources																
1. https://nptel.ac.in/courses/106/105/106105077/																
2. http://aima.cs.berkeley.edu/																
CO-PO/PSO Mapping Matrix																
	CO	P O 1	P O 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PS O 3
	C403E.1	2	2											2	2	
	C403E.2	2	2											2	2	
	C403E.3	2	2											2	2	
	C403E.4	2	2											2	2	
	C403E.5	2	2											2	2	
	Avg.	2	2											2	2	



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Department of Electronics & Communication Engineering

			L	T	P	Cr.	
B.Tech. (VII Sem.)		5GCOMMUNICATION					
		Course Code: 20PEC4112A (Professional Elective –5)		3	0	0	3
Pre-requisites: Basics of analog and digital communications, Basics of Antenna and microwave engineering.							
Course Objectives:							
1. To focus onOverviewof5GBroadbandWirelessCommunications							
2. To analyze Channelmodellingrequirements,propagationscenariosandchallengesinthe5Gmodelling							
3. To develop the performance of Transmission and Design Techniques for 5G like OFDM, GFDM,FBMC,UFMC, OFDMA, GFDMA, NOMA							
4. TounderstandDevice-to-device(D2D)andmachine-to-machine(M2M)typecommunications							
Course Outcomes: At the end of the course, the student will be able to							
C404A.1	:	Aware overviewof5GBroadband Wireless Communications					
C404A.2	:	Aware 5GwirelessPropagationChannels					
C404A.3	:	Aware the TransmissionandDesignTechniquesfor5G					
C404A.4	:	Aware Device-to-device(D2D)andmachine-to-machine(M2M)typecommunications					
C404A.5	:	Aware Massive MIMO and mm Wave MIMO technologies for 5G					
UNIT – I						10	hrs
Overviewof5GBroadbandWirelessCommunications: Evaluation of mobile technologies: 1G to 4G (LTE,LTEA, LTEA Pro), An Overview of 5Grequirements,Regulations for5G, Spectrum Analysis and Sharing for 5G.							
UNIT – II						10	hrs
5GWirelessPropagationChannels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mm Wave MIMO Systems.							
UNIT – III						10	hrs
TransmissionandDesignTechniquesfor5G: Basic requirements of transmission over 5G, Modulation Techniques–Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing(GFDM), filter bank multi-carriers(FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses(GFDMA),non-orthogonal multiple accesses(NOMA).							
UNIT – IV						10	hrs
D2DandM2MTypeCommunications: Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4GD2D standardization to 5G, radio resource management for mobile broadband D2D, multi-hop andmulti-operatorD2D communications.							
UNIT – V						10	hrs
Millimeter Wave Communications: Spectrum regulations, deployment scenarios, beam forming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM).							
Text Books							
1	Martin Sauter, From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broad band, Wiley-Blackwell.						
2	Afif Osseiran, Jose.F.Monserrat, Patrick Marsch, Fundamentals of 5G Mobile Networks, Cambridge University Press.						
3	Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, New Directions in Wireless						

		Communication Systems from Mobile to 5G, CRC Press.														
	4	Theodore S.Rappaport, Robert W.Heath, Robert C.Danials, James N. Murdock, Millimeter Wave Wireless Communications, Prentice Hall Communications.														
	Reference Books															
	1	Jonathan Rodriguez, Fundamentals of 5G Mobile Networks, John Wiley & Sons														
	2	Amitabha Ghosh and Rapeepat Ratasuk, Essentials of LTE and LTE-A, Cambridge University Press.														
	e-resources		If any													
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C404A.1	2	2											2	2	
	C404A.2	2	3											2	2	
	C404A.3	2	2											2	2	
	C404A.4	2	3											2	2	
	C404A.5	3	3											2	2	
	Avg.	2.2	2.6											2	2	



**KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)**

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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)		LOW POWERVLSI DESIGN				
		Course Code: 20PEC4112B (Professional Elective –5)	3	0	0	3
Pre-requisites: Basics of semiconductor materials, circuit analysis						
Course Objectives:						
1. To know the low power and low voltage.						
2. To understand the impact of power on system performance.						
3. To know about different design approaches						
4. To identify suitable techniques to reduce power dissipation in combinational logic circuit.						
5. To identify suitable techniques to reduce power dissipation in sequential logic circuit						
Course Outcomes: At the end of the course, the student will be able to						
C404B.1	:	Recognize advanced issues in VLSI systems, specific to the deep submicron silicon Technologies.				
C404B.2	:	Aware deep submicron CMOS technology and digital CMOS design styles.				
C404B.3	:	Design chips used for battery-powered systems and high performance circuits.				
C404B.4	:	Learn the design of various CMOS dynamic logic circuits.				
C404B.5	:	Learn the design techniques low voltage and low power CMOS circuits for various applications.				
UNIT – I			10	hrs		
Sources of Power Dissipation: Introduction, Short-Circuit Power Dissipation, Switching Power Dissipation, Dynamic Power for Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Subthreshold Leakage Current, Short-Channel Effects						
UNIT – II			10	hrs		
Supply Voltage Scaling for Low Power: Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations: Multilevel Voltage Scaling Challenges in MVS Voltage Scaling Interfaces, Static Timing Analysis Dynamic Voltage and Frequency Scaling.						
UNIT – III			10	hrs		
Switched Capacitance Minimization Probabilistic Power Analysis: Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy, Bus Encoding: Gray Coding, One-Hot Coding, Bus-Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs FSM State Encoding, FSM Partitioning, Precomputation, Glitching Power Minimization.						
UNIT – IV			10	hrs		
Leakage Power Minimization Fabrication of Multiple Threshold Voltages, Multiple Channel Doping, Multiple Oxide CMOS, Multiple Channel Length, Multiple Body Bias, VTCMOS Approach, MTCMOS Approach, Power Gating, Clock Gating Versus Power Gating, Power-Gating Issues, Isolation Strategy, State Retention Strategy, Power-Gating Controller, Power Management, Combining DVFS and Power Management.						
UNIT – V			10	hrs		
Low Power Clock Distribution & Simulation Power Analysis Low power clock distribution: Power dissipation in clock distribution, single driver versus						

distributedbuffers, Zero skew versus tolerable skew, chip and package co design for clock network. SimulationPower Analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation,architecture level analysis, data correlation analysis of DSP systems, Monte Carlo Simulation SpecialTechniques: Power Reduction in Clock networks, CMOS Floating Node, Low Power Bus Delaybalancing,andLow Power Techniques for SRAM.																
Text Books																
1		Low-PowerVLSICircuitsandSystems,AjitPal,Springer Publishers.														
2		PracticalLowPowerDigitalVLSIDesign,GaryYeapMotorola,SpringerScience+Business Media, LLC.														
Reference Books																
1		LowPowerCMOSDesign, AnanthaChandrakasan, IEEEPress/WileyInternational, 1998.														
2		MassoudPedram,JanM.Rabaey,Lowpowerdesignmethodologies,KluwerAcademic Publishers.														
3		LowPowerCMOSVLSICircuit Design, A.Bellamour,M.I.Elamasri,Kluwer, AcademicPress, 1995.														
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	P S O 2	PSO 3
	C404B.1	2												2		
	C404B.2	2		2										2		
	C404B.3	2												2		
	C404B.4		3											2		
	C404B.5		2											2		
	Avg.	2	2.5	2										2		



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Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (VII Sem.)	DEEP LEARNING					
	Course Code: 20PEC4112C (Professional Elective –5)		3	0	0	3
Pre-requisites: Understanding probability, statistics, linear algebra, and calculus is essential for grasping the underlying principles of deep learning algorithms.						
Course Objectives:						
1. To discuss Feed forward networks and their training issues 2. To distinguish different types of ANN architectures 3. To design Feed Forward Neural Network architecture for research problems 4. To apply deep learning techniques to practical problems 5. To evaluate model performance and interpret results						
Course Outcomes: At the end of the course, the student will be able to						
C404C.1	:	Discuss feed forward networks and their training issues				
C404C.2	:	Distinguish different types of ANN architectures				
C404C.3	:	Design Feed Forward Neural Network architecture for research problems				
C404C.4	:	Apply deep learning techniques to practical problems				
C404C.5	:	Evaluate model performance and interpret results				
UNIT – I			10	hrs		
Linear Algebra: Scalars, Vectors, Matrices and Tensors, Multiplying Matrices and Vectors, Identity and Inverse Matrices. Calculus: Derivatives and Differentiation, Partial Derivatives, Gradients. Probability Theory: Basic Probability Theory, Dealing with Multiple Random Variables, Expectation and Variance.						
UNIT – II			10	hrs		
Introduction to Neural Network: Model of Artificial Neuron, Learning rules and various activation functions. Single layer Feed-forward networks. Multi-layer Feed-forward networks. Recurrent Networks.						
UNIT – III			10	hrs		
Backpropagation Networks: Architecture of Backpropagation (BP) Networks, Back-propagation Learning, Variation of Standard Backpropagation algorithms.						
UNIT – IV			10	hrs		
Introduction to Deep Neural Networks: Training Deep Neural Networks using Back Propagation-Setup and initialization issues, Gradient-Descent Strategies, vanishing and exploding Gradient problems, regularizations, dropouts.						
UNIT – V			10	hrs		
Basic Structure of Convolutional Network Convolutions for Images, Padding and Stride, Multiple Input and Multiple Output Channels, Pooling, FCNN. Case study: Image classification using CNN.						
Text Books						
1	S. Rajasekaran and G.A. Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI Learning Pvt. Ltd., 2003, ISBN:978-81-203-2186-1.					
2	Aston Zhang, Zachary C. Lipton, Mu Li and Alexander J. Smola, Dive into Deep Learning, Amazon Science, 2021.					

	Reference Books																
	1	Jacek M. Zurada, Introduction to artificial neural systems, West Publishing Co., 1992, ISBN: 0-314-93391-3.															
	2	Goodfellow I., Bengio Y., and Courville A., Deep Learning, MIT Press, 2016, ISBN: 978-0262035613.															
	3	Bishop C.M., Pattern Recognition and Machine Learning, Springer, 2006, ISBN :978-0-387-31073-2.															
CO-PO/PSO Mapping Matrix																	
		CO	PO 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O1	PS O2	PSO 3
		C404C.1	2	3											2	2	
		C404C.2	2	2											2	2	
		C404C.3	2	3											2	2	
		C404C.4	2	2											2	2	
		C404C.5	2	2											2	2	
		Avg.	2	2.4											2	2	



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)		WIRELESS SENSOR NETWORKS				
		Course Code: 20PEC4112D (Professional Elective –5)	3	0	0	3
Pre-requisites: Basic knowledge of Data Communication Networks. Single Node Architecture Hardware Components Network Characteristics unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks Types of wireless sensor networks.						
Course Objectives:						
1. To describe overview of wireless sensor networks and enabling technologies for wireless sensor networks						
2. To apply design principles of WSN architectures and operating systems for simulating environment situations.						
3. To apply various concepts for assignment of MAC addresses.						
4. To identify the appropriate infrastructure, topology, joint routing and information aggregation for wireless sensor networks						
5. To analyse the sensor network platform and tools state-centric programming.						
Course Outcomes: At the end of the course, the student will be able to						
C404D.1	:	Describe the overview of wireless sensor networks and enabling technologies for wireless sensor networks				
C404D.2	:	Apply the design principles of WSN architectures and operating systems for simulating environment situations.				
C404D.3	:	Apply various concepts for assignment of MAC addresses.				
C404D.4	:	Identify the appropriate infrastructure, topology, joint routing and information aggregation for wireless sensor networks.				
C404D.5	:	Analyse the sensor network platform and tools state-centric programming.				
UNIT – I					10	hrs
Overview of Wireless Sensor Networks Single-Node Architecture - Hardware Components- Network Characteristics- unique constraints and challenges, Enabling Technologies for Wireless Sensor Networks - Types of wireless sensor networks.						
UNIT – II					10	hrs
Architectures Network Architecture - Sensor Networks – Scenarios-Design Principle, Physical Layer and Transceiver Design, Considerations, Optimization Goals and Figures of Merit, Gateway Concepts, Operating Systems and Execution Environments- Introduction to Tiny OS and nes C- Internet to WSN Communication.						
UNIT – III					10	hrs
Networking Sensors 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					10	hrs
Infrastructure Establishment Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor asking and Control.						
UNIT – V					10	hrs
Sensor Network Platforms and Tools Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node						

level Simulators, State-centric programming.	
Text Books	
1	Holger Karl & Andreas Willing, 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.
3	Waltenegus Dargie, Christian Poellabauer, Fundamentals of Wireless Sensor Networks, Theory and Practice, John Wiley & Sons Publications, 2011.

Reference Books	
1	Kazem Sohra, Daniel Minoli & Taieb Znati, Wireless Sensor Networks, Technology, Protocols, and Applications, John Wiley, 2007.
2	Anna Hac, Wireless Sensor Network Designs, John Wiley, 2003.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C404D.1	2	2											2	2	
C404D.2	2	3											2	2	
C404D.3	2	2											2	2	
C404D.4	2	3											2	2	
C404D.5	3	2											2	2	
Avg.	2.2	2.4											2	2	



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)	DIGITAL IMAGE PROCESSING					
	Course Code:20PEC4112E					3 0 0 3

Pre-requisites:..Signal & Systems

Course Objectives:

1. To Understand the image formation and fundamentals
2. To Apply the various image transformation techniques
3. To Analyze the image degradation and restoration
4. To Apply the Image Segmentation, Morphology on images
5. To Analyze the Color Image processing techniques

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

C404.1	:	Understand the image formation and fundamentals
C404.2	:	Apply the various image transformation techniques
C404.3	:	Analyze the image degradation and restoration
C404.4	:	Apply the Image Segmentation, Morphology on images

C404.5	:	Analyze the Color Image processing technique														
UNIT – I		Fundamentals & Transforms of Digital Images												12	hrs	
		Introduction to Image Processing, Applications of 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, Discrete Fourier transform (DFT) of one variable, Extension to functions of two variables, some properties of the 2-D Discrete Fourier transform, Walsh Transform, Hadamard transform, Haar Transform, Slant transform, Discrete Cosine transform, KL Transform,														
UNIT – II		Intensity Transformations and Spatial Filtering												10	hrs	
		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												10	hrs	
		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, Degradation, Estimating the degradation function, Inverse filtering, Minimum mean square error (Wiener) filtering, constrained least squares filtering ,geometric mean filter.														
UNIT – IV		Image compression												10	hrs	
		Fundamentals, Basic compression methods: Huffman coding, Arithmetic coding, Image pyramids, sub-band coding, Image segmentation: Fundamentals, point, line, edge detection, thresholding, region –based segmentation. Morphological Image Processing: Preliminaries, Erosion and dilation, opening and closing														
UNIT – V		Color image processing												8	hrs	
		color fundamentals, color models, pseudo color image processing, basics of full color image processing, color transformations, smoothing and sharpening. Image segmentation based on color, noise in color images, color image compression														
Text Books																
1	1. R. C. Gonzalez and R. E. Woods, Digital Image Processing, 3rd edition, Prentice Hall, 2008.															
2	2. Jayaraman, S. Esakkirajan, and T. Veerakumar,” Digital Image Processing”, Tata McGraw-Hill Education, 2011.															
Reference Books:																
1	1. Anil K.Jain, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 9 thEdition, Indian Reprint, 2002.															
2	2. B.Chanda, D.Dutta Majumder, “Digital Image Processing and Analysis”, PHI, 2009.															
3	e-RESOURCES: https://nptel.ac.in/courses/117105079															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	P O 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O 3
	C404E.1	3	2	3										2	2	
	C404E.2	3	2	3										3	2	
	C404E.3	2	2	3										2	3	
	C404E.4	2	2	3										2	3	
	C404E.5	3	3											3	3	
	Avg.	2. 6	2. 2	3										2.4	2.6	



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech. (VII Sem.)		DIGITAL INTEGRATED CIRCUITS & APPLICATIONS				
		Course Code: 20OEC4107A (Open Elective-3 for other than ECE)			3	0 0 3
Pre-requisites: Digital Logic Design						
Course Objectives:						
1. Introduction of digital logic families and interfacing concepts for digital design						
2. VHDL fundamental to modeling the digital system design blocks.						
3. VHDL compilers, simulators and synthesis tool to verify digital systems in a technology-independent fashion.						
4. Design and implementation of combinational and sequential digital logic circuits						
Course Outcomes: At the end of the course, the student will be able to						
C405A.1	:	Aware the structure of commercially available digital integrated circuit families				
C405A.2	:	Learn the IEEE Standard 1076 Hardware Description Language (VHDL).				
C405A.3	:	Model complex digital systems at several levels of abstractions, behavioral, structural, simulation, synthesis.				
C405A.4	:	Analyze and design basic digital circuits with combinatorial using VHDL.				
C405A.5	:	Analyze and design basic digital circuits with sequential logic circuits using VHDL.				
UNIT – I					1 1	hrs
Digital Logic Families and Interfacing: Introduction to logic families, CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Bi-polar logic, transistor-transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing.						
UNIT – II					9	hrs
Introduction to VHDL: Design flow, program structure, levels of abstraction, Elements of VHDL: Data types, data objects, operators and identifiers. Packages, Libraries and Bindings, Subprograms. VHDL Programming using structural and data flow modeling.						
UNIT – III					1 1	hrs
Behavioral Modeling: Process statement, variable assignment statement, signal assignment statement, wait statement, if-statement, case statement, null statement, loop statement, exit statement, next statement, assertion statement, more on signal assignment statement, Inertial Delay Model, Transport Delay Model.						
UNIT – IV					1 0	hrs
Combinational Logic Design: Binary Adder-Subtractor, Ripple Adder, Look Ahead Carry Generator, ALU, Decoders, encoders, multiplexers and de-multiplexers, parity circuits, comparators, Barrel Shifter, Simple Floating Point Encoder, Dual Priority Encoder, Design considerations of the above combinational logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.						
UNIT – V					9	hrs
Sequential Logic Design: SSI Latches and flip flops, Ring Counter, Johnson Counter, Design of Modulus N Synchronous Counters, Shift Registers, Universal Shift Registers, Design considerations of the above sequential logic circuits with relevant Digital ICs, modeling of above ICs using VHDL.						
Text Books						
1	Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3rd Ed., 2005.					
2	VHDL Primer – J. Bhasker, Pearson Education/ PHI, 3 rd Edition.					

	Reference Books															
1	Fundamentals of Digital Logic with VHDL Design- Stephen Brown, Zvonko Vranesic, McGrawHill, 3 rd Edition.															
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C405A.1	2	2	2												
	C405A.2	2	2	2												
	C405A.3	2	2	2												
	C405A.4	2	2	2												
	C405A.5	2	2	2												
	Avg.	2	2	2												



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KHIT/ECE/UG/File No.3_1a

Date:

Academic Year: 2020-21

Regulations: R20

			L	T	P	Cr.
B.Tech. (VII Sem.)	EMBEDDEDSYSTEMS					
	Course Code: 20OEC4107B (Open Elective-3 for other than ECE)		3	0	0	3
Pre-requisites: Microprocessors and Microcontrollers						
Course Objectives:						
1. To study the basic concepts of an embedded system 2. To learn Different steps involved in the design and development of firmware for embedded systems 3. To explain Internals of Real-Time operating system and the fundamentals of RTOS based embedded firmware design 4. To learn fundamental issues in hardware software co-design 5. To understand Embedded system implementation and testing tools						
Course Outcomes: At the end of the course, the student will be able to						
C405B.1	:	Aware the basic concepts of an embedded system.				
C405B.2	:	Learn hardware components required for an embedded system and the design approach of an embedded hardware.				
C405B.3	:	Explain various embedded firmware design approaches on embedded environment..				
C405B.4	:	Aware the Realtime operating system.				
C405B.5	:	Aware how to integrate hardware and firmware of an embedded system using real time operating system.				
UNIT – I			11	hrs		
Introduction: Embedded System-Definition, classification of embedded systems, major application areas of embedded systems, purpose of embedded system, the typical embedded system. Core of the embedded system, types of core in embedded system Types of Memories in embedded system, Sensors and Actuators, communication interfacing, other devices.						
UNIT – II			9	hrs		
Embedded Hardware Design: Analog and digital electronic components, I/O port types and examples, Serial communication device ports with examples. Parallel device ports with examples, Wireless devices, Timer and counting devices, Watch dog timer, Real time clock.						
UNIT – III			11	hrs		
Embedded Firmware Design: Embedded Firmware design approaches, Embedded Firmware development languages, interrupts, types of interrupts with examples. ISR concept, Interrupt sources, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.						
UNIT – IV			10	hrs		
Real Time Operating System: Operating system basics, Types of operating systems, Tasks, Process and Threads. Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling, Task communication, Task synchronization.						
UNIT – V			9	hrs		
Embedded System Implementation and Testing: The integrated development environment, Types of files generated on cross-compilation, De-assembler. Simulators, Emulators, Debugging, Target hardware debugging, Embedded Software development process and tools, Compilers and Linkers, debugging tools.						
Text Books						
1	Embedded Systems Architecture, Tammy Noergaard, Elsevier Publications, 2013.					
2	Embedded Systems, Shibu.K.V-Tata McGraw Hill Education Private Limited, 2013.					

	Reference Books															
1	EmbeddedSystemDesign, FrankVahid and TonyGivargis, JohnWileyPublications, 2013.															
2	EmbeddedSystems, LylaB .Das, PearsonPublications, 2013.															
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P O 10	P O 11	P O 12	PS O1	PS O2	PS O3
	C405B.1	3	2	3												
	C405B.2	3	2													
	C405B.3	3														
	C405B.4	2	2	3												
	C405B.5	3	2	3												
	Avg.	2.8	2	3												



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)		INFORMATION THEORY & CODING				
		Course Code: 20OEC4107C (Open Elective-3 for other than ECE)	3	0	0	3
Pre-requisites:						
Course Objectives:						
1. To acquire knowledge on concept of information.						
2. To understand the limits of Error free representation of Information Signals.						
3. To understand the concept of various theorems proposed by Shanon for efficient data compression and reliable transmission.						
4. To give idea on different coding techniques.						
5. To design Optimal Decoder for various Coding Schemes						
Course Outcomes: At the end of the course, the student will be able to						
C405C.1	:	Acquire knowledge on concept of information.				
C405C.2	:	Aware the limits of Error free representation of Information Signals.				
C405C.3	:	Aware the concept of various theorems proposed by Shan on for efficient data compression and reliable transmission.				
C405C.4	:	Give idea on different coding techniques.				
C405C.4	:	Design Optimal Decoder for various Coding Schemes.				
UNIT – I			11			hrs
Introduction to Information Theory: Concept of information, units, entropy, marginal, conditional and joint entropies, relation among entropies, mutual information, information rate. Source coding : Instantaneous codes, construction of instantaneous codes, Kraft’s inequality, coding efficiency and redundancy, Noiseless coding theorem, construction of basic source codes, Shannon-Fano Algorithm, Huffman coding, Channel capacity – redundancy and efficiency of a channel, binary symmetric channel (BSC)						
UNIT – II			9			hrs
Continuous Sources and Channels: Differential Entropy, Mutual information, Waveform channels, Gaussian channels, Shannon – Hartley theorem, bandwidth, SNR trade off, capacity of a channel of infinite bandwidth, Shannon’s limit.						
UNIT – III			11			hrs
Perfect codes, Hamming codes, encoding and decoding Cyclic codes, polynomial and matrix descriptions, generation of cyclic codes, decoding of cyclic codes BCH codes, Construction and decoding, Reed Solomon codes.						
UNIT – IV			10			hrs
Introduction to rings, fields, and Galois fields. Codes for error detection and correction – parity check coding – linear block codes – error detecting and correcting capabilities – generator and parity check matrices–Standard array and syndrome encoding.						
UNIT – V			9			hrs
Convolution Codes – encoding – time and frequency domain approaches, State Tree & Trellis diagrams–transfer function and minimum free distance–Maximum likelihood decoding of convolutional codes – The Viterbi Algorithm. Sequential decoding.						
Text Books						
1	P S Sathya Narayana, Concepts of Information Theory & Coding, Dynaram Publications, 2005.					
2	Simon Haykin, Digital Communication Systems, Wiley India, 2013. Semester VII, Course Hand-out					

	Department of EC, RSET 11.															
3	Bose, Information theory coding and cryptography, 3/e, McGraw Hill Education India, 2016.															
	Reference Books															
1	Kelbert & Suhov, Information theory and coding by examples, Cambridge University Press, 2013															
2	J S Chitode, Information Theory and Coding, Technical Publications, Pune, 2009.															
	CO	P O 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O1	PS O2	PSO 3
	C405C.1	2	2	2												
	C405C.2	2	2	2												
	C405C.3	2	2	2												
	C405C.4	2	2	2												
	C405C.5	2		2												
	Avg.	2	2	2												



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VI Sem.)	ADAPTIVE SIGNAL PROCESSING					
	Course Code: 20OEC4107D (Open Elective-3 for other than ECE)		3	0	0	3
Pre-requisites: Signal processing						
Course Objectives:						
1. To focus on problems, algorithms and solutions for processing signals. 2. To develop systems on recursive, model based estimation methods taking the advantage of the statistical properties of the received signals. 3. To analyze the performance of adaptive filters and considers the application of the theory to a variety of practical problems such as beam forming and echo cancelation signal. 4. To understand innovation process, Kalman filter theory and estimation of state using the innovation process, concept of Kalman Gain and Filtering.						
Course Outcomes: At the end of the course, the student will be able to						
C405D.1	:	Design optimal minimum mean square estimators and in particular linear estimators.				
C405D.2	:	Compute expected performance and verify it.				
C405D.3	:	Design Wiener Filters (FIR, non-casual, causal) and evaluate their performance.				
C405D.4	:	Aware innovation process, Kalman filter theory and estimation of state using the Innovation Process, concept of Kalman Gain and Filtering.				
C405D.5	:	Design LMS, RLS and Kalman filter to given applications.				
UNIT – I			11			hrs
Introduction to Adaptive Systems Adaptive Systems: Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner–Description, Weight Vectors, Desired Response Performance function–Gradient & Mean Square Error.						
UNIT – II			9			hrs
Development of Adaptive Filter Theory & Searching the Performance Surface: Introduction to Filtering–Smoothing and Prediction–Linear Optimum Filtering, Problem statement, Principle of Orthogonally–Minimum Mean Square Error, Wiener-Hopf equations, Error Performance –Minimum Mean Square Error, Estimation of phase shift between two narrow band signals using Orthogonal Decomposer						
UNIT – III			11			hrs
Steepest Descent Algorithms: Searching the performance surface– Methods & Ideas of Gradient Search methods– Gradient Searching Algorithm & its Solution – Stability & Rate of convergence – Learning Curves Gradient Search by Newton’s Method, Method of Steepest Descent, Comparison of Learning Curves						
UNIT – IV			10			hrs
LMS Algorithm & Applications: Overview–LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms–LMS Gradient & Stochastic algorithms – Convergence of LMS algorithm. Applications: Adaptive BFSK, BPSK, ASK demodulators and delay estimation. Adaptive Beam forming, concept of IQ channels, Adaptive filter implementation of Hilbert Transform. Introduction to MUSIC						
UNIT – V			9			hrs
State Estimators: Introduction to RLS Algorithm, Statement of Kalman filtering problem, The Innovation Process, Estimation of State using the Innovation Process- Expression of Kalman Gain, Filtering Example, estimation of state from observations of noisy observed narrow band signals. Target tracking using DOA.						
Text Books						
1	Bernard Widrow, Samuel D. Stearns, Adaptive Signal Processing, 2005, PE.					
2	Simon Haykin, Adaptive Filter Theory, 4 th Edition, 2002, PE Asia.					

	Reference Books															
1	Kaluri V. Rangarao, Ranjan K. Mallik, “Digital Signal Processing: A Practitioner’s Approach,ISBN:978-0-470-01769-2, 210 Pages, November2006, JohnWiley(UK)															
2	Sophocles.J.Orfamadis,Optimumsignalprocessing:Anintroduction,2 nd Edition,1988,McGraw-Hill,New York															
3	S. Thomas Alexander, Adaptive Signal ProcessingTheory and Applications, 1986, Springer –Verlag															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	P O 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PS O 3
	C405D.1	2	2	2												
	C405D.2	2	2	2												
	C405D.3	2	2	2												
	C405D.4	2	2	2												
	C405D.5	2	2	2												
	Avg.	2	2	2												



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.		
B.Tech. (VII Sem.)		LINEARINTEGRATEDCIRCUITS&APPLICATIONS						
		Course Code:20OEC4108A (Open Elective-4 for other than ECE)			3	0	0	3
Pre-requisites: Basic Circuit Theory								
Course Objectives:								
1.To understandfundamentals ofOp-Amps								
2.To understandapplications ofOp-Amps								
3.To designactive filters								
4.To understandtimers andPLL concepts								
5.To understanddifferent converters								
Course Outcomes: At the end of the course, the student will be able to								
C406A.1		:	Awarefundamentals ofOp-Amps					
C406A.2		:	Aware applications of Op-Amps					
C406A.3		:	Design active filters					
C406A.4		:	Awaretimers andPLL concepts					
C406A.5		:	Awaredifferent converters					
UNIT – I							10	hrs
CharacteristicsofOp-AMPs: Integratedcircuits-Types,Classification,PackageTypesandTemperatureranges,Powersupplies,Op-Amp Block Diagram, ideal and practical Op-amp Specifications, DC and AC characteristics, 741 op-amp&itsfeatures,Op-Ampparameters&Measurement,Input&OutputOffsetvoltages &currents,slewrate, CMRR, PSRR,drift, FrequencyCompensation techniques								
UNIT – II							10	hrs
LinearandNon-LinearApplicationsofOP-AMPs: InvertingandNon-invertingamplifier,Adder,Subtractor,Integratoranddifferentiator,Instrumentation amplifier, V to I, I to V converters. Non- Linear function generation, Comparators,Multivibrators, Triangular and Square wavegenerators,Log and Antilog Amplifiers, Precisionrectifiers.								
UNIT – III							10	hrs
ActiveFilters: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass,Bandrejectand all pass filters, Sample&Hold circuits.								
UNIT – IV							10	hrs
Timers&PhaseLockedLoops: Introductionto555timer,functionaldiagram,MonostableandAstableoperationsandapplications,PLL-introduction,blockschematic,principlesanddescriptionofindividualblocks,565PLL,ApplicationsofPLLandVCO(566).								
UNIT – V							10	hrs
DigitaltoAnalogandAnalogtoDigitalConverters: Introduction, DAC and ADC Specifications, basic DAC techniques, weighted resistor DAC, R-2Rladder DAC, inverted R-2R DAC. Different types of ADCs – parallel Comparator type ADC, countertypeADC, successiveapproximation ADC.								
Text Books								
1		Linear IntegratedCircuits–D.RoyChoudhury,NewAgeInternational(p)Ltd,2 nd Edition, 2003.						
2		Op-Amps&LinearICs-RamakanthA.Gayakwad,PHI,1987						
3		OperationalAmplifiers–C.G.Clayton,Butterworth&CompanyPubl. Ltd./Elsevier,1971						
Reference Books								
1		OperationalAmplifiers&LinearIntegratedCircuits–SanjaySharma, SKKataria&Sons;2 nd Edition,2010						
2		Design with Operational Amplifiers & Analog Integrated Circuits – Sergio Franco, Mc Graw						

		Hill,1988.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
	C406A.1	2	3													
	C406A.2	3	2													
	C406A.3	2	3													
	C406A.4	2	3													
	C406A.5	2	3													
	Avg.	2.2	2.8													



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)	FUNDAMENTALS OF FPGA					
	Course Code: 20OEC4108B (Open Elective-4 for other than ECE)		3	0	0	3
Pre-requisites: Knowledge of basic digital design techniques. Some understanding of VHDL or Verilog.						
Course Objectives:						
1. To design simple digital systems with programmable logic devices 2. . To analyze the architecture of FPGA 3. To analyze the design considerations of FPGA 4. To design simple combinational and sequential circuits using FPGA 5. To experiment with different types of FPGA boards						
Course Outcomes: At the end of the course, the student will be able to						
C406B. 1	:	Design simple digital systems with programmable logic devices				
C406B. 2	:	Analyze the architecture of FPGA				
C406B. 3	:	Analyze the design considerations of FPGA				
C406B. 4	:	Design simple combinational and sequential circuits using FPGA				
C406B. 5	:	Experiment with different types of FPGA boards				
UNIT – I			10		hrs	
Introduction: Digital system design options and tradeoffs, Design methodology and technology overview, High Level System Architecture and Specification: Behavioral modeling and simulation, Hardware description languages (emphasis on Verilog), combinational and sequential design, state machine design, synthesis issues, test benches.						
UNIT – II			10		hrs	
Programmable Logic Devices: ROM, PLA, PAL, CPLD, FPGA Features, Limitations, Architectures and Programming. Implementation of MSI circuits using Programmable logic Devices.						
UNIT – III			10		hrs	
FPGA Architecture: FPGA Architectural options, granularity of function and wiring resources, coarse vs fine grained, vendor specific issues (emphasis on Xilinx and Altera), Logic block architecture: FPGA logic cells, timing models, power dissipation I/O block architecture: Input and Output cell characteristics, clock input, Timing, Power dissipation.						
UNIT – IV			10		hrs	
Placement and Routing: Programmable interconnect- Partitioning and Placement, Routing resources, delays; Applications –Embedded system design using FPGAs, DSP using FPGAs.						
UNIT – V			10		hrs	
Commercial FPGAs: Xilinx, Altera, Actel (Different series description only), Case study Xilinx Virtex: implementation of simple combinational and sequential circuits.						
Text Books						
1	FPGA-Based System Design by Wolf					

	Reference Books															
1	Fundamentals of Logic Design by Charles H.RothJr,Jaico Publishers,2006															
CO-PO/PSO Mapping Matrix																
	CO	P O 1	PO 2	P O 3	P O 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PSO 1	PSO 2	PSO3
	C406B.1	3														
	C406B.2	3	3	3												
	C406B.3	2	3	3												
	C406B.4	2	3	3												
	C406B.5	2	3	2												
	Avg.	2. 4	3	2. 8												



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)	DATA COMMUNICATION SYSTEMS					
	Course Code:20OEC4108C (Open Elective-4 for other than ECE)		3	0	0	3
Pre-requisites: Communication Systems Basics						
Course Objectives:						
1. To discuss the nature, uses and implications of internet technology. 2. To understand various types of transmission media, network devices; and parameters of evaluation of performance for each media and device 3. To understand the basic concepts of data communication 4. To understand the basic methods of wave propagation 5. To understand the basic concepts of wireless communications						
Course Outcomes: At the end of the course, the student will be able to						
C406C.1	:	Aware network communication using the layered concept, Open System Interconnect (OSI) and the Internet Model.				
C406C.2	:	Explain various types of transmission media, network devices; and parameters of evaluation of performance for each media and device.				
C406C.3	:	Explain different types of digital pulse modulation techniques.				
C406C.4	:	Explain the concept of wave propagation.				
C406C.5	:	Explain different telephone instruments.				
UNIT – I			10			hrs
Standards Organizations for Data Communications, Layered Network Architecture, Open Systems Interconnection, Data Communications Circuits, Serial and parallel Data Transmission, Data communications Circuit Arrangements, Data communications Networks, Alternate Protocol Suites. Signals, Noise, Modulation, and Demodulation: Signal Analysis, Electrical Noise and Signal-to-Noise Ratio, Analog Modulation Systems, Information Capacity, Bits, Bit Rate, Baud, and <i>M</i> -ary Encoding, Digital Modulation.						
UNIT – II			10			hrs
Metallic Cable Transmission Media: Metallic Transmission Lines, Transverse Electromagnetic Waves, Characteristics of Electromagnetic Waves, Transmission Line Classifications, Metallic Transmission Line Types, Metallic Transmission Line Equivalent Circuit, Wave Propagation on Metallic Transmission Lines, Metallic Transmission Line Losses. Optical Fiber Transmission Media: Advantages of Optical Fiber Cables, Disadvantages of Optical Fiber Cables, Electromagnetic spectrum, Optical Fiber Communications System Block Diagram, Optical Fiber construction, The Physics of Light, Velocity of Propagation, Propagation of Light Through an Optical fiber Cable, Optical Fiber Modes and Classifications, Optical Fiber Comparison, Losses in Optical Fiber Cables, Light sources, Light Detectors, Lasers.						
UNIT – III			10			hrs
Digital Transmission: Pulse Modulation, Pulse code Modulation, Dynamic Range, Signal Voltage –to-Quantization Noise Voltage Ration, Linear Versus Nonlinear PCM Codes, Companding, PCM Line Speed, Delta Modulation PCM and Differential PCM. Multiplexing and T Carriers: Time Division Multiplexing, T1 Digital Carrier System, North American Digital Multiplexing Hierarchy, Digital Line Encoding, T Carrier systems, European Time- Division						

Multiplexing, Statistical Time – Division Multiplexing, Frame Synchronization, Frequency Division Multiplexing, Wavelength- Division Multiplexing, Synchronous Optical Network.																
UNIT – IV															10	hrs
Wireless Communications Systems: Electromagnetic Polarization, Rays and Wave fronts, Electromagnetic Radiation, Spherical Wave front and the Inverse Square Law, wave Attenuation and Absorption, Optical Properties of Radio Waves, Terrestrial Propagation of Electromagnetic Waves, Skip Distance, Free-Space Path Loss, Microwave Communications Systems, Satellite Communications Systems.																
UNIT – V															10	hrs
Telephone Instruments and Signals: The Subscriber Loop, Standard Telephone Set, Basic Telephone Call Procedures, Call Progress Tones and Signals, Cordless Telephones, Caller ID, Electronic Telephones, Paging systems. Telephone Circuit: The Local Subscriber Loop, Telephone Message- Channel Noise and Noise Weighting, Units of Powers Measurement, Transmission Parameters and Private-Line Circuits, Voice-Frequency Circuit Arrangements, Crosstalk.																
Text Books																
1	Introduction to Data Communications and Networking, Wayne Tomasi, Pearson Education.															
Reference Books																
1	Data Communications and Networking, Behrouz A Forouzan, Fourth Edition.															
2	Computer Communications and Networking Technologies, Gallow, Second Edition, Thomson															
3	Computer Networking and Internet, Fred Halsll, Lingana Gouda Kulkarni, Fifth Edition, Pearson Education.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	P O 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	P S O 1	P S O 2	PSO 3
	C406C.1	2	3													
	C406C.2	3	2													
	C406C.3	2	3													
	C406C.4	2	3													
	C406C.5	2	3													
	Avg.	2.2	2.8													



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)	BIO-MEDICALSIGNALPROCESSING					
	Course Code: 20PEC4111E (Professional Elective-4)		3	0	0	3
Pre-requisites: Signals and systems and stochastic process						
Course Objectives:						
1.To understand the types of Biomedical Signals						
2.To understand the Biomedical Sensors						
3.To analyze the Biomedical Signals						
4.To analyze the non-stationary Biomedical Signals						
5.To understand the Application of Biomedical equipment						
Course Outcomes: At the end of the course, the student will be able to						
C406D.1	:	Aware the types of Biomedical Signals				

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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech.(VII Sem.)	SUMMER INTERNSHIP-1I					
	Course Code:20PROJ4101		0	0	0	3

Course Objectives:

1. Gain knowledge through field practice and experiential learning (PO5)
2. To Apply knowledge of engineering techniques, tools and resources on the project appropriate to the internship program (PO1, PO2)
3. To Understand the implication of solutions provided on society and environment (PO 6 and 7)
4. Learning of professional ethics and develop ability to work effectively as a member and leader in teams. (PO 8 and 9)
5. Communicate effectively (oral and written communication, report writing, presentation skills). (PO 10)

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

C310.1	:	Gain knowledge through field practice and experiential learning (PO5)
C310.2	:	Apply knowledge of engineering techniques, tools and resources on the project appropriate to the internship program (PO1, PO2)
C310.3	:	Understand the implication of solutions provided on society and environment (PO 6 and 7)
C310.4	:	Learning of professional ethics and develop ability to work effectively as a member and leader in teams. (PO 8 and 9)
C310.5	:	Communicate effectively (oral and written communication, report writing, presentation skills). (PO 10)
C310.6	:	Identify and address their own educational needs in a changing world in ways sufficient to maintain their competence. (PO 12)

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C310.1					3										2
C310.2	3	2													
C310.3						3	3								
C310.4								3	3						3
C310.5										3					
C310.6												3			
Avg.	3	2			3	3	3	3	3	3		3			2.5



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Department of Electronics & Communication Engineering

			L	T	P	Cr.
B.Tech. (VII Sem.)		SKILL ORIENTED COURSE-V IOT FUNDAMENTALS: BIG DATA AND ANALYTICS				
		Course Code: 20SOC4102		1	0	2
Pre-requisites: Basics of IoT						
Course Objectives:						
1. To optimize business decisions and create competitive advantage with Big Data analytics						
2. To learn to analyze the big data using intelligent techniques						
3. To introduce programming tools PIG & HIVE in Hadoop ecosystem						
Course Outcomes: At the end of the course, the student will be able to						
C408.1	:	Illustrate big data challenges in different domains including social media, transportation, finance and medicine				
C408.2	:	Use various techniques for mining data stream				
C408.3	:	Design and develop Hadoop				
C408.4	:	Identify the characteristics of datasets and compare the trivial data and big data for various applications				
C408.5	:	Explore the various search methods and visualization techniques				
UNIT – I					1 0	hrs
Nature of Data, Analytic Processes and Tools, Analysis vs Reporting. Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking.						
UNIT – II					1 1	hrs
Introduction to Big data: Introduction to Big Data Platforms, Challenges of Conventional Systems, Intelligent data analysis, Stream Processing: Mining data streams: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in a Stream, Filtering Streams, Counting.						
UNIT – III					9	hrs
Introduction to Big Data Storage Platforms for Large Scale Data Storage, Introduction to data analytics and Python fundamentals, Introduction to probability, Sampling and sampling distributions, Hypothesis testing, Two sample testing and introduction to ANOVA.						
UNIT – IV					1 0	hrs
Introduction to Big Data Applications (Machine Learning), Introduction of Big data Machine learning with Spark, Frameworks and Applications: Frameworks: Applications on Big Data Using Pig and Hive, Data processing operators in Pig, Hive services, Hive QL, Querying Data in Hive, fundamentals of HBase and Zoo Keeper.						
UNIT – V					1 0	hrs
Predictive Analytics and Visualizations: Predictive Analytics, Simple linear regression, Multiple linear regression, Interpretation of regression coefficients, Visualizations, Visual data analysis techniques, interaction techniques, Systems and application.						
Text Books						
1	Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley, 2014.					
Reference Books						

	1	Dirk Deroos et al., Hadoop for Dummies, Dreamtech Press, 2014.														
	2	Chuck Lam, Hadoop in Action, December, 2010.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO3
	C408.1	2														
	C408.2	2		3												
	C408.3												2			
	C408.4												3			
	C408.5					3				3	2					
	Avg.	2	-	3	-	3	-	-	-	3	2	-	2.5			



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Department of Electronics & Communication Engineering

		L	T	P	Cr.
B.Tech. (VIII Sem.)	Project Work, Seminar and Internship in Industry				
	Course Code: 20PROJ4201	0	0	0	8

At the completion of the above course, the learner will be able to

- C409.1 Gain knowledge through field practice and experiential learning (PO5),
- C409.2 Apply knowledge in application of engineering techniques, tools and resources on the project appropriate to the internship program (PO1, 2)
- C409.3 Apply appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions. (PO 3, 4)
- C409.4 Apply professional engineering knowledge to assess societal, health, safety, legal issues and Economical feasibility. Identify the importance and methods of environment protection & sustainability. (PO 6,7 &11)
- C409.5 Learning of professional ethics and develop ability to work effectively as a member and leader in teams. (PO 8 and 9)

C409.6	Communicate effectively (oral and written communication, report writing, presentation skills). (PO 10)														
C409.6	Identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence. (PO 12)														
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C409.1					3								3		
C409.2	3	3												3	
C409.3			3	3											3
C409.4						3	3				3				
C409.5								3	3						
C409.6										3					
C409.7												3			
Avg.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3

B.Tech Honors in Electronics and Communication Engineering HONORS
COURSES OFFERED

TRACK-1: IOT

TRACK-2: SIGNAL PROCESSING

TRACK-3: VLSI DESIGN

TRACK-4: COMMUNICATIONS

B.Tech Honors in Electronics and Communication Engineering (TRACK-1: IOT)							
S.NO.	COURSE NAME	L	T	P	CREDITS	PRE-REQ	OFFERED TO
1	Introduction to IoT (2-2)	3	0	0	3		ECE
2	IoT Lab (2-2)	0	2	1	1		
3	Introduction to Industry 4.0 and Industrial IoT (3-1)	3	0	0	3		
4	Advanced IoT Lab (3-1)	0	2	1	1		
5	Cybersecurity & Privacy (3-2)	3	0	0	3		
6	Cyber Security Lab (3-2)	0	2	1	1		
7	Mobile Application Development for IoT (3-2)	3	0	0	3		
8	Mobile Application Development for IoT Lab (3-2)	0	2	1	1		
9	Applications of IoT in Robotics (4-1)	3	0	0	3		
10	IoT in Robotics Lab (4-1)	0	2	1	1		
Total		15	0	10	20		

B.Tech Honors in Electronics and Communication Engineering (TRACK-2: SIGNAL PROCESSING)							
S.NO.	COURSE NAME	L	T	P	CREDITS	PRE-REQ	OFFERED TO
1	Signal Processing Techniques (2-2)	3	0	0	3		ECE
2	Signal Processing Techniques Lab (2-2)	0	0	2	1		
3	Speech Processing (3-1)	3	0	0	3		
4	Speech Processing Lab (3-1)	0	0	2	1		
5	Advanced Digital Signal Processing (3-2)	3	0	0	3		
6	Advanced Digital Signal Processing Lab (3-2)	0	0	2	1		
7	Video Signal Processing (3-2)	3	0	0	3		
8	Video Signal Processing Lab (3-2)	0	0	2	1		
9	DSPP Processors (4-1)	3	0	0	3		
10	DSPP Processors Lab (4-1)	0	0	2	1		
Total		15	0	10	20		

DEGREE IN HONOR DISCIPLINE B.Tech Honors in Electronics and Communication Engineering (T RACK-3: VLSI DESIGN)							
S.NO.	COURSE NAME	L	T	P	CREDITS	PRE-REQ	OFFERED TO
1	CMOS Analog IC Design (2-2)	3	0	0	3		ECE
2	CMOS Analog IC Design Lab (2-2)	0	0	2	1		
3	CMOS Digital IC design (3-1)	3	0	0	3		
4	CMOS Digital IC design Lab (3-1)	0	0	2	1		
5	System on Chip (3-2)	3	0	0	3		
6	System on Chip Lab (3-2)	0	0	2	1		
7	Design for Testability (3-2)	3	0	0	3		
8	Design for Testability Lab (3-2)	0	0	2	1		
9	Low Power VLSI Design (4-1)	3	0	0	3		
10	Low Power VLSI Design Lab (4-1)	0	0	2	1		
Total		15	0	10	20		

DEGREE IN HONOR DISCIPLINE B.Tech Honors in Electronics and Communication Engineering (T RACK-4: COMMUNICATIONS)							
S.NO.	COURSE NAME	L	T	P	CREDITS	PRE-REQ	OFFERED TO
1	Software Defined Radio (2-2)	3	0	0	3		ECE
2	Cognitive Radio (3-1)	3	0	0	3		
3	Information Theory & Coding (3-2)	3	0	0	3		
5	Global Navigational Satellite Systems (3-2)	3	0	0	3		
6	Data Communications (4-1)	3	0	0	3		
7	Data Communications Lab (4-1)	0	0	2	1		
8	Optical Networks (4-1)	3	0	0	3		
9	Optical Networks Lab (4-1)	0	0	2	1		
Total		18	0	4	20		



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Honors in IoT		INTRODUCTION TO IOT				
			3	0	0	3
Pre-requisites: Embedded Systems						
Course Objectives:						
1. To acquire knowledge basic principles of IoT.						
2. To acquire knowledge ARM Cortex Processors.						
3. To acquire the knowledge on types of Protocols.						
4. To acquire knowledge on IoT cloud platforms.						
5. To acquire knowledge on IoT Applications.						
Course Outcomes: At the end of the course, the student will be able to						
C201.1	:	Aware basic principles of IoT.				
C201.2	:	Analyze ARM Cortex Processors.				
C201.3	:	Apply various protocols for development of IoT Applications.				
C201.4	:	Analyse various cloud platforms of IOT.				
C201.5	:	Analyse various prototypes of IoT Applications.				
UNIT – I					10	hrs
Introduction to IoT Introduction to IoT, Architectural Overview, Design principles and needed capabilities, Basics of Networking, M2M and IoT Technology Fundamentals- Devices and gateways, Data management, Business processes in IoT, Everything as a Service (XaaS), Role of Cloud in IoT, Security aspects in IoT.						
UNIT – II					10	hrs
Elements of IoT Hardware Components - Computing- Arduino, Raspberry Pi, ARM Cortex-A class processor, Embedded Devices – ARM Cortex-M class Processor, ARM Cortex-M0 Processor Architecture, Block Diagram, Cortex-M0 Processor Instruction Set, ARM and Thumb Instruction Set.						
UNIT – III					10	hrs
IoT Application Development Communication, IoT Applications, Sensing, Actuation, I/O interfaces. Software Components- Programming APIs (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, CoAP, UDP, TCP, Bluetooth. Bluetooth Smart Connectivity Bluetooth overview, Bluetooth Key Versions, Bluetooth Low Energy (BLE) Protocol, Bluetooth, Low Energy Architecture, PSoC4 BLE architecture and Component Overview.						
UNIT – IV					10	hrs
Solution framework for IoT applications Implementation of Device integration, Data acquisition and integration, Device data storage Unstructured data storage on cloud/local server, Authentication, authorization of devices.						
UNIT – V					10	hrs
IoT Case Studies IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.						
Cloud Analytics for IoT Application: Introduction to cloud computing, Difference between Cloud Computing and Fog Computing: The Next Evolution of Cloud Computing, Role of Cloud Computing in IoT, Connecting IoT to cloud, Cloud Storage for IoT Challenge in integration of IoT with Cloud.						
Text Books						
1	Raj Kamal, “Internet of Things: Architecture and Design Principles”, 1st Edition, McGraw Hill Education, 2017.					
2	The Definitive Guide to the ARM Cortex-M0 by Joseph Yiu, 2011.					
3	Vijay Madiseti, Arshdeep Bahga, “Internet of Things, A Hands on Approach”, University Press,					

		2015.														
	Reference Books															
	1	Cypress Semiconductor/PSoC4 BLE (Bluetooth Low Energy) Product Training Modules.														
	2	Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press, 2017.														
	3	Embedded System: Architecture, Programming and Design by Rajkamal, TMH														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
	C201.1	2	2													
	C201.2	2	2													
	C201.3	2	2		2											
	C201.4	2	3													
	C201.5	2	3		2											
	Avg.	2	2.3		2											



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Honors in IoT		IOT LAB				
			0	0	2	1
Pre-requisites: Embedded Systems, Communication Standard Protocols						
Course Objectives:						
1. Classify the latest microcontrollers with application development						
2. Plan about the product design and prototyping.						
3. Build interconnection and integration of the physical world and the cyberspace.						
4. Construct the IOT Devices.						
5. Apply to develop the IOT Devices.						
Course Outcomes: At the end of the course, the student will be able to						
C202.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C202.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C202.3	Explain the application areas of IOT					
C202.4	Discuss about the importance of Cloud in IOT					
List of Experiments						
(All experiments are required to be conducted)						
1	Familiarization with Arduino/Raspberry Pi and perform necessary software installation.					
2	To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.					
3	To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.					
4	To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.					
5	To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.					
6	To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.					
7	To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.					
8	To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.					
9	Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to Thingspeak cloud.					
10	Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from Thingspeak cloud.					

	Reference Books:															
	1	Vijay Madiseti, ArshdeepBahga, Internet of Things, “A Hands on Approach”, University Press, 2015.														
	2	Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press, 2017.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
	C202.1									2	3		2			
	C202.2								2	2	3		2			
	C202.3	2			3											2
	C202.4	2			3											3
	Avg.	2			3				2	2	3		2			2.5



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			L	T	P	Cr.
B.Tech Honors in IoT		INTRODUCTIONTOINDUSTRY4.0AND INDUSTRIALIOT				
			3	0	0	3
Pre-requisites: Internet of Things (IOT), Cloud Platforms , Services and its Protocols						
Course Objectives:						
1.To acquire knowledge on History of IIoT						
2. To acquire knowledge on Overview of IoT components.						
3.To acquire the knowledge on Types of Protocols						
4.To acquire knowledge on IIoT cloud platforms						
5.To acquire knowledge on Industrial IoT- Applications						
Course Outcomes: At the end of the course, the student will be able to						
C301.1	:	Aware the elements of IIoT				
C301.2	:	Awarevarious sensors, transducers and Actuators				
C301.3	:	Apply various protocols for development of IIoT Applications				
C301.4	:	Analyse various cloud platforms of IIOT				
C301.5	:	Analyse various prototypes related to Industrial IoT- Applications				
UNIT – I					10	hrs
Introduction to IoT, IoT Vs. IIoT, History of IIoT, Components of IIoT -Sensors, Interface, Networks, IOT Market, Trends & future Real life examples, Role of IIoT in Manufacturing Processes/						
UNIT – II					10	hrs
Architectures of IIoT, Advantages & disadvantages, IIoT System components : Introduction to Sensors, Transducers, Actuators, Role of sensors in IIoT, special requirements for IIoT sensors.						
UNIT – III					10	hrs
Protocols: Need of protocols; Types of Protocols, Wi-Fi direct, Zigbee, I2C, IIoT protocols –MQTT, 6LoWPAN, AMPQ.						
UNIT – IV					10	hrs
IIoT cloud platforms: Overview of Predix, PTC Thing Worx, Microsoft Azure etc, cloud services. Security: Vulnerabilities of IoT, Privacy, Security requirements, Threat analysis.						
UNIT – V					10	hrs
Industrial IoT- Applications: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security, Facility Management.						
Text Books						
1	Industry 4.0: The Industrial Internet of Things, Alasdair Gilchrist Publications: A press.					
2	Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, by Daniel Minoli, Bernd Scholz-Reiter, Florian, Wiley Publication.					
Reference Books						
1	Dr. Ovidiu Vermesan, Dr. Peter Friess, “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers.					
2	Architecting the Internet of Things, by Michahelles, Springer, 2011.					
3	Embedded System: Architecture, Programming and Design by Rajkamal, TMH					

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO 3
	C301.1	2	2													
	C301.2	2	2													
	C301.3	2	2		2											
	C301.4	2	3													
	C301.5	2	3		2											
	Avg.	2	2.3		2											



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			L	T	P	Cr.
B.Tech Honors in IoT		ADVANCED IOT LAB				
			0	0	2	1
Pre-requisites: Embedded Systems, Communication Standard Protocols						
Course Objectives:						
1. Classify the latest microcontrollers with application development						
2. Plan about the product design and prototyping.						
3. Build interconnection and integration of the physical world and the cyberspace.						
4. Construct the IOT Devices.						
5. Apply to develop the IOT Devices.						
Course Outcomes: At the end of the course, the student will be able to						
C302.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C302.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C302.3	Explain the application areas of IOT					
C302.4	Discuss about the importance of Cloud in IOT					
List of Experiments						
(All experiments are required to be conducted)						
1	Familiarization with Raspberry Pi / Node MCU and perform necessary software installation.					
2	To interface LED/Buzzer with Raspberry Pi / Node MCU and write a program to turn ON LED for 1 sec after every 2 seconds.					
3	To interface Push button/Digital sensor (IR/LDR) with Raspberry Pi / Node MCU and write a program to turn ON LED when push button is pressed or at sensor detection.					
4	To interface DHT11 sensor with Raspberry Pi / Node MCU and write a program to print temperature and humidity readings.					
5	To interface motor using relay with Raspberry Pi / Node MCU and write a program to turn ON motor when push button is pressed.					
6	To interface OLED with Raspberry Pi / Node MCU and write a program to print temperature and humidity readings on it.					
7	To interface Bluetooth with Raspberry Pi / Node MCU and write a program to send sensor data to smartphone using Bluetooth.					
8	To interface Bluetooth with Raspberry Pi / Node MCU and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.					
9	Write a program on Raspberry Pi / Node MCU to upload temperature and humidity data to Thingspeak cloud.					
10	Write a program on Raspberry Pi / Node MCU to retrieve temperature and humidity data from					

		Thingspeakcloud.														
	Reference Books:															
	1	Vijay Madiseti, ArshdeepBahga, Internet of Things, “A Hands on Approach”, University Press, 2015.														
	2	Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press, 2017.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
	C302.1									2	3		2			
	C302.2								2	2	3		2			
	C302.3	2			3											2
	C302.4	2			3											3
	Avg.	2			3				2	2	3		2			2.5



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			L	T	P	Cr.
B.Tech Honors in IoT		CYBER SECURITY & PRIVACY				
			3	0	0	3
Pre-requisites: Communication Standard Protocols						
Course Objectives:						
1. To prepare students with the technical knowledge and skills needed to protect and defend computer systems and networks.						
2. To develop graduates that can plan, implement, and monitor cyber security mechanisms to help ensure the protection of information technology assets.						
3. Analyze and resolve security issues in networks and computer systems to secure an IT infrastructure						
4. Evaluate and communicate the human role in security systems with an emphasis on ethics, social engineering vulnerabilities and training						
5. Interpret and forensically investigate security incident						
Course Outcomes: At the end of the course, the student will be able to						
C303.1	:	Follow a structured model in Security Systems Development Life Cycle (SDLC)				
C303.2	:	Plan, implement and audit operating systems' security in a networked, multi-platform and cross platform environment				
C303.3	:	Protect data and respond to threats that occur over the Internet				
C303.4	:	Design and implement risk analysis, security policies, and damage assessment				
C303.5	:	Detect attack methodology and combat hackers from intrusion or other suspicious attempts at connection to gain unauthorized access to a computer and its resources				
UNIT – I			10	hrs		
Overview of cyber security and why it is important; Internet governance: challenges and constraints; cyber threats: cyber warfare, cybercrime, cyber terrorism, cyber espionage; Need for a comprehensive cyber security policy; Need for an international convention on cyber space; Identify trends in cyber security events and protection techniques;						
UNIT – II			10	hrs		
. Categorize assets, risk, threat and vulnerability; Identify different types of vulnerabilities in a system; Vulnerability in software; Complex network architecture of organization; Open access to organizational data; Weak authentication; Determine the phase of a cyber-attack; Overview of cryptography; Deception; Denial of service filters; Ethical hacking						
UNIT – III			10	hrs		
Computer Ethics and security policies; Cyber security regulations; Role of International Laws; Role of stakeholders (state and private sector) in cyber security; Components of cyber security framework; Cyber security standards; Indian cyber space; National cyber security policy;						
UNIT – IV			10	hrs		
overview- Why cyber forensics is important; Types of computer forensics; Objective of cyber security forensics investigators; How experts works; Stages of forensics investigation; Techniques and tools used by forensics experts; Advantages of cyber forensics; Incident handling;						
UNIT – V			10	hrs		
Introduction; Basic security for HTTP applications and services; Basic security for SOAP (Simple Object Access Protocol) services; Identify management and Web Services; Authorization Patterns; Security Considerations and challenges;						

Text Books	
1	Jon Friedman. Mark Bouchard, CISSP. Foreword by John P. Watters to. Cyber Threat Intelligence. Definitive Guide TM. 2015.
2	Scott Roberts, Rebekah Brown. Intelligence-Driven Incident Response: Outwitting the Adversary: O'Reilly 2017

Reference Books	
1	Marjie T Britz, Computer Forensics and Cyber Crime: An Introduction, Pearson Education, 2nd Edition, 2008
2	Cyberspace and the Law: Your Rights and Duties in the On-Line World By Edward Cavazos and Gavino Morin: MIT Press: 1994.
3	Bob Gourley, The Cyber Threat, Createspace Independent Pub 2014

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO 3
	C303.1	2	2											2	2	
	C303.2	2	2											2	2	
	C33.3	2	2		2									2	2	
	C303.4	2	3											2	2	
	C303.5	2	3		2									2	2	
	Avg.	2	2.3		2									2	2	



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			L	T	P	Cr.
B.Tech Honors in IoT		CYBER SECURITY LAB				
			0	0	2	1
Pre-requisites: Communication Standard Protocols Lab						
Course Objectives:						
1. Explain & Design computer science terminology related to coding, password protection, social engineering, and network security						
2. Learn & implement fundamentals of cryptography and its application to network security						
3. Develop & Understand network security threats, security services, and countermeasures						
4. Acquire & Design well known network security protocols such as IPSec, SSL, and WEP						
5. Acquire & Develop background on hash functions; authentication; firewalls; intrusion detection techniques.						
Course Outcomes: At the end of the course, the student will be able to						
C304.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C304.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C304.3	Design operational and strategic cyber security strategies and policies					
C304.4	Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools					
List of Experiments						
(Any of the 8 experiments are required to be conducted)						
1	Study of different wireless network components and features of any one of the Mobile Security Apps					
2	Study of the features of firewall in providing network security and to set Firewall Security in windows					
3	Study of steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome)					
4	Study of System threat attacks - Denial of Service and Sniffing and Spoofing attacks					
5	Study of Techniques used for Web Based Password Capturing					
6	Implementation of S-DES algorithm for data encryption					
7	Implementation of Asymmetric Encryption Scheme – RSA					
8	Study of IP based Authentication.					
9	To implement the simple substitution technique named Caesar cipher using C language.					
10	To write a program to implement the hill cipher substitution techniques					
Reference Books:						
1	Scott Roberts, Rebekah Brown. Intelligence-Driven Incident Response: Outwitting the Adversary: O'Reilly, 2017					
2	Bob Gourley, The Cyber Threat, Createspace Independent Pub. 2014					

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C304.1									2	2		2			
	C304.2								2	2	2		2			
	C304.3				2											3
	C304.4				2											2
	Avg.				2				2	2	2		2			2.5



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			L	T	P	Cr.
B.Tech Honors in IoT		MOBILE APPLICATION DEVELOPMENT FOR IOT				
			3	0	0	3
Pre-requisites: Mobile Communications						
Course Objectives:						
1. Learn mobile application development for Internet of Things (IoT) devices						
2. Learn various components of mobile devices and essential sensors for various application						
3. Learn analytics and security aspects of mobile applications in IoT platforms						
Course Outcomes: At the end of the course, the student will be able to						
C305.1	:	Outlines a fundamental full stack architecture for IoT				
C305.2	:	Describes various development technologies in each IoT layer				
C305.3	:	Develops IoT applications using standardized hardware and software platforms.				
C305.4	:	Creates prototype using low power communication technologies.				
C305.5	:	Explains IoT solution development from Product management perspective				
UNIT – I					10	hrs
Introduction to IoT Ecosystem; Industry 4.0; Application development platforms for IoT; IoT Data sources						
UNIT – II					10	hrs
Temperature sensors, Proximity sensor, IR sensors, Image sensors, Motion detection sensors, Accelerometer sensors, Gyroscope sensors, Optical sensors						
UNIT – III					10	hrs
Sensor Data-Gathering and Data-Dissemination Mechanisms; Sensor Database system architecture; Sensor data-fusion mechanisms; Data-fusion Architectures and models						
UNIT – IV					10	hrs
IoT Programming Approaches: Node-Centric Programming - Database approach – Model Driven Development - IoT Programming Frameworks: Android Things - ThingSpeak - IoTivity - Node-RED - DeviceHive - Contiki and Cooja – Zetta						
UNIT – V					10	hrs
Wireless communications in product development – Bluetooth LE - Near Field Communications (NFC) – WiFi; Prototyping Bluetooth LE with Arduino Nano; Power management strategies and practices						
Text Books						
1	Kale, Vivek. Parallel Computing Architectures and APIs: IoT Big Data Stream Processing1st Edition, CRC Press, 2019.					
2	Lea, Perry. Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, 1st Edition, Packet Publishing Ltd, 2018.					
Reference Books						
1	Fadi Al-Turjman, Intelligence in IoT-enabled Smart Cities, 1st edition, CRC Press, 2019					
2	Giacomo Veneri, and Antonio Capasso, Hands-on Industrial Internet of Things: Create a powerful industrial IoT infrastructure using Industry 4.0, 1 st edition, Packt Publishing, 2018					

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO3
	C305.1	2	3											2		
	C305.2	3	2											2		
	C305.3	2	3											2		
	C305.4	2	3											2		
	C305.5	2	3											2		
	Avg.	2.2	2.8											2		



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			L	T	P	Cr.
B.Tech Honors in IoT		MOBILE APPLICATION DEVELOPMENT FOR IOT LAB				
			0	0	2	1
Pre-requisites: Mobile Application Development for IoT						
Course Objectives:						
1. To understand the installation of Android SDK						
2. To explore various features of Android SDK tools						
3. To explore various components in Android SDK						
Course Outcomes: At the end of the course, the student will be able to						
C306.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C306.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C306.3	Explore various components in GUI development through Android					
C306.4	Experiment different applications through Android SDK					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Procedure to install Android Studio.					
2	Develop a sample “Hello World Application.					
3	Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.					
4	Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout).					
5	Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity.					
6	Design an android application Send SMS using Intent					
7	Create an android application using Fragments.					
8	Design an android application for menu.					
9	Design an android application to display list of fruits using Listview					
10	Design an android application to display list of users using Recyclerview from internet.					

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	C306.1									2	3		2			
	C306.2								2	2	3		2			
	C306.3	2			3											2
	C306.4	2			3											3
	Avg.	2			3				2	2	3		2			2.5



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			L	T	P	Cr.
B.Tech Honors in IoT	APPLICATIONS OF IOT IN ROBOTICS					
			3	0	0	3

Pre-requisites: Embedded Systems, MEMS & NEMS

Course Objectives:

1. Comprehend basics of IoT, Industrial IoT and Operational Technology (OT) vulnerabilities, threats & risks.
2. Realize IoT security requirements and management tools
3. Comprehend ways to secure IoT

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

C401.1	:	Summarize the concepts of network connected embedded devices
C401.2	:	Design suitable network architecture and use appropriate protocols for a given IOT application
C401.3	:	Identify and summarize different components required for IOT applications.
C401.4	:	Analyze the system through Data Analytics tools.
C401.5	:	Analyze case studies on IoT applications

UNIT – I	11	hrs
Introduction & Basic of IoT: Definition, Characteristics, Physical and Logical Designs, challenges, Technological trends in IOT, IoT Examples, M2M.		
UNIT – II	9	hrs
Introduction to Sensing and Networking: Sensing & actuation, Wireless Sensor network, Sensor nodes, Communication Protocols.		
UNIT – III	11	hrs
Network Operator Requirements, IoT Platform Design Specification – Requirements, Process, Domain Model, Service, IoT Level, Function, Operational view, Device and Component Integration, Application development.		
UNIT – IV	10	hrs
Networking and Computing File: Handling, Python Packages for IoT, IoT Physical Servers – Cloud Storage Models, Communication APIs		
UNIT – V	9	hrs
Case studies: Smart Cities, Smart Home, Connected Vehicles, Industrial IOT.		
Text Books		
1	Kamal, R., Internet of Things – Architecture and Design Principles, 1st Edition, Mc Graw Hill, 2017	
2	Alessandro Bassi, Enabling Things to Talk- Designing IoT solutions with the IoT Architectural Reference Model, Springer, 2013.	

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	P O 7	P O 8	P O 9	P O 10	P O 11	P O 12	PS O 1	PS O 2	PSO3
C401.1	2	2	2												
C401.2	2	2	2												
C401.3	2	1	2												
C401.4	2	1	2												
C401.5	2	2	2												
Avg.	2	1.6	2												



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		L	T	P	Cr.
B.Tech Honors in IoT	IOT IN ROBOTICS LAB				
		0	0	2	1

Pre-requisites: Robotics and IOT

Course Objectives:

1. To understand Embedded-System programming.
2. To simulate and test ARM processor based circuits and their interfaces.
3. To provide a platform to conduct advanced fundamental and applied research in the design development and programming the robots for various applications.
4. To provide solutions to solve real life problems by the use of robots

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

C402.1	Develop basic program on serial communication implementation and Delay generation using timers using microcontroller
C402.2	Develop Interrupt handling, Share resource using MUTEX and Allocate resource using semaphores with ARM.
C402.3	Construct robotic concepts like sensor guided robotics, spy robotics etc
C402.4	Examine the different behavior of robotics

List of Experiments

(All experiments are required to be conducted)

1	Serial communication between two microcontrollers.
2	Interrupt generation using microcontrollers.
3	Delay generation using internal timers of microcontrollers.
4	Interrupt handling with ARM.
5	Share Resource using MUTEX with ARM.
6	Allocate resource using semaphores with ARM.
7	Simple Motion Control Robot.
8	Line Following Robot.
9	Obstacle avoidance robot.
10	Zigbee controlled Robot.

Reference Books

1. Kamal, R., Internet of Things – Architecture and Design Principles, 1st Edition, Mc Graw Hill, 2017

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3
C402.1				2	2									1	
C402.2				2	2									1	
C402.3				2	2									1	
C402.4				2	2									1	
Avg.				2	2									1	



KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS&COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Honors in Signal Processing	SIGNAL PROCESSING TECHNIQUES					
			3	0	0	3
Pre-requisites: Basic knowledge of integration, differentiation and complex numbers						
Course Objectives:						
1. To study about signals and systems. 2. To Analyze and implement digital systems using the Discrete Fourier Transform and Fast Fourier Transform (FFT) techniques. 3. To use Z transforms to analyze a digital system finding the region of convergence. 4. To design and Implement digital FIR and IIR filters. 5. To introduce the concept of the sampling rate process.						
Course Outcomes: At the end of the course, the student will be able to						
C201.1	:	Categorizing the fundamentals of various signals & systems and analyze the discrete-time signals and discrete-time systems.				
C201.2	:	Define LTI systems and describe the signal transmission through linear systems Analyze the spectral characteristics of signal using Fourier series and Fourier transforms				
C201.3	:	Compute DFT using FFT algorithms and derive DFT properties for signal processing				
C201.4	:	Design and implement different IIR filters and FIR filters for specific applications.				
C201.5	:	Multirate digital signal processing focus the sampling rate of a signal in increasing or decreasing.				
UNIT – I						
			10			hrs
INTRODUCTION: Definition of Signals and Systems, Signal and its types, Characteristics of a signal, Digitization of Signal, discrete-time signal, discrete-time system, concept of frequency in continuous time and discrete time signal, sampling of a signal.						
UNIT – II						
			10			hrs
ANALYSIS OF LINEAR SYSTEMS: Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain. correlation. convolution, filtering of a signal. Z-TRANSFORM: Introduction, Z-Transform Properties, Pole and zero concepts, inverse Z-transform.						
UNIT– III						
			10			hrs
DISCRETE FOURIER TRANSFORMS: Discrete Fourier transform, Properties of DFT, two dimensional discrete Fourier transform, discrete cosine transform, frequency analysis of long signal using DFT, short time Fourier transform (STFT). FAST FOURIER TRANSFORM (FFT): Radix-2 decimation in time and decimation in frequency FFT Algorithms.						
UNIT– IV						
			10			hrs
DIGITAL FIR FILTER DESIGN: Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques. DIGITAL IIR FILTER DESIGN: Analog filter approximations Chebyshev, Design of IIR Digital filters from analog filters, Analog and Digital frequency transformations.						

UNIT – V													10	hrs		
MULTIRATE DIGITAL SIGNAL PROCESSING: Introduction to Multirate signal processing, Decimation by factor D, interpolation by a factor I ,Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design &Implementation for sampling rate conversion.																
Text Books																
1	Signals, Systems & Communications - B.P. Lathi, BSPublications, 2003.															
2	Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn., 1997															
3	Digital Signal Processing, Principles, Algorithms and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 2007.															
4	Discrete Time Signal Processing– A.V. Oppenheim and R.W. Schaffer, PHI, 2002															
Reference Books																
1	Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015															
2	Signals and Systems – T K Rawat, Oxford University press, 2011															
3	Multirate Systems and Filter Banks-P.P. Vaidyanathan-Pearson Education.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PS O3
	C201.1	2	2	3	2								1	2		
	C201.2	2	2	3	2									2		
	C201.3	2	2	3	2									2		
	C201.4	2	2	3	2									2		
	C201.5	2	2	3	2									2		
	Avg.	2	2	3	2								1	2		



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
Tech Honors in Signal Processing		SIGNAL PROCESSING TECHNIQUES LAB				
			0	0	2	1
Pre-requisites: Basic knowledge of Signal Processing						
Course Objectives:						
1. To generate & Perform different operations on discrete-time signals and systems.						
2. To analyze and implement digital systems using the Discrete Fourier Transform and Fast Fourier Transform (FFT) techniques.						
3. To use Z transforms to analyze a digital system finding the region of convergence.						
4. To introduce the concept of the sampling process.						
Course Outcomes: At the end of the course, the student will be able to						
C202.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C202.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C202.3	Design and Implement digital FIR and IIR filters.					
C202.4	Design Up converter, down converter & Sample rate converter.					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	To find DFT / IDFT of given DT signal					
2	Program for computing Auto-correlation.					
3	Program to obtain Linear Convolution of two finite length sequences					
4	To find frequency response of a given system (in Transfer Function/ Differential equation form).					
5	Implementation of FFT of given sequence					
6	Determination of power spectrum of a given signal(s).					
7	Implementation of LP FIR filter for given sequence					
8	Implementation of HP FIR filter for given sequence					
9	Implementation of LP IIR filter for given sequence					
10	Implementation of HP IIR filter for given sequence					
11	Generation of sinusoidal signal through filtering					
12	Implementation of Decimation Process					
13	Implementation of Interpolation Process					
14	Implementation of I/D sampling rate converters.					

Reference Books:																
	1	Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI,2nd Edn.,1997														
	2	Digital Signal Processing, Principles, Algorithms and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education/PHI, 2007.														
	3	Multirate Systems and Filter Banks- P.P.Vaidyanathan - Pearson Education.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	C202.1									2	2		2			
	C202.2								2	2	2		2			
	C202.3		2	2	2									2		
	C202.4		2	2	2									2		
	Avg.		1	1	1				0.5	1	1		1	1		

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Honors in Signal Processing		SPEECH PROCESSING LAB				
			0	0	2	1
Pre-requisites: Fourier Transform						
Course Objectives:						
4. To identify, understand speech signals						
5. To analyze sound signals using mathematical tools						
6. To estimate sound signals using mathematical tools						
Course Outcomes: At the end of the course, the student will be able to						
C302.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C302.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C302.3	Determine the speech signal parameters.					
C302.4	Determine analyze and detect speech signals.					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Non-Stationary Nature of Speech Signal					
2	Sampling Frequency and Bit Resolution for Speech Signal Processing					
3	Identification of Voice/Unvoiced/Silence regions of Speech					
4	Different Sounds in Language					
5	Short Term Time Domain Processing of Speech					
6	Short-Term Frequency Domain Processing of Speech					
7	Cepstral Analysis of Speech					
8	Linear Prediction Analysis					
9	Estimation of Pitch from Speech Signals					
10	Estimation of Formants from Speech Signals					
11	Voice Activity Detection in Speech					

References:																
1	https://ssp-iiith.vlabs.ac.in/List%20of%20experiments.html															
2	https://vlab.amrita.edu/index.php?sub=59&brch=164															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
	C302.1									2	3		2			
	C302.2								2	2	3		2			
	C302.3		2		2	3										3
	C302.4		2		2	3										2
	Avg.		2		2	3			2	2	3		2			2.5

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			L	T	P	Cr.
B.Tech Honors in Signal Processing	ADVANCED DIGITAL SIGNAL PROCESSING LAB					
			0	0	2	1
Pre-requisites: Signal operations basics						
Course Objectives: The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using industry standard EDA Tools.						
Course Outcomes: At the end of the course, the student will be able to						
C304.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C304.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C304.3	Measure the PSD using parametric and non-parametric methods.					
C304.4	Design Adaptive Noise Cancellation.					
	List of Experiments (Any of the 12 experiments are required to be conducted)					
1	Basic Operations on Signals, Generation of Various Signals and finding its FFT					
2	Program to verify Decimation and Interpolation of a given Sequences.					
3	Design and Implementation of Full Adder					
4	Generation of Dual Tone Multiple Frequency (DTMF) Signals					
5	Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods					
6	Estimation of Power Spectrum using Bartlett and Welch methods					
7	Verification of Autocorrelation Theorem					
8	Parametric methods (Yule-Walker and Burg) of Power Spectrum Estimation					
9	Estimation of data series using Nth order Forward Predictor and comparing to the Original Signal					
10	Design of LPC filter using Levinson-Durbin Algorithm					
11	Computation of Reflection Coefficients using Schur Algorithm					
12	To study Finite Length Effects using Simulink					
13	Design and verification of Matched filter					
14	Adaptive Noise Cancellation using Simulink					

	15	Design and Simulation of Notch Filter to remove 60Hz Hum/any unwanted frequency component of given Signal (Speech/ECG)
	Reference Books:	
	1	Oppenheim, Alan V. Discrete-time signal processing. Pearson Education India, 1999
	2	Mitra, Sanjit Kumar, and Yonghong Kuo. Digital Signal Processing: A Computer-Based Approach. Volume 2, New York, McGraw-Hill Higher Education, 2006.
CO-PO/PSO Mapping Matrix		
	CO	PO 1PO 2PO 3PO 4PO 5PO 6PO 7PO 8PO 9PO 10PO 11PO 12PS O1PS O2PS O3
	C304.1	
	C304.2	
	C304.3	
	C304.4	
	Avg.	

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		L	T	P	Cr.
B.Tech Honors in Signal Processing	VIDEO SIGNAL PROCESSING LAB				
		0	0	2	1

Pre-requisites: Fundamentals of Image Processing methods.

Course Objectives:

1. To implement different operations on video.
2. To estimate 3D feature/structure over 2D images/video.

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

C306.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C306.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C306.3	Implement different operations on video.
C306.4	Estimate 3D feature/structure over 2D images/video.

List of Experiments

(All experiments are required to be conducted)

1	Write a program to detect feature points and track them using Lucas-Kanade method.
2	Write a program to detect lines and circles using Hough Transform.
3	Write a program for video stabilization using Lucas-Kanade method of feature tracking.
4	Write a program to detect motion using Iterative Motion Estimation Algorithm.
5	Write a program to take stereo input/video and do stereo matching to provide merged output
6	Write a program to do alpha blending between two images (use image mask) using interoperation between VisionWorks, OpenCV and NPP
7	Write a program to take video input from camera or video and display output using interoperation between VisionWorks and OpenGL.
8	Write a program to take input video or camera input and display as it is to test I/O facilities and camera.
9	Write a program to track any rigid object using optical flow method and object can be selected real time by dragging cursor using mouse or touch.
10	Write a program to estimate 3D feature/structure using VisionWorks SFM pipeline over 2D images/video.

Reference Books:

- 1 Digital Signal Processing, Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
- 2 DSP Processor Fundamentals, Architectures & Features, Lapsley et al. S. Chand & Co, 2000.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C306.1									2	3		2			
	C306.2								2	2	3		2			
	C306.3	2			3	3										
	C306.4	2			3	3										
	Avg.	2			3	3			2	2	3		2			

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		L	T	P	Cr.
B.Tech Honors in Signal Processing	DSP PROCESSORSLAB				
		0	0	2	1

Pre-requisites: Signals and Systems.

Course Objectives:

1. Illustrate time and frequency domain response of discrete time signals and systems.
2. Develop IIR filters and FIR filters.
3. Learn to develop the programs for the designing of filters.
4. Understand the response of an LTI system

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

C402.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C402.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C402.3	Demonstrate the architecture of DSP chips – TMS 320C 5X/6X & frequency domain response of signals and systems through simulation
C402.4	Design IIR filters and extend it to convert into FIR filters using windowing techniques and also to obtain the frequency responses.

List of Experiments

(Any of the 10 experiments are required to be conducted)

1	To Study the architecture of DSP chips – TMS 320C 5X/6X.
2	Time domain and Frequency domain Analysis of signals and systems.
3	To obtain spectrum of the discrete time sequence (without using default functions)
4	To obtain output of an LTI system (without using default functions).
5	To verify linear and circular convolution.
6	To design FIR filter (LP/HP) using windowing technique a) Using rectangular window. b) Using triangular window. c) Using Kaiser Window.
7	To Implement IIR filter (LP/HP) on DSP Processors
8	To obtain frequency samples of a time sequence using FFT algorithm.
9	To obtain frequency response of analog LP/HP filters.
10	To compute power density spectrum of a sequence.

Reference Books:

1	Digital Signal Processing, Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2	DSP Processor Fundamentals, Architectures & Features, Lapsley et al. S. Chand & Co, 2000.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C402.1									2	3		2			
	C402.2								2	2	3		2			
	C402.3	2			3	3										3
	C402.4	2			3	3										3
	Avg.	2			3	3			2	2	3		2			3

Text Books	
1	CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holmberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
2	Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

2	Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

	Reference Books

1	Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.
2	Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
3	CMOS: Circuit Design, Layout and Simulation- Baker, Li.

2	Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.

3	CMOS: Circuit Design, Layout and Simulation- Baker, Li.

				PQ		PQ	PQ	P	PQ	P	P	P	P	P	PS	PS	

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Honors in VLSI Design	CMOS ANALOG IC DESIGN LAB					
			0	0	2	1
Pre-requisites: Fundamentals of Analog Circuits						
Course Objectives:						
1. To learn Hardware Descriptive Language(Verilog/VHDL)						
2. To learn the fundamental principles of VLSI circuit design in digital and analog domain.						
3. To familiarize fusing of logical modules on FPGAs.						
4. To provide hands on design experience with professional design (EDA) platforms.						
Course Outcomes: At the end of the course, the student will be able to						
C202.1	Analyze and design of MOS and different current mirror circuits including Wilson, cascade current mirror.					
C202.2	Design of CMOS Amplifiers including Differential, Cascade and high gain amplifier Architectures.					
C202.3	Design of CMOS Operational amplifiers and to measure the characteristics of cascade operational-amplifier.					
C202.4	Model various components in CMOS process to estimate their performance in circuits.					
List of Experiments (Any of the 10 experiments are required to be conducted)						
1	Design an Adder (8-Bit) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.					
2	Design a Multiplier (4-Bit) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.					
3	Design an ALU using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.					
4	Design a Universal Shift Register using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.					
5	Design Finite State Machine (Moore/Mealy) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.					
6	Design Memories using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA.					
7	Design and simulate a CMOS inverter using digital flow.					
8	Design and simulate a CMOS Basic Gates & Flip-Flops.					
9	Design and simulate a 4-bit synchronous counter using a Flip-Flops.					
10	Design and Simulate a CMOS Inverting Amplifier.					
11	Design and Simulate basic Common Source, Common Gate and Common Drain Amplifiers.					
12	Design and Simulate simple transistor differential amplifier. Analyze Gain, Bandwidth and CMRR by performing Schematic Simulations.					

Tools:																
Cadence/Synopsis/ Mentor Graphics/Tanner/equivalent EDA Tools																
Reference Books:																
1	Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.															
2	CMOS: Circuit Design, Layout and Simulation- Baker, Li.															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PS O2	PSO 3
	C202.1									2	3		2			
	C202.2								2	2	3		2			
	C202.3	2			3											3
	C202.4	2			3											2
	Avg.	2			3				2	2	3		2			2.5

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	Cr.
B.Tech Honors in VLSI Design	CMOS DIGITAL IC DESIGN LAB				
		0	0	2	1

Pre-requisites: Fundamentals of Digital Circuits

Course Objectives:

1. To understand the response of linear circuits with different signals.
2. To learn about limiting and level shifting circuits, and their applications
3. To generate different types of non-sinusoidal waveforms
4. To learn about basics of sampling gates and their applications
5. To understand the basics of digital logic families

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

C302.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C302.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C302.3	:	To explain the VLSI Design Methodologies using Mentor Graphics Tools.
C302.4	:	To explain the Physical Verification in Layout Extraction.

List of Experiments

(Any of the 10 experiments are required to be conducted)

1.	Inverter Characteristics.
2.	NAND and NOR Gate
3.	XOR and XNOR Gate
4.	2:1 Multiplexer
5.	Full Adder
6.	RS-Latch
7.	Clock Divider
8.	JK-Flip Flop
9.	Synchronous Counter
10.	Asynchronous Counter
11.	Static RAM Cell
12.	Dynamic Logic Circuits
13.	Linear Feedback Shift Register

Reference Books:

1	Pulse, Digital and Switching Waveforms - Millman and H. Taub, Mothiki S Prakash Rao Mc Graw-

		Hill, Second Edition, 2007.														
2	Solid State Pulse circuits- David A.Bell, PHI,4 th Edn.,2002															
3	Pulse & Digital Circuits - Venkata Rao, K, Ramasudha K, Manmadha Rao, G.,Pearson, 2010															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	P S O 1	PSO2	PSO3
	C302.1									2	3	2				
	C302.2								2	2	3		2			
	C302.3			3						2						2
	C302.4			3						2						3
	Avg.			3					2	2	3		2			2.5

[illegible]

	C304.1								2	3		2			
	C304.2							2	2	3		2			
	C304.3	2			3										3
	C304.4	2			3										2
	Avg.	2			3			2	2	3		2			2.5

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		L	T	P	Cr.
B.Tech Honors in VLSI Design	DESIGN FOR TESTABILITY LAB				
		0	0	2	1

Pre-requisites: Digital Electronics, DSD & DICA

Course Objectives:

1. Overview of Design for Testability
2. Importance of DFT in electronic systems
3. Benefits of DFT in electronics systems
4. Introduction to testability metrics

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

C306.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C306.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C306.3	Design various Testability Techniques.
C306.4	Generate test patterns.

List of Experiments

(Any of the 10 experiments are required to be conducted)

1	Introduction to DFT Tools
2	Scan chain Implementation
3	Boundary scan testing
4	Built-in self-Test(BIST).
5	Fault simulation and Diagnosis
6	Designing testable sequential circuits
7	Hierarchical testability analysis
8	Fault modeling and coverage analysis
9	DFT insertion strategies
10	Design rule checking for testability
11	Test pattern generation
12	Advanced DFT techniques

Reference Books:

- 1 Digital Systems and Testable Design-M.Abramovici,M.A.Breuer and A.D.Friedman,Jaico Publishing House.
- 2 Digital Circuits Testing and Testability-P.K. Lala,Academic Press.

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	P O 12	PSO 1	PSO 2	PSO 3
	C306.1									2	3		2			
	C306.2								2	2	3		2			
	C306.3	2			3											3
	C306.4	2			3											2
	Avg.	2			3				2	2	3		2			2.5

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			L	T	P	Cr.
B.Tech Honors in VLSI Design	LOWPOWERVLSIDESIGN LAB					
			0	0	2	1
Pre-requisites: Fundamentals of VLSI Principles						
Course Objectives:						
1.Students will be able to draw the schematic diagram & layout for the gates, Combinational logic circuits, Differential Amplifier Circuits using EDA Tool.						
2.Students will be able to draw the schematic diagram & layout for Flip Flops, Counters, Static RAM cell and Common Source amplifier circuits using EDA Tool.						
Course Outcomes: At the end of the course, the student will be able to						
C402.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C402.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C402.3	Implement FPGA circuits					
C402.4	Implement back-end circuits.					
List of Experiments (Any of the 10 experiments are required to be conducted)						
	PART(A):FPGA Level Implementation					
1	Realization of Logic gates					
	Design and Implementation of the following:					
2	4-bit ripple carry and carry look ahead adder using behavioral, dataflow and structural modeling					
3	16:1 mux through 4:1 mux b) 3:8 decoder realization through 2:4 decoder					
4	8:3 encoder					
5	8-bit parity generator and checker					
6	J-K and T Flip-Flops					
7	8-bit synchronous up-down counter					
8	4-bit sequence detector through Mealy and Moore state machines					

		PART (B): Back-end Level Design and Implementation														
		Design and Implementation of the following:														
	9	UniversalGates														
	10	An Inverter														
	11	Full Adder														
	12	Full Subtractor														
	13	Decoder														
	14	D-Flip-flop														
		Reference Books:														
	1	Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998.														
	2	Low Power CMOS VLSI Circuit Design – A. Bellamour, M. I. Elamasri, Kluwer Academic Press, 1995.														
		CO-PO/PSO Mapping Matrix														
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C402.1									2	3		2			
	C402.2								2	2	3		2			
	C402.3	2			3											3
	C402.4	2			3											2
	Avg.	2			3				2	2	3		2			2.5

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Honors in Communications	COGNITIVE RADIO					
			3	1	0	3
Pre-requisites: Knowledge on Software defined radio						
Course Objectives:						
1. To know the design of the wireless networks based on the cognitive radios.						
2. To understand the concepts of wireless networks and next generation networks.						
3. To understand the various radio spectrum sensing and dynamic spectrum access.						
Course Outcomes: At the end of the course, the student will be able to						
C301.1	:	Aware the fundamental concepts of cognitive radio networks.				
C301.2	:	Develop the cognitive radio, as well as techniques for spectrum holes detection that cognitive radio takes advantages in order to exploit it.				
C301.3	:	Aware technologies to allow an efficient use of TVWS for radio communications based on two spectrum sharing business models/policies.				
C301.4	:	Aware fundamental issues regarding dynamic spectrum access, the radio-resource management and trading, as well as a number of optimization techniques for better Spectrum exploitation.				
C301.5	:	Analyze the research challenges in Cognitive radio that is network and transport layer issues, cross layer design for cognitive radio.				
UNIT – I					10	hrs
INTRODUCTION TO COGNITIVE RADIOS: Digital dividend, cognitive radio (CR) architecture, functions of cognitive radio, dynamic spectrum access (DSA), components of cognitive radio, spectrum sensing, spectrum analysis and decision, potential applications of cognitive radio.						
UNIT – II					9	hrs
SENSING: Spectrum sensing, detection of spectrum holes (TVWS), collaborative sensing, geo-location database and spectrum sharing business models (spectrum of commons, real time secondary spectrum market).						
UNIT – III					8	hrs
OPTIMIZATION TECHNIQUES OF DYNAMIC SPECTRUM ALLOCATION: Linear programming, convex programming, non-linear programming, integer programming, dynamic programming, stochastic programming.						
UNIT – IV					10	hrs
DYNAMIC SPECTRUM ACCESS AND MANAGEMENT: Spectrum broker, cognitive radio architectures, centralized dynamic spectrum access, distributed dynamic spectrum access, learning algorithms and protocols.						
UNIT – V					12	hrs
SPECTRUM TRADING: Introduction to spectrum trading, classification to spectrum trading, radio resource pricing, brief discussion on economics theories in DSA (utility, auction theory), classification of auctions (single auctions, double auctions, concurrent, sequential). Research Challenges in Cognitive Radio: Network layer and transport layer issues, cross-layer design for cognitive radio networks.						
Text Books						
1	Ekram Hossain, Dusit Niyato, Zhu Han, “Dynamic Spectrum Access and Management in Cognitive Radio Networks”, Cambridge University Press, 2009.					
2	Kwang-Cheng Chen, Ramjee Prasad, “Cognitive radio networks”, John Wiley & Sons Ltd., 2009					
Reference Books						
1	Bruce Fette, “Cognitive radio technology”, Elsevier, 2nd edition, 2009.					



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			L	T	P	Cr.
B.Tech Honors in Communications			INFORMATION THEORY & CODING			
			3	0	0	3
Pre-requisites: Probability and Statistics, Basic course on Communications.						
Course Objectives:						
The objective of this course is to introduce the basic concepts of information theory and coding, including information, source coding, channel model, channel capacity, channel coding and so on.						
Course Outcomes: At the end of the course, the student will be able to						
C302.1	:	Explain the basic concepts of information theory.				
C302.2	:	Describe random channel codes.				
C302.3	:	Describe Text, Audio and Speech Source coding methods.				
C302.4	:	Describe Image and Video coding methods.				
C302.5	:	DescribeError control coding methods.				
UNIT – I					10	hrs
Information Theory: Overview; Basic Concepts - Entropy and Mutual information; Lossless Source Coding – Source entropy rate; Kraft inequality; Huffman code; Asymptotic equipartition property; Universal coding; Noisy Channel Coding - Channel capacity.						
UNIT – II					10	hrs
Random channel codes: Noisy channel coding theorem for discrete memory-less channels; Typical sequences; Error exponents; Feedback; Continuous and Gaussian channels; Lossy Source Coding – Rate Distortion functions; Random source codes; Joint source-channel coding and the separation theorem						
UNIT – III					10	hrs
Source coding- Text, Audio and Speech: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 - Speech: Channel Vocoder, Linear Predictive Coding						
UNIT – IV					10	hrs
Source coding- Image and Video: Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: READ, JPEG – Video Compression: Principles-I,B,P frames, Motion estimation, Motion compensation, H.261, MPEG standard						
UNIT – V					10	hrs
Error control coding- Block codes: Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding - Single parity codes, Hamming codes, Repetition codes - Linear block codes, Cyclic codes - Syndrome calculation, Encoder and decoder – CRC Error control coding.						
Text Books						
1	Mark Kelbert, Yuri Suhov, Information Theory and Coding by Example, Cambridge University Press, 2013.					

	Reference Books

1	Simon Haykin and Michael Moher, Communication Systems, 5th Edition, Wiley, 2010
2	T.M. & Thomas, J.A. (2006). Elements of information theory. New York: Wiley.
3	Ad'amek, Foundations of coding, Wiley Interscience, 1991.

CO-PO/PSO Mapping Matrix	

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Honors in Communications		GLOBAL NAVIGATIONAL SATELLITE SYSTEMS				
			3	0	0	3
Pre-requisites: Basic knowledge of GIS and Remote Sensing						
Course Objectives:						
1. To provide an insight into the concept of GNSS data type, position principle, and estimation strategy.						
2. To explore in detail, different types of GPS errors, analyze various standard formats of GPS. Differentiate GPS applications.						
3. To provide an insight into the concept of GNSS Receiver, GNSS Errors						
Course Outcomes: At the end of the course, the student will be able to						
C303.1	:	Aware Fundamentals of Satellite Navigation.				
C303.2	:	Aware Global Positioning System.				
C303.3	:	Aware Navigation with Indian Constellation.				
C303.4	:	Develop GNSS Receiver.				
C303.5	:	Aware GNSS Errors.				
UNIT – I			10	hrs		
Introduction, GNSS overview, Global Positioning System, Russian GLONASS system, Galileo satellite system, Chinese BeiDou system, Regional system: Quasi-Zenith Satellite System (QZSS), Navigation with Indian Constellation (NavIC), Augmentations, Markets and Applications. Fundamentals of Satellite Navigation: Concept of Ranging using Time of arrival Measurements: Two-Dimensional Position Determination, Principle of Position Determination via Satellite-Generated Ranging Codes, Fundamentals of satellite orbits: Orbital Mechanics, Constellation Design, Positioning determination using Ranging codes: Determining Satellite-to-User Range						
UNIT – II			10	hrs		
Global Positioning System: overview: Space Segment Overview, Control Segment Overview, User Segment Overview, Space segment description: GPS Satellite Constellation Description, Space Segment Phased Development, Control segment description: OCS Current Configuration, OCS Transition, OCS Planned Upgrades, User segment: GNSS Receiver Characteristics.						
UNIT – III			10	hrs		
Navigation with Indian Constellation (NavIC): overview, space segment, NavIC control segment, Geodesy and time system, Navigation services, signals, applications and NavIC user equipment.						
UNIT – IV			10	hrs		
GNSS Receiver: Acquisition: Single Tone Detector, Tong Search Detector, M of N Search Detector, Combined Tong and M of N Search Detectors, FFT-Based Techniques, Direct Acquisition of GPS Military Signals, Vernier Doppler and Peak Code Search, carrier tracking, code tracking: Carrier Loop Discriminator, sequence of initial receiver operation.						
UNIT – V			10	hrs		
GNSS Errors: Introduction, Measurement errors: satellite clock error, ephemeris error, relative effects, atmospheric effects, receiver noise and resolution, multipath and shadowing effects, hardware bias errors, Pseudo range error budgets.						
Text Books						
1	Elliott D. Kaplan, Christopher J. Hegarty Understanding GPS/GNSS Principles and Applications, Third Edition, Artech House Publishers, Boston, 2017.					
Reference Books						
1	GS Rao, Global Navigational satellite system, Tata McGraw-Hill Education Private Ltd, New Delhi, 2010.					



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Honors in Communications		DATA COMMUNICATIONS				
			3	0	0	3
Pre-requisites: Basics of communication system, Coding Theory.						
Course Objectives:						
1. To gain knowledge in network topology, reference models, various transmission media and ISDN techniques.						
2. To illustrate data link layer design issues, medium access sublayer protocols, routing in computer networking.						
3. To summarize transport layer and application layer functions.						
4. To classify protocols used in different layers of the computer network.						
5. To understand concepts of network security, domain name service, network management protocol.						
Course Outcomes: At the end of the course, the student will be able to						
C401.1	:	List the different types of services, layers and switching techniques in computer networks.				
C401.2	:	Identify design issues of various layers in the reference model of computer networks.				
C401.3	:	Analyze various network topologies, transmission media and ISDN techniques.				
C401.4	:	Classify protocols used in different layers of the computer network.				
C401.5	:	Identify the concepts of network security, domain name service, network management protocol				
UNIT – I			10	hrs		
PHYSICAL LAYER Network topologies, ISO-OSI Reference model-TCP/IP Reference model, Problems in OSI Reference model-Problems in TCP/IP Reference model. Transmission media: copper wire, twisted pair, coaxial cable and fibre optic cable- Switching techniques: circuit, message and packet switching– comparison of switching techniques-ISDN.						
UNIT – II			10	hrs		
DATALINK LAYER Design issues: services provided to network layer, framing techniques, flow control, error control Error detection and correction: Cyclic Redundancy Code, Elementary protocols: Unrestricted simplex protocol - simple stop-and-wait protocol - Sliding window protocols: 1-bit sliding window protocol, Go back and Selective Repeat protocols.						
UNIT – III			10	hrs		
NETWORK LAYER Services provided to transport layer - Communication subnet: Virtual Circuit (VC) and datagram subnets, Routing algorithms: optimality principle - Shortest path routing – Flooding - Distance vector routing - Count-to-infinity problem - Hierarchical routing - Link state routing, Broadcast routing-Multicast routing.						
UNIT – IV			10	hrs		
TRANSPORT LAYER Transport services–Transport service primitives-Connection management: Connection Establishment protocols – Connection release protocol: two-army problem, Transport protocols -TCP protocol: TCP header format– UDP protocol: UDP header format.						
UNIT – V			10	hrs		
APPLICATION LAYER Network security: Authentication – Cryptography – Encryption types - Substitution ciphers and transposition ciphers – DES (Data Encryption Standard) – DNS (Domain Name Service) - SNMP(Simple Network Management Protocol) model.						
Text Books						
1	Andrew S Tanenbaum — Computer Networks, 5 th Edition, PHI, 2013.					
2	Behrouz A. Forouzan— Data Communications and Networking, 3 rd Edition, TMH, 2002.					
3	Wyane Thomas - Introduction to Data Communications and Network Security, 4 th Edition, Pearson					

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

		L	T	P	Cr
B.Tech Honors in Communications	DATA COMMUNICATIONS LAB				
		0	0	2	1

Pre-requisites: Basics of Communication Systems, Coding Theory

Course Objectives:

1. To gain knowledge in network topology, reference models, various transmission media and ISDN techniques.
2. To illustrate data link layer design issues, medium access sublayer protocols, routing in computer networking
3. To summarize transport layer and application layer functions.
4. To classify protocols used in different layers of the computer network.
5. To understand concepts of network security, domain name service, network management protocol.

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

C402.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.
C402.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.
C402.3	To implement different topologies.
C402.4	To design the data network.

List of Experiments

(Any of the 10 experiments are required to be conducted)

1	To study different types of transmission media.
2	To study quadrature phase shift keying modulation.
3	Study & analysis of QAM modulation
4	To study serial interface RS-232
5	To study pc to pc communication using parallel port
6	To study LAN using star topology.
7	To study LAN using bus topology.
8	To study LAN using tree topology.
9	To study configure modem of computer
10	To configure hub/switch.
11	To study interconnections of cables for data communication
12	To study fiber optic communication
13	To study wireless communication
14	To study PC-PC communication using LAN

Reference Books:																
1	AndrewSTanenbaum — ComputerNetworks, 5 th Edition, PHI, 2013.															
2	BehrouzA. Forouzan— DataCommunicationsandNetworking, 3 rd Edition, TMH, 2002															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	P O 11	P O 12	PS O1	PS O2	PS O3
	C101.1									2	3		2			
	C101.2								2	2	3		2			
	C101.3	2			3											3
	C101.4	2			3											3
	Avg.	2			3				2	2	3		2			2.5

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Honors in Communications	OPTICAL NETWORKS LAB					
			0	0	2	1
	Pre-requisites: Microwave Engineering					
	Course Objectives:					
	1. To familiarize with lab equipment like power supplies, function generators, CROs, DMMs					
	2. To study the characteristics of LED and laser diodes					
	3. To determine losses in fibre optic cable					
	Course Outcomes: At the end of the course, the student will be able to					
	C404.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
	C404.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
	C404.3	To study the losses in optical fibre cable.				
	C404.4	To study the modulation and demodulation using optical fibre				
	List of Experiments					
	(All experiments are required to be conducted)					
	1	Measurement of Numerical Aperture				
	2	Characterization of LED				
	3	Characterization of Laser Diode				
	4	Measurement of Data rate for Digital Optical link				
	5	Measurement of losses for Analog Optical link				
	6	Intensity modulation of Laser output through an optical fiber				
	7	Study of Frequency modulation and demodulation using Optical fiber.				
	8	Measurement of bending loss and propagation loss in the optical fiber cable				
	9	Setting up Fiber Optics voice link using Frequency Modulation				
	10	Study of pulse width modulation and demodulation technique using Optical fiber				

B.Tech Minor in Electronics and Communication Engineering
MINOR COURSES OFFERED

TRACK-1: IOT

TRACK-2: SIGNAL PROCESSING

TRACK-3: COMMUNICATION ENGINEERING

TRACK-4: VLSI DESIGN

DEGREE IN MINOR DISCIPLINE B.Tech Minors in Electronics and Communication Engineering (T RACK-1: IOT)						
S.NO.	COURSE NAME	L	T	P	CREDITS	OFFERED TO
1.	Introduction to IoT (2-2)	3	0	0	3	Other Department except ECE
2	IoT Lab (2-2)	0	0	2	1	
3	Introduction to Security of Cyber-Physical Systems (3-1)	3	0	0	3	
4	Introduction to Industry 4.0 and Industrial IOT (3-1)	3	0	0	3	
5	IOT with Arduino & Raspberry Pi (3-2)	3	0	0	3	
6	IOT with Arduino & Raspberry Pi Lab (3-2)	0	0	2	1	
7	Ubiquitous Sensing, Computing, and Communication (3-2)	3	0	0	3	
8	Embedded Systems for IOT (4-1)	3	0	0	3	
Total		18	0	4	20	

DEGREE IN MINOR DISCIPLINE B.Tech Minors in Electronics and Communication Engineering (T RACK-2: SIGNAL PROCESSING)						
S.NO.	COURSE NAME	L	T	P	CREDITS	OFFERED TO
1	Analog Electronics (2-2)	3	0	0	3	Other Department except ECE
2	Analog Electronics Lab (2-2)	0	0	2	1	
3	Digital Electronics (3-1)	3	0	0	3	
4	Digital Electronics Lab (3-1)	0	0	2	1	
5	Signals and Systems (3-2)	3	0	0	3	
6	Signal Processing Lab (3-2)	0	0	2	1	
7	Introduction to Digital Signal Processing (3-2)	3	0	0	3	
8	Digital Signal Processing Lab (3-2)	0	0	2	1	
9	Digital Image Processing (4-1)	3	0	0	3	
10	Image Processing Lab (4-1)	0	0	2	1	
Total		15	0	10	20	

DEGREE IN MINOR DISCIPLINE B.Tech Minors in Electronics and Communication Engineering (T RACK-3: COMMUNICATION ENGINEERING)						
S.NO.	COURSE NAME	L	T	P	CREDITS	OFFERED TO
1	Analog Electronics (2-2)	3	0	0	3	Other Departments except ECE
2	Analog Electronics Lab (2-2)	0	0	2	1	
3	Digital Electronics (3-1)	3	0	0	3	
4	Digital Electronics Lab (3-1)	0	0	2	1	
5	Principles of Communications (3-2)	3	0	0	3	
6	Basic Communication Engineering Lab (3-2)	0	0	2	1	
7	Data Communication (3-2)	3	0	0	3	
8	Data Communication Lab (3-2)	0	0	2	1	
9	Communication Systems (4-1)	3	0	0	3	
10	Communication Systems Lab (4-1)	0	0	2	1	
Total		15	0	10	20	

DEGREE IN MINOR DISCIPLINE B.Tech Minors in Electronics and Communication Engineering (T RACK-4: VLSI DESIGN)						
S.NO.	COURSE NAME	L	T	P	CREDITS	OFFERED TO
1	Analog Electronics (2-2)	3	0	0	3	Other Departments except ECE
2	Analog Electronics Lab (2-2)	0	0	2	1	
3	Digital Logic Design (3-1)	3	0	0	3	
4	Digital Logic Design Lab (3-1)	0	0	2	1	
5	Linear & Digital IC Applications (3-2)	3	0	0	3	
6	LDIC Lab (3-2)	0	0	2	1	
7	VLSI Technology (3-2)	3	0	0	3	
8	VLSI Lab (3-2)	0	0	2	1	
9	Low Power VLSI (4-1)	3	0	0	3	
10	CMOS VLSI Design Lab (4-1)	0	0	2	1	
Total		15	0	10	20	

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinor in IoT	IOT LAB					
			0	0	2	1
Pre-requisites: Embedded Systems, Communication Standard Protocols						
Course Objectives:						
6. Classify the latest microcontrollers with application development						
7. Plan about the product design and prototyping.						
8. Build interconnection and integration of the physical world and the cyberspace.						
9. Construct the IOT Devices.						
10. Apply to develop the IOT Devices.						
Course Outcomes: At the end of the course, the student will be able to						
C202.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C202.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C202.3	Explain the application areas of IOT					
C202.4	Discuss about the importance of Cloud in IOT					
List of Experiments						
(All experiments are required to be conducted)						
1	Familiarization with Arduino/Raspberry Pi and perform necessary software installation.					
2	To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.					
3	To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.					
4	To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.					
5	To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.					
6	To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.					
7	To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.					

	8	To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
	9	Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to Thingspeak cloud.
	10	Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from Thingspeak cloud.

Reference Books:

	1	Vijay Madisetti, Arshdeep Bahga, Internet of Things, "A Hands on Approach", University Press, 2015.
	2	Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C202.1									2	3		2			
	C202.2								2	2	3		2			
	C202.3	2			3											2
	C202.4	2			3											3
	Avg.	2			3				2	2	3		2			2.5



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinor in IoT	INTRODUCTION TO SECURITY OF CYBER-PHYSICAL SYSTEMS					
			3	0	0	3
Pre-requisites:						
Course Objectives:						
1. To understand CPS basics and implementation.						
2. To understand different cyber threats.						
3. To understand possible vulnerabilities, impacts and solutions.						
4. To understand SCADA based control systems.						
5. To understand legal and privacy aspects and Risk Management in CPS.						
Course Outcomes: At the end of the course, the student will be able to						
C301.1	:	Aware CPS basics and implementation.				
C301.2	:	Aware different cyber threats.				
C301.3	:	Aware possible vulnerabilities, impacts and solutions.				
C301.4	:	Aware SCADA based control systems.				
C301.5	:	Aware various legal and privacy aspects and Risk Management in CPS.				
UNIT – I			10	hrs		
Introduction to Industrial Control Systems and Operations, Industrial Network Protocols, Cyber Physical System Modeling, Plant Models, Feed Back Control Model, and Anomaly Detection Models.						
UNIT – II			10	hrs		
CPSS: Concepts and Principles, Securing Industrial Control Systems, Advanced Cyber-Physical Systems Security Concepts, Cyber threat model - Types of Cyber Threats to Industrial Critical System Modeled in a 3 dimensional Attack Space.						
UNIT – III			10	hrs		
Critical Infrastructures such as Power Grid, Railways Systems, Transportation Systems, Water/Sewage Systems and their automation architecture, Vulnerabilities, and Past Cases of Cyber Security Compromises and Trends. Stuxnet Case Study						
UNIT – IV			10	hrs		
SCADA Based Control, Sensors (IEDs, PLCs), field network and its protocols (profibus, DNP3 etc).						
UNIT – V			10	hrs		
ICS/SCADA Security, IoT Security, Legal and Privacy Aspects, CPSS: Risk Management.						
Text Books						
1	Handbook on Securing Cyber-Physical Critical Infrastructure, Sajal K. Das, Krishna Kant, Nan Zhang, Morgan Kaufmann (Elsevier), ISBN 978-0-12-415815-3, 2012.					
2	R. Rajkumar, D. de. Niz and M. Klein, Cyber Physical Systems, Addison-Wesely, 2017.					

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinor in IoT		INTRODUCTIONTOINDUSTRY4.0AND INDUSTRIALIIOT				
			3	0	0	3
Pre-requisites: Internet of Things (IOT), Cloud Platforms , Services and its Protocols						
Course Objectives:						
1.To acquire knowledge on History of IIoT						
2. To acquire knowledge on Overview of IoT components.						
3.To acquire the knowledge on Types of Protocols						
4.To acquire knowledge on IIoT cloud platforms						
5.To acquire knowledge on Industrial IoT- Applications						
Course Outcomes: At the end of the course, the student will be able to						
C302.1	:	Aware elements of IIoT				
C302.2	:	Awarevarious sensors, transducers and Actuators				
C302.3	:	Apply various protocols for development of IIoT Applications				
C302.4	:	Analyse various cloud platforms of IIOT				
C302.5	:	Analyse various prototypes related to Industrial IoT- Applications				
UNIT – I					10	hrs
Introduction to IoT, IoT Vs. IIoT, History of IIoT, Components of IIoT -Sensors, Interface, Networks, IOT Market, Trends & future Real life examples, Role of IIoT in Manufacturing Processes/						
UNIT – II					10	hrs
Architectures of IIoT, Advantages & disadvantages, IIoT System components : Introduction to Sensors, Transducers, Actuators, Role of sensors in IIoT, special requirements for IIoT sensors.						
UNIT – III					10	hrs
Protocols: Need of protocols; Types of Protocols, Wi-Fi direct, Zigbee, I2C, IIoT protocols –MQTT, 6LoWPAN, AMPQ.						
UNIT – IV					10	hrs
IIoT cloud platforms: Overview of Predix, PTC Thing Worx, Microsoft Azure etc, cloud services. Security: Vulnerabilities of IoT, Privacy, Security requirements, Threat analysis.						
UNIT – V					10	hrs
Industrial IoT- Applications: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security, Facility Management.						
Text Books						
1	Industry 4.0: The Industrial Internet of Things, Alasdair Gilchrist Publications: A press.					
2	Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications, by Daniel Minoli, Bernd Scholz-Reiter, Florian, Wiley Publication.					

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KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinor in IoT	IOT WITH AURDINO & RASPBERRY PI					
			3	0	0	3
Pte-requisites: Embedded Systems, Microprocessors & Micro controllers						
Course Objectives:						
11.Describe the concepts of IoT along with its applications.						
12.To impart knowledge on IoT and Machine to Machine application areas						
13.Identify different types of sensors, actuators and communication Protocols.						
4. Build a prototype using Raspberry pi.						
5. To make the students understand the implementation of IoT for various applications.						
Course Outcomes: At the end of the course, the student will be able to						
C303.1	:	Aware internet of Things and its hardware and software components				
C303.2	:	Interface I/O devices .				
C303.3	:	Interfacesensors & communication modules .				
C303.4	:	Remotely monitor data and control devices.				
C303.5	:	Design real time IoT based applications .				
UNIT – I				10	hrs	
INTRODUCTION TO IoT: Microprocessor, Microcontroller, Embedded System, Definition of IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, IoT Enabling Technologies, IoT levels & Deployment Templates, IoT Applications						
UNIT – II				10	hrs	
IOT WITH ARDUINO: Introduction to the Arduino, Creating an Arduino programming Environment, Using the Arduino IDE, Creating an Arduino program, Using Libraries, Working with Digital Interfaces, Interfacing with Analog devices, Adding Interrupts, Communicating with devices, Using sensors, Working with Motors, Using an LCD.						
UNIT – III				10	hrs	
SENSORS AND ACTUATORS: Introduction, Sensor, Types of Sensors, Actuators, classification of Actuators. Technologies used in IoT: Bluetooth, Bluetooth Low Energy (BLE), WiFi, LiFi, Cellular Networks, Z-Wave,X-10,Sig fox, ZigBee, LoRaWAN, 6LowPAN, 5-G, LPWAN, RFID and NFC,WSN. COMMUNICATION PROTOCOLS: CoAP, MQTT, XMPP, DDS,AMQP, REST,HTTP						
UNIT – IV				10	hrs	
IoT WITH RASPBERRY PI : IoT PHYSICAL DEVICES & ENDPOINTS: Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces, Programming Raspberry Pi with Python, Controlling LED with Raspberry Pi, Interfacing an LED and Switch with Raspberry Pi, Interfacing a Light Sensor (LDR) with Raspberry Pi.						
UNIT – V				10	hrs	

.IoT PHYSICAL SERVERS & CLOUD OFFERINGS: Python Packages for IoT, WAMP - AutoBahn for IoT, Python Web Application Framework – Django,Amazon Web Services for IoT, SkyNet IoT messaging platform.

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			L	T	P	Cr.
B.TechMinor in IoT	IOT WITH AURDINO & RASPBERRY PI LAB					
			0	0	2	1
Pre-requisites: Embedded Systems, Microprocessors & Microcontrollers						
Course Objectives:						
7. To implement IoT applications using Arduino						
8. To implement IoT applications using Raspberry Pi						
Course Outcomes: At the end of the course, the student will be able to						
C304.1	Compile the data, organize and analyse it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C304.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C304.3	Implement IoT applications using Arduino.					
C304.4	Implement IoT applications using Raspberry Pi.					
List of Experiments (All experiments are required to be conducted)						
1	Install IDE of Arduino and write a program using Arduino IDE to blink LED.					
2	Interface LED and buzzer with Arduino to buzz for a period of time.					
3	Interface RGB LED with Aurdino to obtain different colours and brightness using PWM.					
4	a) Control a servo motor using Arduino with an input given through a push button. (e.g: When the push button is pressed the servo motor has to rotate by 15 degrees) b) Rotate Stepper motor either clockwise or anti clockwise at ‘n’ number of steps using Arduino.					
5	Write a program to read the data from the RFID tag and display the information on the display board using Arduino and control LED (e.g: if it is a valid card then the LED should be ON otherwise OFF)					
6	Interface analog/digital sensors with Arduino and analyse the corresponding readings. (Sensors like temperature, alcohol, humidity, pressure, gas, sound pollution, level, weight, flow, proximity, LDR, PIR, pulse, vibration, sound etc..)					
7	Demonstration of setup & working of Raspberry Pi.					
8	Interface RGB LED with Raspberry Pi to obtain different colours and brightness using PWM.					

9	Interface an ultrasonic sensor with Raspberry pi to print distance readings on the monitor when the sensor changes its position. b) Reading the data from an analog sensor with Raspberry using Arduino serial port or ADC MCP3208 using SPI.
10	Send real-time sensor data to a smartphone using Raspberry Pi onboard Bluetooth.
Reference Books:	
1	Donald Norris, Internet of things_ do-it-yourself projects with Arduino, Raspberry Pi, and Beagle Bone Black, 1st Edition, McGraw-Hill,2015.
2	Richard Blum, Arduino Programming in 24 Hours, Sams Teach Yourself, Pearson Education, 2017.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C304.1									2	3		2			
C304.2								2	2	3		2			
C304.3	2			3											3
C304.4	2			3											2
Avg.	2			3				2	2	3		2			2.5

	1	Ubiquitous Computing Fundamentals, John Krumm, CRC Press, 2019.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinor in Signal Processing	ANALOG ELECTRONICS LAB					
			0	0	2	1
Pre-requisites: Intermediate Physics and Mathematics						
Course Objectives:						
9. To familiarize with lab equipment like power supplies, function generators, CROs, DMMs						
10. To study the characteristics of semiconductor diodes and transistors						
11. To determine the frequency response of amplifiers using BJT and FETs						
Course Outcomes: At the end of the course, the student will be able to						
C202.1	Compile the data, organize and analyse it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C202.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C202.3	Design and implement amplifier and oscillator circuits using BJT and JFET.					
C202.4	Design and implement basic circuits using IC (OPAMP and 555 timers).					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Measurement of current, voltage, frequency and phase shift of signal in a RC network using oscilloscope.					
2	Clipping circuits using diodes Clamping circuits using diodes					
3	Design and testing of simple Zener voltage regulator.					
4	RC coupled amplifier using BJT in CE configuration-Measurement of gain, BW and plotting of frequency response					
5	JFET amplifier-Measurement of gain, BW and plotting of frequency response.					
6	Op-amp circuits – Design and set up of inverting and non-inverting amplifier, scale changer, adder, integrator, and differentiator.					
7	Op-amps circuits – Scale changer, adder, integrator, and differentiator.					
8	Waveform generation– Square, triangular and saw tooth waveform generation using OP AMPs.					

	9	Basic comparator and Schmitt trigger circuits using Op-amp (Use comparator ICs such as LM311).
	10	Astable and Monostable circuit using 555 IC.
	11	RC phase shift oscillator using Op-amp.
	12	FET-CS Amplifier
	Reference Books:	
	1	Floyd T.L., Fundamentals of Analog Circuits,, Pearson Education, 2012
	2	Millman J. and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw-Hill, 2010.

CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
	C202.1									2	3		2			
	C202.2								2	2	3		2			
	C202.3	2			3											3
	C202.4	2			3											2
	Avg.	2			3				2	2	3		2			2.5



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			L	T	P	Cr.
B.TechMinor in Signal Processing	DIGITAL ELECTRONICS					
			3	0	0	3
Pre-requisites: Mathematics						
Course Objectives:						
1. To solve a typical number base conversion and analyze new error coding techniques. 2. Theorems and functions of Boolean algebra and behavior of logic gates. 3. To optimize logic gates for digital circuits using various techniques. 4. Boolean function simplification using Karnaugh maps and Quine-Mc Cluskey methods. 5. To understand concepts of combinational circuits. 6. To develop advanced sequential circuits.						
Course Outcomes: At the end of the course, the student will be able to						
C301.1	:	Apply the Complements & Parity concepts for numbers systems and Hamming codes.				
C301.2	:	Compute K-map for minimization of logic functions.				
C301.3	:	Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.				
C301.4	:	Design and analyze the different multivibrators.				
C301.5	:	Interpret the different time base generators and also explain the principles of synchronization and sampling gates.				
UNIT – I					10	hrs
REVIEW OF NUMBER SYSTEMS & CODES: Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members. Gray code, 4 bit codes; BCD, Excess-3, 2421, 84-2-1 code etc. Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.						
BOOLEAN THEOREMS AND LOGIC OPERATIONS: Boolean theorems, principle of complementation & duality, De Morgan theorems. Logic operations; Basic logic operations-NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations.						
UNIT – II					10	hrs
MINIMIZATION TECHNIQUES: Minimization and realization of switching functions using Boolean theorems, K Map (up to 6 variables) and tabular method (Quine-Mc Cluskey method) with only four variables and single function.						
COMBINATIONAL LOGIC CIRCUITS DESIGN: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-						

	subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converters using Karnaugh method and draw the complete circuit diagrams.

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			L	T	P	Cr.
B.TechMinor in Signal Processing			DIGITAL ELECTRONICS LAB			
			3	0	0	1
Pre-requisites: Breadboard & ICs Working Models						
Course Objectives:						
1. To optimize logic gates for digital circuits using various techniques. 2. To understand the theorems and functions of Boolean algebra and behavior of logic gates. 3. To understand the concepts of combinational circuits 4. To develop the advanced sequential circuits. 5. To solve a typical number base conversion and analyze new error coding techniques.						
Course Outcomes: At the end of the course, the student will be able to						
C302.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
C302.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
C302.3	:	Verify functional tables of various combinational circuits				
C302.4	:	Design and verify functional tables of various sequential circuits.				
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
	1.	Study the pin diagram and obtain truth table for the following relevant ICs 7400, 7402, 7404, 7408, 7432, 7486.				
	2.	Study the pin diagram and obtain truth table for the following relevant ICs 7442, 7447, 7485, 74154, 7474,7475,7476,7490,7493,74121				
	3.	Verification of truth tables of Logic gates Two input (i)OR (ii)AND (iii)NOR (iv)NAND (v) Exclusive OR (vi) Exclusive NOR				
	4.	Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit				
	5.	Verification of functional table of 3 to 8 line Decoder/De-multiplexer				
	6.	4 variable logic function verification using 8-to-1 multiplexer.				
	7.	Design full adder circuit and verify its functional table.				

8.	Verification of functional tables of JK Edge triggered Flip-Flop
9.	Verification of functional tables of D Flip-Flop
10.	Verification of functional tables of JK Master Slave Flip-Flop
11.	Design a four bit ring counter using D Flip-Flops and verify output
12.	Design a four bit ring counter using JK Flip Flop and verify output

Reference Books:

1	Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006.
2	Digital Electronics by R S Sedha, S. Chand & Company Limited, 2010.
3	Switching Theory and Logic Design by A. Anand Kumar, PHI Learning Pvt Ltd, 2016.
4	Digital Logic Applications and Design by John M Yarbough, Cengage Learning, 2006.
5	TTL74-Series data book.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO2	PS O3
C302.1									2	3		2			
C302.2								2	2	3		2			
C302.3			3						2						2
C302.4			3						2						3
Avg.			3					2	2	3		2			2.5



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinor in Signal Processing	SIGNALS AND SYSTEMS					
			3	0	0	3
Pre-requisites: Basic knowledge of integration, differentiation and complex numbers						
Course Objectives:						
1. To study about signals and systems. 2. To analyze the spectral characteristics of signal using Fourier series and Fourier transforms. 3. To understand the characteristics of systems. 4. To introduce the concept of sampling process 5. To know various transform techniques to analyze the signals and systems.						
Course Outcomes: At the end of the course, the student will be able to						
C303.1	:	Categorizing the fundamentals of various signals & systems and analyze the continuous-time signals				
C303.2	:	Analyze the spectral characteristics of signal using Fourier series and Fourier transforms				
C303.3	:	Define LTI systems and describe the signal transmission through linear systems				
C303.4	:	Distinguish between convolution and correlation operations and also various sampling techniques.				
C303.5	:	Apply the Laplace transforms & Z transforms to analyze CT and DT signals.				
UNIT – I					10	hrs
INTRODUCTION: Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude- shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function. Analogy between vectors and signals, orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, closed or complete set of orthogonal functions, Orthogonality in complex functions. Related Problems.						
UNIT – II					10	hrs
FOURIER SERIES AND FOURIER TRANSFORMS: Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Relation between Trigonometric and Exponential Fourier series, Complex Fourier spectrum. Deriving Fourier transform from Fourier series, Fourier transform of arbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals, properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Introduction to Hilbert Transform. Related Problems.						

UNIT – III												10	hrs			
ANALYSIS OF LINEAR SYSTEMS: Introduction, Linear system, impulse response, Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV) system, Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Transfer function of a LTI system, Related problems. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.																
UNIT – IV												10	hrs			
CORRELATION: Auto-correlation and cross-correlation of functions, properties of correlation function, Energy density spectrum, Parseval’s theorem, Power density spectrum, Relation between Convolution and correlation, Detection of periodic signals in the presence of noise by correlation, Extraction of signal from noise by filtering. SAMPLING THEOREM: Graphical and analytical proof for Band Limited Signals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, Introduction to Band Pass sampling, Related problems.																
UNIT – V												10	hrs			
LAPLACE TRANSFORMS: Introduction, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of LT’s, Inverse Laplace transform, Relation between LT’s, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis. Z–TRANSFORMS: Concept of Z- Transform of a discrete sequence. Region of convergence in Z- Transform, constraints on ROC for various classes of signals, Inverse Z- transform, properties of Z-transforms. Distinction between Laplace, Fourier and Z transforms																
Text Books																
1	Signals, Systems & Communications - B.P. Lathi, BSPublications,2003.															
2	Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI,2nd Edn.,1997															
Reference Books																
1	Principles of Linear Systems and Signals – BP Lathi, Oxford University Press,2015															
2	Signals and Systems – T K Rawat, Oxford University Press,2011															
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PSO 3
	C303.1	2	2	3	2								1	2		
	C303.2	2	2	3	2									2		
	C303.3	2	2	3	2									2		
	C303.4	2	2	3	2									2		
	C303.5	2	2	3	2									2		
	Avg.	2	2	3	2								1	2		



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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinor in Signal Processing	SIGNAL PROCESSING LAB					
			0	0	2	1
Pre-requisites: Basic knowledge in Signal Processing						
Course Objectives:						
1. To study about various signals and systems. 2. To analyze the spectral characteristics of signal using Fourier series and Fourier transforms. 3. To understand the characteristics of systems. 4. To introduce the concept of sampling process						
Course Outcomes: At the end of the course, the student will be able to						
C304.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C304.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker					
C304.3	Demonstrate skills in evaluating various operations on signals to provide feasible solutions.					
C304.4	Analyze and relate the experimental observations on Transform Techniques.					
List of Experiments (Any of the 10 experiments are required to be conducted)						
1	Basic Operations on Matrices					
2	Generation of Various Signals and Sequences (Periodic and A periodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.					
3	Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.					
4	Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal					
5	Convolution between Signals and sequences.					
6	Auto Correlation and Cross Correlation between Signals and Sequences					
7	Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.					
8	Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.					

	9	Gibbs Phenomenon
	10	Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
	11	Waveform Synthesis using Laplace Transform.
	12	Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function
	13	Sampling Theorem Verification.
	Reference Books:	
	1	Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
	2	Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.,1997
	CO-PO/PSO Mapping Matrix	
	CO	PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 P O 12 PS O1 PS O2 PS O3
	C304.1	
	C304.2	
	C304.3	
	C304.4	
	Avg.	



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

			L	T	P	Cr.
B.TechMinor in Signal Processing	INTRODUCTION TO DIGITAL SIGNAL PROCESSING					
			3	0	0	3
Pre-requisites: Knowledge on Signals and Systems						
Course Objectives:						
6. To describe signals mathematically and understand how to perform mathematical operations on signals.						
7. To know the importance of FFT algorithm for computation of Discrete Fourier Transform.						
8. To understand the various implementations of digital filter structures.						
9. To learn the FIR and IIR Filter design procedures.						
10.To learn the concepts of DSP Processors.						
Course Outcomes: At the end of the course, the student will be able to						
C305.1	:	Classify different types of discrete signals & systems and apply Z-Transform technique to solve difference equations.				
C305.2	:	Compute DFT using FFT algorithms and derive DFT properties for DSP operations.				
C305.3	:	Design and implement different IIR filters for specific applications.				
C305.4	:	Design and implement different FIR filters for specific applications.				
C305.5	:	Analyze the architecture of DSP Processor & ARM processor.				
	UNIT – I			10	hrs	
INTRODUCTION: Introduction to Digital Signal Processing: Discrete time signals & sequences, Classification of Discrete time systems, stability of LTI systems, Invertability, Response of LTI systems to arbitrary inputs. Solution of Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems, Review of Z transforms, solution of difference equations using Z-transforms.						
	UNIT – II			10	hrs	
DISCRETE FOURIER TRANSFORMS: Properties of discrete Fourier series, DFS representation of periodic sequences, Discrete Fourier transforms: Properties of DFT, linear filtering methods based on DFT, Fast Fourier transforms(FFT)-Radix-2decimationin time and decimation in frequency FFT Algorithms, Inverse FFT.						
	UNIT – III			10	hrs	
DESIGN OF IIR DIGITAL FILTERS & REALIZATIONS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, Design Examples, Analog and Digital frequency transformations. Basic structures of IIR systems						
	UNIT – IV			10	hrs	
DESIGN OF FIR DIGITAL FILTERS & REALIZATIONS: Characteristics of FIR Digital						

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING**

			L	T	P	Cr.
B.TechMinors in Signal Processing	DIGITAL SIGNAL PROCESSING LAB					
			0	0	3	1.5
Pre-requisites: Knowledge on MATLAB commands						
Course Objectives:						
1. Understand the generation of the signals.						
2. Understand the operations on discrete signals i.e., linear convolution DFT, FFT.						
3. Design IIR and FIR filters using window techniques.						
Course Outcomes: At the end of the course, the student will be able to						
C306.1	Compile the data, organize and analyse it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C306.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C306.3	Perform generation and operations of digital signals.					
C306.4	Implement digital FIR and IIR filters.					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Generation of discrete time signals for discrete signals.					
2	To verify the Linear Convolution using MATLAB					
3	To verify the Circular Convolution for discrete signals using MATLAB					
4	To verify Discrete Fourier Transform(DFT)					
5	To verify Inverse Discrete Fourier Transform (IDFT)					
6	To verify Fast Fourier Transform(FFT)					
7	To verify Inverse Fast Fourier Transform(IFFT)					
8	Frequency Response of IIR LPF(Analog & Digital)					
9	Frequency Response of IIR HPF(Analog & Digital)					
10	To Design FIR (LPF & HPF) using Rectangular window					

	11	To Design FIR (LPF & HPF) using Bartlett window														
	12	Auto correlation and cross correlation of given sequences.														
	Reference Books:															
	1	https://mrcet.com/downloads/ECE/DSP%20Lab%20Manual.pdf														
	2	https://www.scribd.com/document/403467288/DSP-lab-manual-pdf														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3
	C306.1									2	3		2			
	C306.2								2	2	3		2			
	C306.3					3										3
	C306.4					3										3
	Avg.					3			2	2	3		2			3



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			L	T	P	Cr.
B.TechMinors in Signal Processing	DIGITALIMAGEPROCESSING					
			3	0	0	3
Pre-requisites: IntermediatePhysicsandMathematics						
Course Objectives:						
1. Tointroducethefundamentaltechniquesandalgorithmsusedforacquiring,processingandextractinginfor mation from digital images						
2. Tocomprehendtherelationbetweenhumanvisualsystemandmachineperceptionandprocessingofdigital images						
3. Tointroducetheconceptsof imageprocessingandbasic analyticalmethods tobeusedin imageprocessing						
4. Tofamiliarizestudentswithimageenhancementandrestorationtechniques						
5. Toprovideadetailedapproachtowardsimageprocessingapplicationslikeenhancement,segmentation,and compression						
Course Outcomes: At the end of the course, the student will be able to						
C401.1	:	Interpretthelimitationsofthecomputationalmethodsondigitalimages				
C401.2	:	Develop Fourier transform for imageprocessingin frequencydomain.				
C401.3	:	Illustratethespatialandfrequencydomainimagetransformsonenhancementandrestorationofima ges.				
C401.4	:	Utilizetheimageenhancementtechniques.				
C401.5	:	Definetheneedforcompressionandevaluatethebasiccompressionalgorithms.				
UNIT – I					10	hrs
DIGITALIMAGEFUNDAMENTALS&IMAGETRANSFORMS: DigitalImageFundamentals,SamplingandQuantization,RelationshipbetweenPixels.ImageTransforms:2- DFFT,Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform,SlantTransform, HotellingTransform						
UNIT – II					10	hrs
IMAGEENHANCEMENT:Introduction,ImageEnhancementinSpatialDomain,Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, LinearandNon- LinearGrayLevelTransformation,LocalorNeighborhoodcriterion,SpatialFilters:MedianFilter,Low Pass and High Pass Filtering. ImageEnhancement(FrequencyDomain):FilteringinFrequencyDomain,LowPass(Smoothing)andHighPas s (Sharpening)Filters in FrequencyDomain						
UNIT – III					10	hrs
IMAGE RESTORATION: Degradation Model, Algebraic Approach to Restoration,Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, InteractiveRestoration.						
UNIT – IV					10	hrs

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KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
Chowdavaram, Guntur – 522019, Andhra Pradesh
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinors in Signal Processing	IMAGE PROCESSING LAB					
			0	0	2	1
Pre-requisites: IntermediatePhysicsandMathematics						
Course Objectives:						
1.To study the image fundamentals and mathematical transforms necessary for image processing.						
2.To study the image enhancement techniques.						
3.To study image restoration procedures.						
4.To study the image compression procedures.						
Course Outcomes: At the end of the course, the student will be able to						
C402.1	Compile the data, organize and analyse it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C402.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C403.3	Evaluate the techniques for image enhancement and image restoration.					
C404.4	Interpret image segmentation and representation techniques.					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Simulation and Display of an Image, Negative of an Image (Binary & Gray Scale)					
2	Implementation of Relationships between Pixels					
3	Implementation of Transformations of an Image					
4	Contrast stretching of a low contrast image, Histogram and Histogram Equalization					
5	Display of bit planes of an Image					
6	Display of FFT (1-D & 2-D) of an image					
7	Computation of Mean, Standard Deviation and Correlation coefficient of the given Image					
8	Implementation of image sharpening filters and Edge Detection using Gradient Filters					
9	Implementation of Image Smoothing Filters (Mean filtering of an Image)					
10	Implementation of Image Smoothing Filters (Median filtering of an Image)					

	11	Implementation of Image Intensity slicing technique for image enhancement.														
	12	Image Compression by DCT, DPCM, Huffmann coding 11. Implementation of image restoring techniques														
	Tools:															
	Cadence/Synopsis/ Mentor Graphics/Tanner/equivalent EDA Tools															
	Reference Books:															
	1	Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools – Scotte Umbaugh, 2nd Ed, CRC Press, 2011														
	2	Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, Mc Graw Hill Education, 2010.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PS O3
	C402.1									2	3		2			
	C402.2								2	2	3		2			
	C403.3	2			3											3
	C404.4	2			3											2
	Avg.	2			3				2	2	3		2			2.5

[illegible]



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinors in Communication Engineering	ANALOG ELECTRONICS LAB					
			0	0	2	1
Pre-requisites: Intermediate Physics and Mathematics						
Course Objectives:						
1. To familiarize with lab equipment like power supplies, function generators, CROs, DMMs						
2. To study the characteristics of semiconductor diodes and transistors						
3. To determine the frequency response of amplifiers using BJT and FETs						
Course Outcomes: At the end of the course, the student will be able to						
C202.1	Compile the data, organize and analyse it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C202.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C202.3	Design and implement amplifier and oscillator circuits using BJT and JFET.					
C202.4	Design and implement basic circuits using IC (OPAMP and 555 timers).					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	Measurement of current, voltage, frequency and phase shift of signal in a RC network using oscilloscope.					
2	Clipping circuits using diodes					
	Clamping circuits using diodes					
3	Design and testing of simple Zener voltage regulator.					
4	RC coupled amplifier using BJT in CE configuration-Measurement of gain, BW and plotting of frequency response					
5	JFET amplifier-Measurement of gain, BW and plotting of frequency response.					
6	Op-amp circuits – Design and set up of inverting and non-inverting amplifier, scale changer, adder, integrator, and differentiator.					
7	Op-amps circuits – Scale changer, adder, integrator, and differentiator.					
8	Waveform generation– Square, triangular and saw tooth waveform generation using OP AMPs.					

	9	Basic comparator and Schmitt trigger circuits using Op-amp (Use comparator ICs such as LM311).
	10	Astable and Monostable circuit using 555 IC.
	11	RC phase shift oscillator using Op-amp.
	12	FET-CS Amplifier

Reference Books:

	1	Floyd T.L., Fundamentals of Analog Circuits,, Pearson Education, 2012
	2	Millman J. and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw-Hill, 2010.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PS O3
	C202.1									2	3		2			
	C202.2								2	2	3		2			
	C202.3	2			3											3
	C202.4	2			3											2
	Avg.	2			3				2	2	3		2			2.5



		KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS) Chowdavaram, Guntur – 522019, Andhra Pradesh DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING				
			L	T	P	Cr.
B.TechMinors in Communication Engineering	DIGITAL ELECTRONICS					
			3	0	0	3
Pre-requisites: Mathematics						
Course Objectives:						
1. To solve a typical number base conversion and analyze new error coding techniques. 2. Theorems and functions of Boolean algebra and behavior of logic gates. 3. To optimize logic gates for digital circuits using various techniques. 4. Boolean function simplification using Karnaugh maps and Quine-Mc Cluskey methods. 5. To understand concepts of combinational circuits. 6. To develop advanced sequential circuits.						
Course Outcomes: At the end of the course, the student will be able to						
C301.1	:	Apply the Complements & Parity concepts for numbers systems and Hamming codes.				
C301.2	:	Compute K-map for minimization of logic functions.				
C301.3	:	Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.				
C301.4	:	Design and analyze the different multivibrators.				
C301.5	:	Interpret the different time base generators and also explain the principles of synchronization and sampling gates.				
UNIT – I						
REVIEW OF NUMBER SYSTEMS & CODES: Representation of numbers of different radix, conversation from one radix to another radix,r-1’scompliments and r’s compliments of signed members. Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1codeetc.Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.						
BOOLEAN THEOREMS AND LOGIC OPERATIONS: Boolean theorems, principle of complementation & duality, De Morgan theorems. Logic operations; Basic logic operations-NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations.						
UNIT – II						
MINIMIZATION TECHNIQUES: Minimization and realization of switching functions using Boolean theorems, K Map (up to 6 variables) and tabular method (Quine-Mc Cluskey method) with only four variables and single function.						
COMBINATIONAL LOGIC CIRCUITS DESIGN: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-						

	subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converters using Karnaugh method and draw the complete circuit diagrams.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinors in Communication Engineering	DIGITAL ELECTRONICS LAB					
			0	0	2	1
Pre-requisites: Breadboard & ICs Working Models						
Course Objectives:						
1. To optimize logic gates for digital circuits using various techniques. 2. To understand the theorems and functions of Boolean algebra and behavior of logic gates. 3. To understand the concepts of combinational circuits 4. To develop the advanced sequential circuits. 5. To solve a typical number base conversion and analyze new error coding techniques.						
Course Outcomes: At the end of the course, the student will be able to						
C302.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
C302.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
C302.3	:	Verify functional tables of various combinational circuits				
C302.4	:	Design and verify functional tables of various sequential circuits.				
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1.		Study the pin diagram and obtain truth table for the following relevant ICs 7400, 7402, 7404, 7408, 7432, 7486.				
2.		Study the pin diagram and obtain truth table for the following relevant ICs 7442, 7447, 7485, 74154, 7474, 7475, 7476, 7490, 7493, 74121				
3.		Verification of truth tables of Logic gates Two input (i)OR (ii)AND (iii)NOR (iv)NAND (v) Exclusive OR (vi) Exclusive NOR				
4.		Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit				
5.		Verification of functional table of 3 to 8 line Decoder/De-multiplexer				
6.		4 variable logic function verification using 8-to-1 multiplexer.				
7.		Design full adder circuit and verify its functional table.				

	8.	Verification of functional tables of JK Edge triggered Flip–Flop
	9.	Verification of functional tables of D Flip-Flop
	10.	Verification of functional tables of JK Master Slave Flip–Flop
	11.	Design a four bit ring counter using D Flip–Flops and verify output
	12.	Design a four bit ring counter using JK Flip Flop and verify output

Reference Books:

1	Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006.
2	Digital Electronics by R S Sedha, S. Chand & Company Limited, 2010.
3	Switching Theory and Logic Design by A. Anand Kumar, PHI Learning Pvt Ltd, 2016.
4	Digital Logic Applications and Design by John M Yarbough, Cengage Learning, 2006.
5	TTL74-Series data book.

CO-PO/PSO Mapping Matrix

	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
	C302.1									2	3		2			
	C302.2								2	2	3		2			
	C302.3			3						2						2
	C302.4			3						2						3
	Avg.			3					2	2	3		2			2.5

	Cross-correlation functions. Noise: Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth, Noise Figure.

[illegible]

	1	Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004.														
	2	Communication Systems–R.P. Singh, SP Sapre, Second EditionTMH,2007.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	P O 11	P O 12	PS O1	PS O2	PS O3
	C304.1									2	3		2			
	C304.2								2	2	3		2			
	C304.3				3					2						
	C304.4					3										
	Avg.				3	3			2	2	3		2			

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr
B.TechMinors in Communication Engineering		DATA COMMUNICATION LAB				
			0	0	2	1
Pre-requisites: Basics of Communication Systems, Coding Theory						
Course Objectives:						
7. To gain knowledge in network topology, reference models, various transmission media and ISDN techniques.						
8. To illustrate data link layer design issues, medium access sublayer protocols, routing in computer networking						
9. To summarize transport layer and application layer functions.						
10. To classify protocols used in different layers of the computer network.						
11. To understand concepts of network security, domain name service, network management protocol.						
Course Outcomes: At the end of the course, the student will be able to						
C306.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C306.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C306.3	To implement different topologies.					
C306.4	To design the data network.					
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1	To study different types of transmission media.					
2	To study quadrature phase shift keying modulation.					
3	Study & analysis of QAM modulation					
4	To study serial interface RS– 232					
5	To study PC to PC communication using parallel port					
6	To study LAN using star topology.					
7	To study LAN using bus topology.					
8	To study LAN using tree topology.					
9	To study configure modem of computer.					

	10	To configure hub/switch.														
	11	To study interconnections of cables for data communication.														
	12	To study fiber optic communication														
	13	To study wireless communication														
	14	To study PC-PC communication using LAN														
	Reference Books:															
	1	AndrewSTanenbaum — ComputerNetworksl, 5 th Edition,PHI,2013.														
	2	BehrouzA. Forouzan— DataCommunicationsandNetworkingl,3 rd Edition,TMH,2002														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	P O 11	P O 12	PS O1	PS O2	PS O3
	C306.1									2	3		2			
	C306.2								2	2	3		2			
	C306.3	2			3											3
	C306.4	2			3											3
	Avg.	2			3				2	2	3		2			2.5



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinors in Communication Engineering	COMMUNICATION SYSTEMS					
			3	0	0	3
Pre-requisites: Signal and systems, Analog communications, Digital communications						
Course Objectives:						
1. To develop a fundamental understanding on communication systems with emphasis on analog and digital modulation techniques.						
2. To get introduced to the basics of error control coding techniques						
Course Outcomes: At the end of the course, the student will be able to						
C401.1	:	Aware basics of Analog Modulation.				
C401.2	:	Aware basics of Angle Modulation.				
C401.3	:	Aware basics of Pulse Modulation.				
C401.4	:	Aware error control coding techniques.				
C401.5	:	Summarize different types of communication systems.				
UNIT – I					10	hrs
Basic blocks of Communication System Analog Modulation - Principles of Amplitude Modulation, DSBSC, SSB-SC and VSB-SC, AM transmitters and receivers.						
UNIT – II					10	hrs
Angle Modulation - Frequency and Phase Modulation Transmission Bandwidth of FM signals, Methods of generation and detection, FM Transmitters and Receivers.						
UNIT – III					10	hrs
Sampling theorem - Pulse Modulation Techniques PAM, PWM and PPM concepts - PCM system – Data transmission using analog carriers (BASK, BFSK, BPSK, QPSK).						
UNIT – IV					10	hrs
Error control coding techniques Linear block codes- Encoder and decoder, Cyclic codes – Encoder, Syndrome Calculator, Convolution codes.						
UNIT – V					10	hrs
Modern Communication Systems Microwave communication systems, Optical communication system, Satellite communication system, Mobile communication system.						
Text Books						
1	Simon Haykins, ‘Communication Systems’, John Wiley, 3rd Edition, 1995.					

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinors in Communication Engineering	COMMUNICATION SYSTEMS LAB					
			0	0	2	1
Pre-requisites: signal and systems, DSP						
Course Objectives:						
1. To provide a comprehensive introduction to the study of signal processing techniques in Communication systems.						
2. To address implementation concerns and architectures in signal processing algorithms for digital transceivers						
3. To facilitate design of advanced and customized signal processing routines for challenges in design of communication systems.						
Course Outcomes: At the end of the course, the student will be able to						
C402.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C402.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C402.3	Analyze the modern signal processing techniques					
C402.4	Develop signal processing algorithms for specific and domain based applications.					
List of Experiments (Any of the 10 experiments are required to be conducted)						
1	Sampling – low pass and band limited					
2	Numerical computation of DFT					
3	Design and analysis of digital filters – optimization approach					
4	Interpolation and decimation – time and frequency domain analysis					
5	Fractional rate conversion					
6	Realization of resampling filters					
7	Polyphase and CIC structures					
8	Wavelet using resampling filters					
9	Carrier acquisition and tracking					

	10	Timing recovery														
	11	Channel equalization														
	12	QAM transceiver														
	Reference Books:															
	1	Fredric J Harris, Multirate Signal Processing for Communication Systems, Pearson Education, 2004.														
	2	Behrouz Farhang-Boroujeny, Signal Processing Techniques for Software Radios, Lulu Publishing House, 2008.														
	3	Paolo Prandoni, Martin Vetterli, Signal Processing for Communications, EPFL Press, 2008.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	P O 11	PO 12	PSO 1	PSO 2	PS O 3
	C402.1									2	3		2			
	C402.2								2	2	3		2			
	C402.3	3	3	3	3											
	C402.4		3	3	3	3										
	Avg.	3	3	3	3	3			2	2	3		2			



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinors in VLSI Design	ANALOG ELECTRONICS					
		3	0	0	3	
Pre-requisites: Intermediate Physics and Mathematics						
Course Objectives:						
1. To learn and the basic concepts of semiconductor physics. 2. To study the physical phenomena such as conduction, transport mechanism and electrical characteristics of different diodes. 3. To learn and understand the application of diodes as rectifiers with their operation and characteristics with and without filters. 4. To acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics. 5. To learn and understand the purpose of transistor biasing and its significance. 6. To analyze Small Signal model of BJT and FET amplifiers.						
Course Outcomes: At the end of the course, the student will be able to						
C201.1	:	Explain the basic concepts of semiconductor physics and PN Junction diode characteristics.				
C201.2	:	Discuss the construction, operation, electrical characteristics of different diodes and the application of diodes as rectifiers with and without filters.				
C201.3	:	Acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.				
C201.4	:	Explain the transistor biasing, stabilization and compensation techniques				
C201.5	:	Analyze the Small Signal model of BJT and FET amplifiers.				
UNIT – I					10	hrs
Semiconductors and Diodes: Electrons- free and valence. Conductors, Insulators, and Semiconductors- definition & energy band diagrams. Properties of semiconductors. Meaning of Hole current, electron-hole pairs, recombination, doping, acceptor and donor impurities. Intrinsic and Extrinsic, N and P type semiconductors. Diode- formation, depletion region, VI Characteristics, ratings, types and applications. Zener diode- reverse bias characteristics, voltage regulation, shunt voltage regulator, and applications. Thermistor working and applications.						
UNIT – II					10	hrs
Transistors and MOSFETs: Transistors- definition, terminals, types, symbols, formation of NPN and PNP, ratings. Transistor biasing- definition, importance, list types, stabilization, thermal runaway, heat sink, and voltage divider method. List configurations and applications. Alpha and Beta- definitions, relation. CE input and output characteristics- cut off, saturation, and active regions. Transistor as a switch. List applications. FET- definition, types. MOSFET- definition, types, symbols. N type enhancement mode- construction, working, characteristics, switch. List applications and ratings. Differentiate BJT and MOSFET.						

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinors in VLSI Design	ANALOG ELECTRONICS LAB					
			0	0	2	1
	Pre-requisites: Intermediate Physics and Mathematics					
	Course Objectives:					
	1. To familiarize with lab equipment like power supplies, function generators, CROs, DMMs					
	2. To study the characteristics of semiconductor diodes and transistors					
	3. To determine the frequency response of amplifiers using BJT and FETs					
	Course Outcomes: At the end of the course, the student will be able to					
	C202.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
	C202.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
	C202.3	Design and implement amplifier and oscillator circuits using BJT and JFET.				
	C202.4	Design and implement basic circuits using IC (OPAMP and 555 timers).				
	List of Experiments (Any of the 10 experiments are required to be conducted)					
	1	Measurement of current, voltage, frequency and phase shift of signal in a RC network using oscilloscope.				
	2	Clipping circuits using diodes				
		Clamping circuits using diodes				
	3	Design and testing of simple Zener voltage regulator.				
	4	RC coupled amplifier using BJT in CE configuration-Measurement of gain, BW and plotting of frequency response				
	5	JFET amplifier-Measurement of gain, BW and plotting of frequency response.				
	6	Op-amp circuits – Design and set up of inverting and non-inverting amplifier, scale changer, adder, integrator, and differentiator.				
	7	Op-amps circuits – Scale changer, adder, integrator, and differentiator.				
	8	Waveform generation– Square, triangular and saw tooth waveform generation using OP AMPs.				
	9	Basic comparator and Schmitt trigger circuits using Op-amp (Use comparator ICs such as LM311).				

	10	Astable and Monostable circuit using 555 IC.
	11	RC phase shift oscillator using Op-amp.
	12	FET-CS Amplifier
	Reference Books:	
	1	Floyd T.L., Fundamentals of Analog Circuits,, Pearson Education, 2012
	2	Millman J. and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw-Hill, 2010.
CO-PO/PSO Mapping Matrix		
	CO	PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PO 12 PSO 1 PS O2 PS O3
	C202.1	
	C202.2	
	C202.3	2 3
	C202.4	2 3
	Avg.	2 3



		KALLAM HARANADHAREDDY INSTITUTE OF TECHNOLOGY (AUTONOMOUS) Chowdavaram, Guntur – 522019, Andhra Pradesh DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING				
			L	T	P	Cr.
B.TechMinors in VLSI Design	DIGITAL LOGIC DESIGN					
			3	0	0	3
Pre-requisites: Mathematics						
Course Objectives: 1. To solve a typical number base conversion and analyze new error coding techniques. 2. Theorems and functions of Boolean algebra and behavior of logic gates. 3. To optimize logic gates for digital circuits using various techniques. 4. Boolean function simplification using Karnaugh maps and Quine-Mc Cluskey methods. 5. To understand concepts of combinational circuits. 6. To develop advanced sequential circuits.						
Course Outcomes: At the end of the course, the student will be able to						
C301.1	:	Apply the Complements & Parity concepts for numbers systems and Hamming codes.				
C301.2	:	Compute K-map for minimization of logic functions.				
C301.3	:	Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.				
C301.4	:	Design and analyze the different multivibrators.				
C301.5	:	Interpret the different time base generators and also explain the principles of synchronization and sampling gates.				
UNIT – I						
			10	hrs		
REVIEW OF NUMBER SYSTEMS & CODES: Representation of numbers of different radix, conversation from one radix to another radix,r-1’scompliments and r’s compliments of signed members. Gray code ,4 bit codes; BCD, Excess-3, 2421, 84-2-1codeetc.Error detection & correction codes: parity checking, even parity, odd parity, Hamming code.						
BOOLEAN THEOREMS AND LOGIC OPERATIONS: Boolean theorems, principle of complementation & duality, De Morgan theorems. Logic operations; Basic logic operations-NOT, OR, AND, Universal Logic operations, EX-OR, EX-NOR operations. Standard SOP and POS Forms, NAND-NAND and NOR-NOR realizations.						
UNIT – II			10	hrs		
MINIMIZATION TECHNIQUES: Minimization and realization of switching functions using Boolean theorems, K Map (up to 6 variables) and tabular method (Quine-Mc Cluskey method) with only four variables and single function.						
COMBINATIONAL LOGIC CIRCUITS DESIGN: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-						

	subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converters using Karnaugh method and draw the complete circuit diagrams.

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.TechMinors in VLSI Design	DIGITAL LOGIC DESIGN LAB					
			0	0	2	1
Pre-requisites: Breadboard & ICs Working Models						
Course Objectives:						
1. To optimize logic gates for digital circuits using various techniques. 2. To understand the theorems and functions of Boolean algebra and behavior of logic gates. 3. To understand the concepts of combinational circuits 4. To develop the advanced sequential circuits. 5. To solve a typical number base conversion and analyze new error coding techniques.						
Course Outcomes: At the end of the course, the student will be able to						
C302.1	:	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.				
C302.2	:	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.				
C302.3	:	Verify functional tables of various combinational circuits				
C302.4	:	Design and verify functional tables of various sequential circuits.				
List of Experiments						
(Any of the 10 experiments are required to be conducted)						
1.		Study the pin diagram and obtain truth table for the following relevant ICs 7400, 7402, 7404, 7408, 7432, 7486.				
2.		Study the pin diagram and obtain truth table for the following relevant ICs 7442, 7447, 7485, 74154, 7474, 7475, 7476, 7490, 7493, 74121				
3.		Verification of truth tables of Logic gates Two input (i)OR (ii)AND (iii)NOR (iv)NAND (v) Exclusive OR (vi) Exclusive NOR				
4.		Design a simple combinational circuit with four variables and obtain minimal SOP expression and verify the truth table using Digital Trainer Kit				
5.		Verification of functional table of 3-to-8 line Decoder/De-multiplexer				
6.		4 variable logic function verification using 8-to-1 multiplexer.				
7.		Design full adder circuit and verify its functional table.				

	8.	Verification of functional tables of JK Edge triggered Flip–Flop														
	9.	Verification of functional tables of D Flip-Flop														
	10.	Verification of functional tables of JK Master Slave Flip–Flop														
	11.	Design a four bit ring counter using D Flip–Flops and verify output														
	12.	Design a four bit ring counter using JK Flip Flop and verify output														
Reference Books:																
	1	Fundamentals of Logic Design by Charles H. Roth Jr, Jaico Publishers, 2006.														
	2	Digital Electronics by R S Sedha, S. Chand & Company Limited, 2010.														
	3	Switching Theory and Logic Design by A. Anand Kumar, PHI Learning Pvt Ltd, 2016.														
	4	Digital Logic Applications and Design by John M Yarbough, Cengage Learning, 2006.														
	5	TTL74-Series data book.														
CO-PO/PSO Mapping Matrix																
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO2	PS O3
	C302.1									2	3		2			
	C302.2								2	2	3		2			
	C302.3			3						2						2
	C302.4			3						2						3
	Avg.			3					2	2	3		2			2.5



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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

			L	T	P	Cr.
B.Tech Minors in VLSI Design	LINEAR & DIGITAL IC APPLICATIONS					
		3	0	0		3
Pre-requisites: 1. Switching Theory and Logic Design 2. Electronic Circuit Analysis 3. Pulse and Digital Circuits						
Course Objectives: 1. To understand the basic operation & performance parameters of differential amplifiers. 2. To learn the linear and non-linear applications of operational amplifiers. 3. To understand the analysis & design of different types of active filters using op-amps 4. To learn the internal structure, operation and applications of different analog ICs 5. To Acquire skills required for designing and implementation of combinational and sequential logic circuits.						
Course Outcomes: At the end of the course, the student will be able to						
C303.1	:	Aware the internal operation of Op-Amp and its specifications. Analyze and design linear and non-linear applications using Op-Amp.				
C303.2	:	Classify various active filter configurations based on frequency response and construct using 741 Op-Amp.				
C303.3	:	Operate 555 timers in different modes and study their applications. Determine the lock range and capture range of PLL and use in various applications of communications.				
C303.4	:	Design and implementation of combinational logic ICs.				
C303.5	:	Design and implementation of Sequential logic ICs.				
UNIT – I					10	hrs
INTRODUCTION: Operational Amplifier: Internal block diagram of various stages of op-amp and roll of each stage. Differential Amplifier using BJT's and with R_E DC and AC analysis, basic current mirror circuit. OP-Amp Block Diagram (Symbolic Representation), Ideal and Practical Op-Amp specifications, DC and AC Characteristics, Definitions of Input and Output Off-set voltage and currents slew rate, CMRR, PSRR. etc,						
UNIT –II					10	hrs
LINEAR and NON-LINEAR APPLICATIONS OF OP-AMPS: Integrator and differentiator, Difference amplifier, Instrumentation amplifier, V to I, I to V converters. Non- Linear function generation, Comparators, Multivibrators, Triangular and Square wave generators, Log and Anti log Amplifiers.						
UNIT -III					10	hrs
ACTIVE FILTERS: Design & Analysis of Butterworth active filters – 1st order, 2nd order LPF, HPF filters. Band pass, Band reject and all pass filters.						

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			L	T	P	Cr.
B.TechMinors in VLSI Design	LDICA LAB					
			0	0	2	1
Pre-requisites: 1. Electronic Circuit Analysis 2. Pulse and Digital Circuits 3. Switching Theory and Logic Design						
Course Objectives: Tolearn design,testingandcharacterizing ofcircuitbehaviorwithdigital and analogICs.						
Course Outcomes: At the end of the course, the student will be able to						
C304.1	Compilethedata,organizeandanalyzeitfordiscussionandreportthefindings andobservationsfrom experimental learningactivities in thelaboratory.					
C304.2	Buildholisticdevelopmentandpleasingdispositionbyreviewingandcorrectingtheperformanceto become independent andautonomousthinker.					
C304.3	AcquirethebasicknowledgeaboutOperationalamplifiersanditsapplicationsandto generate various waveforms usingop-amps.					
C304.4	Designandimplementationofdifferentcombinationallogiccircuits.					
List of Experiments (Any of the 10 experiments are required to be conducted)						
1	StudyofOPAMPs–IC741–functioning,parametersandSpecifications.					
2	OPAMPApplications–Adder,Subtractor,ComparatorCircuits.					
3	IntegratorandDifferentiatorCircuits.					
4	WaveformGeneratorusingsingleOP-AMPwithvariabledutycycle.					
5	ActiveFilterApplications–LPF,HPF(firstorder)					
6	ActiveFilterApplications–BPF,BandReject(Wideband)andNotch Filters.					
7	IC555Timer–MonostableOperationCircuit,AstableOperationCircuit					
8	DesignSchmittTriggerCircuits–usingSingleOP-AMPwithReferencevoltage.					
9	PLLOperationandEstimationofCaptureand Lockrange.					
10	Realizationoflogic gates.					

11	Design and implementation of full adder.
12	Design and implementation of Decoder.
13	Design and implementation of multiplexer.
14	Design and implementation of flip-flops.
15	Design and implementation of 4-bit synchronous counter.

Reference Books:

1	Linear Integrated Circuits–D. Roy Chowdhury, New Age International (P) Ltd, 2 nd Ed., 2003.
2	Modern Digital Electronics – RP Jain – 4/e – Mc Graw Hill Education, 2010.

CO-PO/PSO Mapping Matrix

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
C304.1									2	3		2			
C304.2								2	2	3		2			
C304.3	2	3													3
C304.4	2	3													2
Avg.	2	3						2	2	3		2			2.5



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			L	T	P	Cr.
B.TechMinors in VLSI Design	VLSI TECHNOLOGY					
			3	0	0	3

Pre-requisites: Basic Electronics devices

Course Objectives:

1. Basic characteristics of MOS transistor and examines various possibilities for configuring inverter circuits and aspects of latch-up are considered.
2. Design processes are aided by simple concepts such as stick and symbolic diagrams but the key element is a set of design rules, which are explained clearly.
3. Basic circuit concepts are introduced for MOS processes we can set out approximate circuit parameters which greatly ease the design process.

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

C305.1	:	Aware the properties of MOS active devices and simple circuits configured when using them and the reason for such encumbrances as ratio rules by which circuits can be inter connected in silicon.
C305.2	:	Know three sets of design rules with which NMOS and CMOS designs may be fabricated.
C305.3	:	Aware the scaling factors determining the characteristics and performance of MOS circuits in silicon.
C305.4	:	Aware the FPGA Architecture, Design flow and different testing techniques to detect the Fault
C305.5	:	Aware the Low Power CMOS Logic Circuits and know importance of low power consumption.

UNIT – I		12	hrs
Introduction and Basic Electrical Properties of MOS Circuits: Introduction to IC technology, Fabrication process: NMOS, PMOS and CMOS. I_{ds} , Aspects of MOS transistor Threshold Voltage, MOS transistor Trans, Output Conductance and Figure of Merit. nMOS Inverter, Pull-up to Pull-down Ratio, MOS inverter driven by another NMOS inverter, and through one or more pass transistors. Alternative forms of pull-up, The CMOS Inverter, Latch-up in CMOS circuits.			
UNIT – II		12	hrs
MOS and Bi-CMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout, General observations on the Design rules, Layout Diagrams of NAND and NOR gates and CMOS inverter, Symbolic Diagrams-Translation to Mask Form.			
UNIT – III		12	hrs
Basic Circuit Concepts: Sheet Resistance, Sheet Resistance concept applied to MOS transistors and Inverters, Area Capacitance of Layers, Standard unit of capacitance, some area Capacitance			

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			L	T	P	Cr.
B.TechMinors in VLSI Design		VLSI LAB				
			0	0	3	1.5
Pre-requisites:Digital Electronics						
Course Objectives:						
The students need to design the following experiments at schematic level using CMOS logic and verify the functionality. Further students need to draw the corresponding layout and verify the functionality including parasites. Available state of the art technology libraries can be used while simulating the designs using industry standard EDA Tools.						
Course Out comes: At the end of the course, the student will be able to						
C306.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C306.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C306.3	Design and implementation of Combinational circuits using Mentor Graphics Tool.					
C306.4	Design and implementation of Sequential circuits using Mentor Graphics Tool.					
List of Experiments (All experiments are required to be conducted)						
1	Design and Implementation of Universal Gates.					
2	Design and Implementation of an Inverter.					
3	Design and Implementation of Full Adder.					
4	Design and Implementation of Full Subtractor.					
5	Design and Implementation of Decoder.					
6	Design and Implementation of RS-Latch.					
7	Design and Implementation of D-Flip-flop.					
8	Design and Implementation of multiplexer.					
9	Design and Implementation of an asynchronous counter.					

	10	Design and Implementation of an sequential circuits .															
	EDA Tools/Hardware Required																
	1	Mentor Graphics Software /Cadence /Synopsys /Tanner or Equivalent Industry Standard CAD Tool															
	2	Desktop computer with appropriate Operating System that supports the EDA tools.															
CO-PO/PSO Mapping Matrix																	
	CO	PO 1	PO 2	PO 3	PO 4	PO 5	P O 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3	
	C306.1									2	3		2				
	C306.2								2	2	3		2				
	C306.3					3									2		
	C306.4					3									2		
	Avg.					3			2	2	3		2		2		



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			L	T	P	Cr.
B.TechMinors in VLSI Design	LOWPOWERVLSI					
			3	0	0	3
Pre-requisites: Switching Theory& Logic Design,Computer Architecture and Organization						
Course Objectives:						
1.To learn the MOS Process Technology 2. To understand the operation of MOS devices 3. To understand and learn the characteristics of CMOS circuit construction. 4. To describe the general steps required for processing of CMOS integrated circuits. 5. To impart in-depth knowledge about analog and digital CMOS circuits.						
Course Outcomes: At the end of the course, the student will be able to						
C401.1	:	Identify the sources of power dissipation in digital IC systems & aware the impact of power on system performance and reliability.				
C401.2	:	Characterize and model power consumption & aware the basic analysis methods				
C401.3	:	Aware the basic analysis methods				
C401.4	:	Aware leakage sources and reduction techniques.				
C401.5	:	Aware Low power clock distribution & Simulation Power Analysis				
UNIT – I			10			hrs
Sources of Power Dissipation Introduction, Short-Circuit Power Dissipation, Switching Power Dissipation, Dynamic Power for a Complex Gate, Reduced Voltage Swing, Switching Activity, Leakage Power Dissipation, p–n Junction Reverse-Biased Current, Band-to-Band Tunneling Current, Subthreshold Leakage Current, Short-Channel Effects						
UNIT – II			10			hrs
Supply Voltage Scaling for Low Power Device Feature Size Scaling, Constant-Field Scaling, Constant-Voltage Scaling, Architectural-Level Approaches: Parallelism for Low Power, Pipelining for Low Power, Combining Parallelism with Pipelining, Voltage Scaling Using High-Level Transformations.						
UNIT – III			10			hrs
Switched Capacitance Minimization Probabilistic Power Analysis: Random logic signals, probability and frequency, probabilistic power analysis techniques, signal entropy, Bus Encoding: Gray Coding, One- Hot Coding, Bus-Inversion, T0 Coding, Clock Gating, Gated-Clock FSMs FSM State Encoding, FSM Partitioning, Precomputation, Glitching Power Minimization						
UNIT – IV			10			hrs

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			L	T	P	Cr.
B.Tech	Minor	CMOS VLSI DESIGN LAB				
s in VLSI	Design		0	0	2	1
Pre-requisites: Switching Theory& Logic Design,Computer Architecture and Organization						
Course Objectives:						
In this course, student will understand working of instructions by practicing VLSI fabrication and design technology and develop EDA tool and test its efficiency						
Course Outcomes: At the end of the course, the student will be able to						
C402.1	Compile the data, organize and analyze it for discussion and report the findings and observations from experimental learning activities in the laboratory.					
C402.2	Build holistic development and pleasing disposition by reviewing and correcting the performance to become independent and autonomous thinker.					
C402.3	Aware the relationship between design automation algorithms and Various constraints posed by VLSI fabrication and design technology.					
C402.4	Identify layout optimization techniques and map them to the algorithms, Develop proto-type EDA tool and test its efficiency					
List of Experiments (Any of the 12 experiments are required to be conducted)						
1	MOS Device Characterization and parametric analysis					
2	Common Source Amplifier					
3	Common Source Amplifier with source degeneration					
4	Cascode amplifier					
5	Simple current mirror					
6	Cascode current mirror					
7	Wilson current mirror					
8	Full Adder					
9	RS-Latch					
10	ClockDivider					

	11	JK-Flip Flop
	12	Synchronous Counter
	13	Asynchronous Counter
	14	Static RAM Cell
	Reference Books:	
	1	Naveed Shervani, Algorithms for VLSI Physical Design Automation, 3rd Edition, Kluwer Academic, 1999..
	2	Charles J Alpert, Dinesh P Mehta, Sachin S Sapatnekar, Handbook of Algorithms for Physical Design Automation, CRC Press, 2008
CO-PO/PSO Mapping Matrix		
	CO	PO 1 PO 2 PO 3 PO 4 PO 5 PO 6 PO 7 PO 8 PO 9 PO 10 PO 11 PO 12 PSO 1 PSO 2 PSO 3
	C402.1	
	C402.2	
	C402.3	
	C402.4	
	Avg.	