# **B.TECH ECE SYLLABUS**



VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE (An Autonomous, ISO 9001:2015 Certified Institution) (Approved by AICTE, Accredited by NAAC, NBA, Affiliated to JNTUK, Kakinada) (Sponsored by Siddhartha Academy of General & Technical Education) Kanuru, Vijayawada Andhra Pradesh - 520007, INDIA. <u>www.vrsiddhartha.ac.in</u>

#### VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE SCHEME OF INSTRUCTION FOR FOUR YEAR UG PROGRAMME [VR17]

	SEMESTER I	Col	<b>Contact Hours: 26</b>						
S.no	Course Code	Title of the Course	L – T - P	Credits					
1.	17MA1101	Matrices And Differential Calculus	3 - 1 - 0	4					
2.	17PH1102	Engineering Physics	3-0-0	3					
3.	17CS1103	Problem Solving Methods	2 - 1 - 0	3					
4.	17EE1104	Basics of Electrical Engineering	3 - 0 - 0	3					
5.	17HS1105	Technical English and Communication Skills	2-0-2	3					
6.	17PH1151(A)	Engineering Physics Laboratory	0-0-3	1.5					
7.	17CS1152	Computing and Peripherals Laboratory	0-0-2	1					
8.	17ME1153	Basic Workshop	0-0-3	1.5					
		Total Credits	13 - 2 - 10	20					
9.	17MC1106A	Technology and Society	1 - 0 - 0	-					
10.	17MC1107	Induction Program		-					

#### **SEMESTER II**

#### **Contact Hours: 27**

S.no	Course Code	Course	L - T - P	Credits
1.	17MA1201	Laplace Transforms And Integral	3 - 1 - 0	4
		Calculus		
2.	17CH1202A	Engineering Chemistry	3 - 0 - 0	3
3.	17CS1203	Programming in C	3 - 0 - 0	3
4.	17EC1204B	Electronic Devices	3-0-0	3
5.	17ME1205	Engineering Graphics	2 - 0 - 4	4
6.	17CH1251	Engineering Chemistry Laboratory	0-0-3	1.5
7.	17CS1252	Computer Programming Laboratory	0-0-3	1.5
		Total Credits	14 – 1– 10	20
8.	17MC1206B	Professional Ethics & Human Values	2 - 0 - 0	-

L–Lecture, T– Tutorial, P –Practical, C-Credits

#### **SEMESTER III**

#### **Contact Hours: 29**

S. No	Course	Course	L	Τ	Р	Credits
	Code					
1.	17MA1301	Complex Analysis and Numerical	3	1	0	4
		Methods				
2.	17EC3302	Analog Electronics	3	0	0	3
3.	17EC3303	Network Theory	3	0	0	3
4.	17EC3304	Digital Circuit Design	3	0	0	3
5.	17HS2305	Humanities Elective	1	0	0	1
6.	17TP1306	Logic & Reasoning	0	0	2	1
7.	17EC3308	Signals and Systems	3	0	0	3
8.	17EC3351	Analog Electronics Lab	0	0	3	1.5
9.	17EC3352	Digital Circuits Lab	0	0	3	1.5
10.	17HS1353	Communication Skills Laboratory	0	0	2	1
		Total	16	1	10	22
11.	17MC1307A	Environmental Studies	2	0	0	-

#### List of Humanities Electives

17HS2305A:Yoga & Meditation	17HS2305F:Visual Communication
17HS2305B:Music	17HS2305G:Film Appreciation
17HS2305C:Human Rights and Legislative	17HS2305H:Sanskrit Bhasha
Procedures	
17HS2305D:Philosophy	17HS2305I:Foreign Languages
	(German/French)
17HS2305E:Development of societies	17HS2305J:Psychology

#### **SEMESTER IV**

#### **Contact Hours: 26**

S.	Course	Course	L	Т	Р	Credits
No	Code					
1.	17EC3401	Probability Theory and Random Processes	3	1	0	4
2.	17EC3402	Analog Integrated Circuits and Applications	3	0	0	3
3.	*17EC3403A	Transmission Lines and Wave Guides	3	0	0	3
4.	17EC3404	Analog Communications	3	0	0	3
5.	17TP1405	English for Professionals	0	0	2	1
6.	17EC3406	Pulse and Switching Circuits	3	0	0	3
7.	17EC3451	Analog Integrated Circuits Lab	0	0	3	1.5
8.	17EC3452	Analog Communications Lab	0	0	3	1.5
		Total	15	1	8	20
9.	17MC1407B	Indian Constitution (CSE/ECE/IT)	2	0	0	-

\* 17EC3403 – Electro Magnetic Theory and Transmission Lines for 2017-18 joined students only

#### **SEMESTER V**

#### **Contact Hours: 24**

S. No	Course Code	Course	L	Т	Р	Credits
1.	17EC3501	Linear Control Systems	3	1	0	4
2.	17EC3502	Digital Communications	3	1	0	4
3.	17EC3503	VLSI Design	3	0	0	3
4.	17EC2504	Open Elective – I	3	0	0	3
5.	17EC2505	Open Elective -II	3	0	0	3
		(Inter Disciplinary Elective )				
6.	17EC2506	Open Elective-III	0	0	0	2
		(Self-Learning Elective Course)*				
7.	17TP1507	Personality Development	1	0	0	1
8.	17EC3551	Digital Communications Lab	0	0	3	1.5
9.	17EC3552	VLSI Design Lab	0	0	3	1.5
	Total					23
10.	17MC1507	Biology for Engineers	1	0	0	-

\*Students can opt any one of the self-learning courses prescribed by the Department. Students register and complete the opted course in approved MOOCS platform on or before the Last Instruction Day of V semester. They have to submit the certificate before the Last Instruction Day of V semester.

#### **Open Elective – I**

17EC2504A: Computer Architecture and Organization 17EC2504B: Electronic Measurements and Instrumentation

#### **Open Elective – II (Inter Disciplinary Elective)**

17EC2505A: Artificial Neural Networks 17EC2505B: Principles of Embedded Systems

#### **Open Elective-III (Self-Learning Elective Course) \***

17EC2506A: Programming, Data Structures and Algorithms using Python 17EC2506B: Introduction to Machine Learning 17EC2506C: Data Science for Engineers **SEMESTER VI** 

#### **Contact Hours: 28**

S. No	Course	Course	L	Т	Р	Credits
	Code					
1.	17EC3601	Digital Signal Processing	3	1	0	4
2.	17EC3602	Microcontrollers	3	1	0	4
3.	17EC4603	Programme Elective-1	3	0	0	3
4.	17EC4604	Programme Elective -2	3	0	0	3
5.	17EC2605	Open Elective-IV	3	0	0	3
6.	17TP1606	Quantitative Aptitude	1	0	0	1
7.	17EC3651	Digital Signal Processing Lab	0	0	3	1.5
8.	17EC3652	Microcontrollers Lab	0	0	3	1.5
9.	17EC5653	Engineering Project for Community	0	1	2	2
		services*				
		Total	16	3	8	23

\* Students will go to the society (Villages/ Hospitals / Towns etc.) to identify the problem and survey the literature for a feasible solution. The work will be carried out during summer vacation after IV Semester. The student is encouraged to take up real life problems leading to innovative model building

#### **Programme Elective-1**

17EC4603/A: Embedded Systems and Real Time Operating System

17EC4603/B: Advanced Communication Systems

17EC4603/C: Microwave Engineering

17EC4603/D Device Modeling

#### **Programme Elective-2**

17EC4604/A Advanced Digital Design

17EC4604/B: Image and Video Processing

17EC4604/C: Microstrip Lines

17EC4604/D: Computer Networks

#### **Open Elective-IV**

17EC2605/A: Artificial Neural Networks 17EC2605/B: Global Navigational Satellite Systems **SEMESTER VII** 

#### **Contact Hours: 26**

S. No	Course	Course	L	Τ	Р	Credits
	Code					
1.	*17EC3701A	Antennas and wave propagation	3	0	2	4
2.	17EC4702	Programme Elective -3	3	0	0	3
3.	17EC4703	<b>Programme Elective -4</b>	3	0	0	3
4.	17EC4704	Programme Elective -5	3	0	0	3
5.	17HS1705	Engineering Economics and Finance	2	0	0	2
6.	17EC4751	RTOS/Networks Simulation Lab	0	0	3	1.5
7.	17EC4752	Advanced Communications Lab	0	0	3	1.5
8.	17EC5753	Mini Project *	0	0	4	2
9.	17EC6754	A Internship				2
		B Industry offered Course				
		C Global Professional Certification				
	·	Total	14	0	12	22

\* Could be done in a group of students; involves working under a faculty member and carrying out a detailed feasibility study, literature survey and preparing a work plan for major project.

#### **Programme Elective -3**

17EC4702/A: DSP Processors & Architectures 17EC4702/B: Optical Communications 17EC4702/C: Principles of RADAR Engineering 17EC4702/D: Adhoc and Sensor Networks

#### **Programme Elective -4**

17EC4703/A: Advanced Microcontrollers 17EC4703/B: Mobile & Cellular Communication 17EC4703/C: Remote Sensing and GIS 17EC4703/D: VLSI Signal Processing

#### **Programme Elective -5**

17EC4704/A: Embedded Device Drivers

17EC4704/B: Smart Antennas

17EC4704/C: Analog and Digital IC Design

17EC4704/D: Data Compression

\* 17EC3701- Guided Waves and Antennas for 2017-18 joined students only

#### **SEMESTER VIII**

#### **Contact Hours: 19**

S.no	Course Code	Course	L	Т	Р	Credits
1.	17EC4801	Programme Elective - 6	3	0	0	3
2.	17EC2802	<b>Open Elective –V*</b>	3	0	0	3
3.	17EC5851	Major Project**	0	5	8	9
		6	5	8	15	

\*Open Elective- V may also opt as self-learning course. Students register and complete the opted course in approved MOOCS platform on or before Last Instruction Day of VIII Semester. They have to submit the certificate before the last Instruction Day of VIII Semester. Students who have not opted as a self-learning are required to attend for the class work and internal assessment as per the regular theory course.

\*\*Major project involves continuation of Mini Project. The objective is to complete the work as per the prepared work plan and prepare a detailed project report.

#### **Programme Elective – 6**

17EC4801/A: MEMS and its Applications17EC4801/B: Wireless Networks17EC4801/C: Cryptography and Data Security17EC4801/D: Open Elective

#### **Open Elective –**V

17EC2802/A: DBMS 17EC2802/B: Cloud Computing

17MA1101 MATRICES AND DIFFERENTIAL CALCULUS														
Cours	e Cate	gory:	Instit	utional	Core				(	Credits	:	4		
Cours	е Тур	2:	Theo	ry		]	Lectur	e -Tuto	orial-P	ractice	3 -	1 - 0		
Prere	quisite	s:	Fund	amenta	amentals of <b>Continuous Ev</b>				is Eval	luation		30		
			Matri	ices,	1		Seme	ster en	d Eva	luation		70		
			Fund Calcu Integ Diffe	amenta ilus, ration, rentiati	iis of				Total	Marks	: 1	00		
COURSE OUTCOMES Upon successful completion of the course. the student will be able to:														
Upon successful completion of the course, the student will be able to:														
CO1	CO1 Determine Eigen values, Eigen vectors of a matrix.													
CO2	<b>CO2</b> Estimate Maxima and Minima of Multi Variable Functions.													
CO3	Solve	the Li	near di	fferenti	al equa	ations v	with co	nstant o	coeffici	ients.				
CO4	Solve	the Li	near di	fferenti	al equa	tions v	vith va	riable c	oeffici	ents.				
Contr (1 – L	ibutio ow, 2 -	n of Co Mediu	ourse ( um, 3 -	)utcon - High)	nes tow )	ards a	chieve	ement o	of Prog	gram O	utcom	ies		
	РО	PO	РО	РО	PO	РО	РО	PO	РО	PO	PO	РО		
	1	2	3	4	5	6	7	8	9	10	11	12		
CO1	3			1	3						2			
CO2	3			1	3						2			
CO3	3			1	3		2							
<b>CO</b> 4	3			1	3						2			

VR17

# **COURSE CONTENT**

# UNIT I

**Matrices:** Rank of a Matrix, Elementary transformations, Inverse of a Matrix (Gauss Jordan Method), Consistency of Linear System of Equations, Linear Transformations, Vectors, Eigen values, Properties of Eigen values, Finding Inverse and Powers of a Matrix by Cayley-Hamilton Theorem. Reduction to Diagonal form, Reduction of Quadratic form to Canonical form, Nature of a Quadratic form, Complex matrices.

## UNIT II

**Differential Calculus:** Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Taylor's Theorem, Maclaurin's Series.

Application: Curvature, Radius of Curvature.

**Functions of two or more Variables**: Partial Derivatives, Change of Variables, Jacobians, Taylor's Theorem for Function of two Variables, Maxima and Minima of Functions of two Variables, Lagrange's Method of Undetermined Multipliers.

### UNIT III

**Differential Equations of First Order**: Formation of a Differential Equation, Solution of a Differential Equation, Linear Equations, Bernoulli's Equation, Exact Differential Equations, Equations Reducible to Exact Equations.

Applications: Orthogonal Trajectories, Newton's Law of Cooling.

**Linear Differential Equations of Higher Order**: Definitions, Operator D, Rules for Finding the Complementary Function, Inverse Operator, Rules for finding Particular Integral, Working Procedure to Solve the Equation.

## UNIT IV

Linear Dependence of Solutions, Method of Variation of Parameters, Method of Undetermined Coefficients, Equations Reducible to Linear Equations with Constant Coefficients: Cauchy's Homogeneous Linear Equation, Legendre's Linear Equation, Simultaneous Linear Differential Equations with Constant Coefficients.

Applications: L-C-R Circuits.

# TEXT BOOKS

[1] B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43<sup>rd</sup> Edition, 2014.

#### **REFERENCE BOOKS**

- [1].Pal Bhunia, Engineering Mathematics, Oxford University Press, 2015.
- [2].Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Edition, 2015
- [3].B.V.Ramana, "Higher Engineering Mathematics", Tata MC Graw Hill, 1<sup>st</sup> Edition, 2007
- [4].N.P.Bali, Dr.Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, 9<sup>th</sup> Edition, 2014.

## **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1]. www.nptel videos.com/mathematics/ (Math Lectures from MIT, Stanford, IIT'S)
- [2]. nptel.ac.in/courses/122104017
- [3]. nptel.ac.in/courses/111105035
- [4]. Engineering Mathematics Open Learning Project. www.3.ul.ie/~mlc/support/ Loughborough%20website/

## 17PH1102(A) ENGINEERING PHYSICS (ECE/EIE/EEE)

ENGINEEKING PHYSICS (ECE/EEE)													
Cours	se Cat	egory:	Insti	tutiona	al Core	;				Cred	lits:	3	
Cours	se Typ	e:	Theo	ory			Lectu	ire -Ti	itorial	-Pract	ice:	3 - 0 - 0	
Prere	quisite	es:	Basi	<b>c</b> ]	Knowl	edge	С	ontinu	ous E	valuati	ion:	30	
			abou	it vecto	ors		Sen	nester	end E	valuati	ion:	70	
									Tot	al Mai	rks:	100	
COURSE OUTCOMES													
Upon successful completion of the course, the student will be able to:													
<b>CO1</b>	1 Employ physical laws of electrostatics and compute problems related to static electric fields.												
CO2	12 Illustrate the laws of magnetostatics and solve various problems involving static magnetic fields.												
<b>CO3</b>	Descr	ibe va	rious ty	pes of	electr	ic and	magne	tic mat	erials.				
<b>CO</b> 4	Under appro	rstand priate	the tim Maxwe	e vary ell's ec	ing ele Juation	ectric as s.	nd mag	gnetic f	fields b	y appl	ying		
Contr (1 – L	ributio .ow, 2	n of C - Medi	ourse ium, 3	Outco – Hig	mes to h)	owards	achie	vemen	t of Pr	ogram	o Out	comes	
	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>CO1</b>	3			2									
CO2	3			2									
CO3	3		1										
<b>CO4</b>	3			2									

## **COURSE CONTENT**

# UNIT – I

**Electrostatics:** Coulomb's Law and Field Intensity, Electric Field due to Continuous Charge Distributions, Electric Flux Density, Gauss's Law, Applications of Gauss Law-Line charge, Surface charge, Volume charge, Electric Potential, Relation between E and V, Maxwell's Equation for static electric fields (Qualitative), Potential and Field of Electric Dipole, Energy Density in Electrostatic Fields.

# UNIT – II

**Magnetostatics:** Biot-Savart's Law, Ampere's circuit law-Maxwell's equation, Applications of Ampere's law-Infinite line Current, Infinite sheet of current, Magnetic flux density-Maxwell's equation for static magnetic field, Magnetic Vector and Scalar potentials, Force due to magnetic fields - Force on a charged particle, Current element, Force between two current elements, Magnetic dipole, Magnetic Energy.

### UNIT – III

**Types of Electric and Magnetic Materials:** Properties of electric materials-Conductors and Dielectrics, Convection and Conduction Currents, Polarization in Dielectrics, Dielectric Constant and Strength, Continuity Equation and Relaxation Time, Poisson's and Laplace's Equations, Electro static boundary conditions: Dielectric-Dielectric, Conductor-Dielectric, Conductor-Free Space. Types of magnetic materials, Magnetization in Materials, Magnetic boundary conditions.

#### UNIT – IV

Time Varying Fields: Faraday's Law, Transformer and Motional Electro motive Forces,

Displacement Current, Maxwell's Equations in Final Forms, Time Harmonic Fields.

**Electro Magnetic Waves**: Wave propagation in lossy dielectrics, lossless dielectrics, free space, good conductors, Poynting Theorem.

# TEXT BOOKS

- [1].Resnick, Halliday and Krane, "Physics", 5<sup>th</sup> edition, Wiley India Pvt. Ltd, New Delhi, 2016.
- [2].Matthew N. O. Sadiku, "Principles of Electromagnetics", 4<sup>th</sup> edition, Oxford University Press, New Delhi, 2009.

#### **REFERENCE BOOKS**

[1].R.K. Gaur and S.L. Gupta, "Engineering Physics", 8<sup>th</sup> Edition Reprint, Dhanpat Rai Publications (P) LTD., New Delhi, 2013

- [2].W. H. Hayt and J. A. Buck, "Engineering Electromagnetics", 7<sup>th</sup> edition, Tata McGraw Hill, New Delhi, 2006
- [3].Joseph A. Edminister, "Electromagnetics Theory and problems", 2<sup>nd</sup> edition, Schaum's outline series, MCGraw Hill,1993

## **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- 1. http://nptel.iitm.ac.in/video.php?subjectId=10810607
- 2. <u>http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-</u> <u>%20Guwahati/em/index.htm</u>
- 3. http://www.mike-willis.com/Tutorial/PF2.htm

	17CS1103												
			P	ROBL	EM SO	OLVIN	NG ME	THOI	DS				
Cours	e Cat	egory:	Instit	tutiona	l Core					Credi	ts:	3	
Cours	е Тур	e:	Theo	ory			Lectu	ire -Ti	itorial	Practi	<b>ce:</b> 2	2 -1- 0	
Preree	quisite	es:					С	ontinu	ous Ev	aluatio	on:	30	
							Sen	nester	end Ev	aluatio	on:	70	
									Tota	al Mar	ks:	100	
COURSE OUTCOMES													
Upon successful completion of the course, the student will be able to:													
CO1Understand the Computer problem solving approaches, efficiency and analysis of algorithms													
CO2	Appl	ly the fa	actorin	g meth	ods to s	solve th	ne give	n probl	em				
CO3	Appl	ly the a	rray te	chnique	es to fin	nd the s	solution	n for th	e given	proble	m		
CO4	Solv	e the pi	oblem	s using	MATI	LAB							
Contr (1 – L	ibutio ow, 2	on of Co - Medi	ourse ( um, 3	Outcor – High	nes tov .)	vards a	achieve	ement	of Prog	gram O	utcoi	nes	
	РО	РО	PO	РО	РО	РО	РО	РО	РО	РО	PO	РО	
	1	2	3	4	5	6	7	8	9	10	11	12	
CO1	3	2											
CO2	1		3										
CO3	1		3										
<b>CO4</b>	1	1							3				
I													

# UNIT - I

**Introduction to Computer Problem Solving:** Programs and Algorithms, characteristics of an algorithm, Requirements for solving problems by computer; Flowchart, pseudo-code **The Problem – Solving Aspect**: Problem definition phase, Getting started on a problem, Similarities among problems, Working backwards from the solution, General problem-solving strategies; **Top-Down design**: Breaking a problem into sub-problems, Construction of loops, Establishing initial conditions for loops, Finding the iterative construct, Termination of loops;

**The Efficiency of Algorithms**: Redundant Computations, Referencing array elements, Inefficiency due to late termination, Early detection of desired output conditions, Trading storage for efficiency gains;

Analysis of Algorithms: Computational complexity, The order notation, Worst and average case behavior.

## UNIT - II

**Fundamental Algorithms:** Problem, Algorithm Development, Algorithm Description - Exchanging values of two variables, Counting, Summation of a set of numbers, Factorial computation, Generation of Fibonacci sequence, Reversing the digits of an Integer. Using pseudo-codes and flowcharts to represent fundamental algorithms.

**Factoring Methods:** Finding the Square Root of a number: Smallest Divisor of an Integer, GCD of two Integers, Generating Prime numbers, Computing the Prime Factors of an Integer, Raising a Number to a Large Power, Pseudo random number generation, Computing n<sup>th</sup> Fibonacci number.

#### UNIT – III

**Array Techniques:** Introduction, Array Order Reversal, Array counting, Finding the maximum number in a set, Removal of duplicates from an ordered array, Partitioning an array, Finding The K<sup>th</sup> Smallest Element.

**Merging, Sorting and Searching:** Sorting By Selection, Sorting By Exchange, Linear Search, Binary search;

#### $\mathbf{UNIT} - \mathbf{IV}$

Introduction to MATLAB: MATLAB Environment, Constants, Variables and Expressions: Data types, Constants and Variables, Operators, Built-in Functions, Vectors and Matrices: Introduction, Scalars and Vectors, Matrix Manipulations, Control Structures: Loops, Branches.

**Input-Output Statements:** Reading/Storing File Data, **MATLAB Graphics:** Introduction, Two-Dimensional Plots

# **TEXT BOOKS**

- [1]R.G. Dromey, "How to Solve it By Computer", Prentice-Hall International Series in Computer Science, 1982.
- [2]Bansal.R.K, Goel.A.K, Sharma.M.K, "MATLAB and its Applications in Engineering", Pearson Education, 2012.

# **REFERENCE BOOKS**

- [1] Michael Schneider, Steven W. Weingart, David M. Perlman, "An Introduction to Programming and Problem Solving With Pascal", John Wiley and Sons Inc, 1984.
- [2] David Gries, "The Science of Programming", Springer Verlag, 1981.
- [3] ReemaThareja, "Computer Fundamentals and C Programming", Oxford, 2012

# **E-RESOURCES AND OTHER DIGITAL MATERIAL**

[1]MATLAB Getting Started Guide http://www.mathworks.com/help/pdf\_doc/ matlab/getstart.pdf

		ŀ	BASICS	17EE1 5 OF F	104 (C Eleci	CSE/E	CE/EII	E/IT) Ginef	ERING	۲ F			
Course	e Categ	ory:	Engine	eering	Scienc	es				Credits	s: 3		
Course	e Type:		Theory	у			Lectur	e -Tut	orial-F	ractice	e: 3 -	0 - 0	
Prereq	uisites						Co	<b>:</b> 30					
							Semester end Evaluation: 70						
									Total	Marks	<b>s:</b> 100	)	
COUR Upon s	SE OU	TCO	MES mpletio	on of tl	he cou	rse, the	e stude	ent will	be ab	le to:			
<b>CO1</b>	Analy	ze Ele	ectric C	ircuit f	undam	entals.							
CO2	Under Circui	Understand the basic concepts of Alternating Quantities and Magnetic Circuits											
CO3	Analy	ze the	basic c	concep	ts of El	lectric	Machir	nes					
CO4	Under	stand	Measu	ring In	strume	nts & S	Solar P	hoto V	oltaic S	System	conce	pts	
Contri (1 – Lo	bution ow, 2 - 1	of Co Mediu	urse O ım, 3 –	utcom High)	es tow	ards a	chieve	ment o	of Prog	ram O	utcom	es	
	РО	PO	РО	РО	РО	РО	РО	РО	РО	РО	PO	РО	
	1	2	3	4	5	6	7	8	9	10	11	12	
CO1	3	1			2								
CO2	3	1											
CO3	2				2								
<b>CO4</b>	2												
<u> </u>										<u>,                                     </u>		]	

VR17

# UNIT I

**Introduction to Electrical Engineering:** Electric Current, Electromotive force, Electric power and energy, Basic circuit components- Resistors-Inductors-Capacitors. Electromagnetic Phenomenon and Related Laws, Kirchhoff's laws.

**Network Analysis:** Network sources-Ideal independent voltage source, Ideal independent current source, Dependent sources, Practical voltage and current sources, Source conversion, Voltage and Current division rule, series and parallel connection of R, L and C, Star-Delta or, Delta- Star transformation. Mesh and Nodal Analysis (with independent sources only).

# UNIT II

Alternating Quantities: Introduction; Generation of a.c. voltages, Waveforms and Basic Definitions, Relationship between frequency, speed and number of poles, Root Mean Square and Average values of alternating current and voltages, Form Factor and Peak Factor, Phasor representation of alternating quantities.

**Magnetic Circuits:** Introduction, Magnetic Circuits, Magnetic Field Strength (H), Magneto motive Force, Permeability, Reluctance, Analogy between Electric and Magnetic Circuits, Magnetic potential drop, Magnetic circuit computations, Self and Mutual Inductance, Energy in Linear Magnetic Systems.

# UNIT III

**DC Machines:** Introduction, Construction of DC machines, Armature Windings, Generation of dc voltage and torque production in a DC machine, Torque production in a DC Machine, Operation of a DC machine as a generator, Operation of DC machine as a motor.

**Induction Motors:** Introduction, Constructional features of three-phase induction motors, Principle of operation of three-phase induction motor- Slip and rotor frequency, Voltage and current equations and equivalent circuit of an induction motor.

# UNIT IV

**Measuring Instruments:** Introduction, Classification of instruments, Operating Principles, Essential features of measuring instruments, Ammeters and Voltmeters, Measurement of power.

Solar photovoltaic Systems: Solar cell fundamentals, characteristics, classification, module, panel and array construction, Maximizing the solar PV output and load

matching, Maximum Power Point Tracker(MPPT), Balance of system components, solar PV systems and solar PV applications.

#### **TEXT BOOKS**

[1]T.K. Nagasarkar and M.S. Sukhja, "*Basic Electric Engineering*", 2<sup>nd</sup> ed., Oxford University press 2011.

#### **REFERENCE BOOKS**

- [1]B.H.Khan, "*Non Conventional Energy Resources*", 2<sup>nd</sup> ed., Mc.Graw Hill Education Pvt Ltd., New Delhi, 2013.
- [2]Ashfaq Husain, Haroon Ashfaq, "*Fundamentals of Electrical Engineering*", 4<sup>th</sup> ed., Dhanpat Rai & Co, 2014.
- [3]I.J.Nagrath and Kothari , "*Theory and problems of Basic Electrical Engineering*", 2<sup>nd</sup> ed., Prentice-Hall of India Pvt.Ltd.,2016.

#### **E-RESOURCES AND OTHER DIGITAL MATERIAL**

[1] http://nptel.ac.in/courses/108108076/

Prerequisites		Basic the lat	unders nguage	standin e skills	ng of ,viz	( Se	Contin mester	uous l r end l	Evalua Evalua	ation: ation:	30 70	0 0	
		Listen Readin includ constr	ing, ng an ing uction	Speal d Wri Sent abilitie	king, ting, ence es			То	otal M	arks:	10	0	
COURS	SE OUT	COM	ES										
Upon su	iccessfu	l comp	letion	of the	cours	e, the s	studen	t will	be abl	e to:			
CO1	Deve relate	elop ac ed(On-	dminis line) co	trative ommu	and nicatio	profes n with	sional felicit	comp y of ex	oilation pression	ns incl on	luding	web	
CO2	Dem stanc	onstrat lard pa	e Profi tterns o	iciency of Pron	v in I iunciat	nterpe ion	rsonal	Comm	nunicat	tion, in	addit	ion to	
CO3	Appl autho envir	y the e entic u ronmen	lement se of t	ts of fu langua	inction age in	al Eng any	lish w given	ith sus acade	tained mic a	under nd/or	standii profess	ng for sional	
CO4	Exec	ute tas	ks in	Techni	ical co	mmun	ication	with	compe	etence			
Contrib (1 – Lov	oution of w, 2 - Me	Cours edium,	se Out 3 – H	comes igh)	towar	ds acl	nievem	ent of	Prog	ram O	utcom	es	
	РО 1	PO 2	PO 3	PO 4	РО 5	PO 6	<b>PO</b> 7	РО 8	РО 9	<b>PO</b> 10	РО 11	PO 12	
CO1				3		3	3	3	2	3	1	2	_
CO2				3		3	3	3	3	3		3	
CO3	2			3		3	3	3	3	3		2	
CO4	2	2		3		2	3	3	2	3	1	2	
				1			1			1	I	1	-
VRSEC													-

# 17HS1105 TECHNICAL ENGLISH &COMMUNICATION SKILLS

Institutional Core

Theory

Course Category:

**Course Type:** 

VR17

3

2 - 0 - 2

**Credits:** 

**Lecture - Tutorial-Practice:** 

# COURSE CONTENT

# UNIT I

# Professional Writing Skills:-

# > <u>Professional Letters</u>:

Business, Complaint and Transmittal – Purpose, Style and format with special reference to Block Format and Modified Block Format

# Essay Writing:

Descriptive and Analytical with illustrations

# > Administrative and On-line drafting skills:

Minutes- Purpose, Scope and Illustrations

Web notes including Basics of e-mail- Chat-room interaction, Written Response to web-content, Basics of Format and etiquette for e-mail

# UNIT II

# Phonetics and Interpersonal Communication Skills

- Transcription using International Phonetic Alphabet
- > Word Stress (Primary) and Rhythm with practice
- Speech/ Conversational acts- Extending Invitation, Reciprocation, Acceptance, Concurrence, Disagreeing without being disagreeable-Written Form: Discourse/dialogue development and identification of inconsistencies in pre-prepared dialogues Spoken Form: Role play

# UNIT III

# Vocabulary and Functional English

- Root words (A Representative collection of 50)
- Vocabulary for Competitive examinations (A list of 500 High frequency words) Direct meaning,

Matching and Cloze test

- Verbal analogies(Single Unit) Synonym Relation, Antonym relation, Object-Operator relation, Object-Obstacle/obstruction relation, Sequence Relation, Place-Monument Relation, Science- area of activity relation, Profession- Tool relation, Gender relation, Diminutive relation, etc
- Confusables- Homonyms, Homophones and nearer words (A Representative collection of 100)
- Idiomatic expressions- Myth-based, Folklore based, life-based- Meanings, along with sentential illustrations
- Phrasal Collocationssentential illustrations
  Representative collection of 50 -Meanings, along with

- Exposure through Reading Comprehension- Skimming, Scanning and tackling different kinds of questions including interpretation of graphs and statistical data
- Functional Grammar with special reference to Tense, Concord, Articles, pronoun-referent, Prepositions, use of Gerund ,Parallelism etc (A Representative collection of 100 sentences)

#### UNIT IV

#### **Technical Communication skills:**

- Technical Proposal writing- Characteristics, Proposal Superstructure, Checklist, Formal Proposal
- Technical Vocabulary- Basic explanations and Description
- > Introduction to Executive summary Purpose and illustration
- > Technical Report writing-
- Informational Reports and Feasibility Report- Types, Components, Style and Formats

## **TEXT BOOKS**

- [1]Martin Cutts, Oxford guide to Plain English, 7<sup>th</sup> Impression, Oxford University Press, 2011
- [2]TM Farhathullah, Communication skills for Technical Students, I Edition, Orient Longman, 2002
- [3] John Langan, College Writing Skills, McGraw Hill, IX Edition, 2014.
- [4]Eclectic Learning materials offered by the Department

#### **REFERENCE BOOKS**

- [1]Randolph Quirk, Use of English, Longman, I Edition (1968) Reprinted 2004.
- [2] Thomson A.J & A.V, Martinet, Practical English Grammar, III Edition, Oxford University Press, 2001
- [3]V.Sethi and P.V. Dhamija, A Course in Phonetics and Spoken English, II Edition, PHI, 2006

# **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1]https://www.britishcouncil.org/english Accessed on 15<sup>th</sup> June 2017
- [2]<u>www.natcorp.ox.ac.uk/Wkshops/Materials/specialising.xml?ID=online</u> Accessed on 15<sup>th</sup> June 2017
- [3] https://www.uni-marburg.de/sprachenzentrum/selbstlernzentrum/.../apps\_for\_esl.pdf Accessed on 15<sup>th</sup> June 2017

					17	'PH11:	51(A)							
	ENGINEERING PHYSICS LAB (ECE/EIE/EEE) Course Category: Institutional Core Credits: 1.5													
Cours	se Cat	egory:	Insti	tution	al Core	;				Cree	dits:	1.5		
Cours	se Typ	e:	Lab				<b>Lecture - Tutorial-Practice:</b> 0 -							
Prere	quisit	es:	Basi	c	knowl	edge	C	Continu	ious E	valuat	ion:	30		
			aboı	about fundamental			Ser	nester	end E	valuat	ion:	70		
	measuring <b>Total Marks:</b> 100													
	instruments													
COURSE OUTCOMES														
Upon successful completion of the course, the student will be able to:														
CO1       Test optical components using principles of interference and diffraction of light														
<b>CO2</b> Use spectrometer, travelling microscope and function generator in various experiments														
CO3	<b>CO3</b> Determine the V-I characteristics of photo cells and appreciate the accuracy in measurements													
Contr (1 – L	ributio 20w, 2	on of C - Medi	ourse ium, 3	Outco - Hig	mes to h)	owards	achie	vemen	t of Pi	rogram	n Out	comes		
	PO 1	PO 2	PO 3	<b>PO</b> 4	PO 5	PO 6	<b>PO</b> 7	<b>PO</b> 8	PO 9	PO 10	PO 11	12		
<b>CO1</b>		3	1											
CO2		3	1											
CO3		3	1											
COUR	RSE CO	ONTE	NT	I	1	1	1	1	I	1	<u></u>			
1 1	Tioure	ofmer	itofa	oalvan	ometer	•								
1.1 <b>)</b> 1			tuder a	5arvari f Dogo	nonciel									
2. I		icuit-S	iuay o			41.	:C		•		1	.:1		
5. N	v ariati	on of m		ic field	along	the ax		urrent-	carryin	g circu	lar co	)11		

- 4. Wedge Method-Measurement of thickness of a foil
- 5. Solar cell –Determination of Fill Factor

- 6. AC Sonometer –Verification of vibrating laws
- 7. B-H Curve Unit- Determination of hysteresis loss
- 8. Hall effect -Hall coefficient measurement
- 9. Diffraction grating-Measurement of wavelength
- 10. Torsional pendulum-Measurment of Rigidity Modulus
- 11. Photo cell Study of V-I Characteristics, determination of work function
- 12. Optical fiber-Determination of Numerical aperture

# **TEXT BOOKS**

- [1] Madhusudhan Rao, "Engineering Physics Lab Manual", Ist ed., Scitech Publications, 2015
- [2] Ramarao Sri, Choudary Nityanand and Prasad Daruka, "Lab Manual of Engineering Physics"., Vth ed., Excell Books, 2010

# **E-RESOURCES**

- [1] http://plato.stanford.edu/entries/physics-experiment
- [2] http://www.physicsclassroom.com/The-Laboratory
- [3] http://facstaff.cbu.edu/~jvarrian/physlabs.html

# VIRTUAL LAB REFERENCES

[1] http://vlab.amrita.edu/?sub=1&brch=201&sim=366&cnt=1

- [2] http://vlab.amrita.edu/?sub=1&brch=195&sim=840&cnt=1
- [3] http://vlab.amrita.edu/?sub=1&brch=282&sim=879&cnt=1

		СОМ	PUTIN	IG AN	170 D PER	CS115 CS115	2 RALS	LABO	ORAT	ORY			
Course	Categ	ory:	Institu	tional	Core				С	redits:	-	1	
Course	Type:		Labora	atory		L	ecture	-Tuto	rial-Pr	actice:	0 - 0	0 - 2	
Prereq	uisites	•					Cont	inuou	s Evalı	ation:	3	0	
						1	Semes	ter end	l Evalı	ation:	7	0	
	Total Marks: 100												
COUR	SE OU	TCO	MES										
Upon s	uccess	ful co	npletio	on of th	ne cour	se, the	e stude	nt will	be ab	le to:			
CO1	Unde	rstand	and Ap	oply M	S Offic	e tools	5						
CO2	Configure the components on the motherboard and install different operating systems												
CO3	Unde	rstand	and co	nfigure	e differe	ent stor	rage m	edia					
CO4	Perfo	rm Ne	tworkir	ng, trou	ıblesho	oting a	and sys	tem ad	ministi	ration ta	asks		
Contri (1 – Lo	bution w, 2 - 1	of Co Mediu	urse O m, 3 –	utcom High)	es towa	ards a	chieve	ment o	f Prog	ram O	utcom	es	
	PO	РО	PO	РО	РО	РО	PO	PO	РО	РО	РО	РО	
	1	2	3	4	5	6	7	8	9	10	11	12	
CO1	1								3				
CO2		3	1										
CO3	3		1			<u> </u>							
<b>CO4</b>			3						1				

### **COURSE CONTENT**

#### **CYCLE - I:Word Processing, Presentations and Spread Sheets**

#### 1. Word Processing:

- a) Create personal letter using MS Word.
- b) Create a resume using MS Word.
- c) Creating project abstract: Features to be covered:- Table of Content, List of Tables, Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check,Track Changes.
- d) Creating a Newsletter: Features to be covered:- Table of Content, List of figures, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphsand Mail Merge in word.

#### 2. Spread Sheets:

a) Create a worksheet containing pay details of the employees.

- b)Creating a Scheduler: Features to be covered:- Gridlines, Format Cells, Summation, auto fill,Formatting Text
- c)Create a worksheet which contains student results: .Features to be covered:- Cell Referencing, Formulae in excel – average, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting
- d)Create a worksheet importing data from database and calculate sum of all the columns.

#### 3. Presentations:

- a) Create a presentation using themes.
- b)Save, edit, print and import images/videos to a presentation.
- c)Create a power Point presentation on business by using master layouts, adding animation to a presentation and see the presentation in different views.

#### 4. MS Access:

- a) Create simple table in MS Access for results processing.
- b)Create a query table for the results processing table.
- c) Create a form to update/modify the results processing table.
- d)Create a report to print the result sheet and marks card for the result.

# **CYCLE - II: Hardware Experiments**

- 1. Identification of System Layout: Front panel indicators & switches and Front side & rear side connectors. Familiarize the computer system Layout: Marking positions of SMPS, Motherboard, FDD,HDD, CD, DVD and add on cards. Install Hard Disk. Configure CMOS-Setup. Partition and Format Hard Disk.
- 2. Install and Configure a DVD Writer or a Blu-ray Disc writer.
- 3. Install windows operating system and check if all the device (graphics, sound, network etc.) drivers are installed.
- 4. Install Linux operating system and check the working of all devices (graphics, sound, network etc.) in the computer.
- 5. Assemble a Pentium IV or Pentium Dual Core Pentium Core2 Duo system with necessary peripherals and check the working condition of the PC.
- 6. PC system layout: Draw a Computer system layout and Mark the positions of SMPS, Mother Board, FDD, HDD, and CD-Drive/DVDDrive add on cards in table top / tower model systems.
- 7. Mother Board Layout: Draw the layout of Pentium IV or Pentium Dual core or Pentium Core2 DUO mother board and mark Processor, Chip set ICs. RAM, Cache, cooling fan, I/O slots and I/O ports and various jumper settings.
- 8. Configure BIOS setup program to change standard and advanced settings to troubleshoot typical problems.
- 9. Install and configure Printer/Scanner/Web cam/Cell phone/bio-metric device with system. Troubleshoot the problems

# CYCLE – III : Networking

- 1. Prepare an Ethernet/UTP cable to connect a computer to network switch. Crimp the 4 pair cable with RJ45 connector and with appropriate color code.
- 2. Manually configure TCP/IP parameters (Host IP, Subnet Mask andDefault Gateway) for a computer and verify them using IPCONFIG command. Test connectivity to a server system using PING command.
- 3. Creating a shared folder in the computer and connecting to that folder using Universal Naming Convention (UNC) format. (Ex: computername sharename)
- 4. Connects computers together via Switch/ Hub
- 5. Connect different devices via Switch/Hub
- 6. Statically configure IP address and subnet mask for each computer
- 7. Examine non-existent IP address and subnet conflicts
- 8. Configure a computer to connect to internet (using college internetsettings) and troubleshoot the problems using PING, TRACERT and NETSTAT commands.

- 9. Using scan disk, disk cleanup, disk Defragmenter, Virus Detectionand Rectifying Software to troubleshoot typical computer problems.
- 10. Configure DNS to establish interconnection between systems and describe how a name is mapped to IP Address.
- 11. Remote desktop connections and file sharing.
- 12. Installation Antivirus and configure the antivirus.
- 13. Introducing Ethereal , a packet capture tool.

## **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1] Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras https://www.youtube.com/ watch?v=zjyR9e-#1D4&list=PLC5DC6AD60D798FB7
- [2] Introduction to Coding ConceptsInstructor: Mitchell Peabody View the complete course: http://ocw.mit.edu/6-00SCS11

# 17ME 1153 BASIC WORKSHOP

					DA		W UK	KSIIC	71				
Cours	e Cat	egory	: En	gineer	ing S	cienc	es				Cre	edits:	1.5
Cours	e Typ	oe:	La	borato	ry			Lectu	re -Tu	torial	-Prac	ctice:	0 - 0 - 3
Preree	quisit	es:						Co	ontinuo	ous Ev	valua	tion:	30
								Sem	ester e	end Ev	valua	tion:	70
										Tot	al Ma	arks:	100
COU	RSE	OUTC	COME	2S									
Upon	succ	essful	comp	letion	of th	e cou	rse, t	he stu	dent w	ill be	able	to:	
CO1	Prep aspe	are bacts of	asic m house	odels wiring	using g.	g woo	od and	d fami	liarize	with	vario	ous fur	ndamental
CO2	Prep arc v	Prepare basic models using sheet metal and practice joining of metals using arc welding technique.											
CO3	Familiarize with various manufacturing processes such as lathe operations, injection moulding and 3Dprinting												
<b>CO4</b>	Stud	ents w	vill be	able to	o unde	erstan	d the	prepar	ration o	of PCI	3		
CO5	Stud	ents w	vill be	able to	o unde	erstan	d sim	ple IO	Т Арр	licatio	ons us	sing A	rduino
Contr (1 – L	ributi Low, 2	on of 2 - Me	Cours dium,	e Out 3 – H	come igh)	es tow	ards	achiev	vemen	t of P	rogra	m Ou	tcomes
	<b>PO</b> 1	PO 2	РО 3	PO 4	<b>PO</b> 5	РО 6	РО 7	РО 8	РО 9	PO 10	РО 11	<b>PSO</b> 12	PSO 2
<b>CO1</b>			2					1			3		2
CO2			2					1			3		2
<b>CO3</b>			2					1			3		
<b>CO</b> 4						1							1
CO5							2						1

(9 Sessions)

# **COURSE CONTENT**

# <u>Part-A</u>

## **Carpentry:**

- a. Preparation of Cross half lap joint and use of power tools.
- b. Preparation of a T joint.

#### **Electrical wiring:**

- a. Fundamentals of house wiring and practice of Series wiring.
- b. Practice of stair case wiring and connecting a fluorescent Tube.

### Sheet metal & soldering:

- a. Preparation of complete funnel using sheet metal and practice of soldering.
- b. Preparation of a square box using sheet metal and practice of soldering.

#### Welding:

- a. Preparation of Corner Joint using arc welding process.
- b. Preparation of "T" joint using arc welding process.

## Manufacturing processes:

a.i. Demonstration of Green sand moulding process.

- ii. Demonstration of various operations on a lathe machine.
- b. Preparation of a small plastic part using injection moulding process.
- c. Demonstration of manufacturing a simple model using 3D printing process.

# <u>Part-B</u>

## **ELECTRONIC WORKSHOP**

#### Experiments:

## 1. To prepare PCB for the given electronic circuit

- a. To prepare the layout and printing it on copper clad board
- b. To etch and drill the holes on PCB

# 2. To solder the components on the PCB prepared and test the circuit

- a. To identify and solder the components on the PCB prepared
- b. To test the operation of the circuit.

# **BASIC IOT WORKSHOP**

### Experiments:

## 1. Demonstration of Arduino board

- a. Demonstrate different components & pin configuration of Arduino
- b. To set up Arduino IDE for programming.

## 2. To measure Temperature & Humidity

- a. Interfacing of temperature & humidity sensor with Arduino.
- b. Execute the program on Arduino IDE & display the measured values.

## 3. To measure Distance

- a. Interfacing of Ultrasonic Sensor with Arduino
- b. Execute the program on Arduino IDE & display the measured value.

# TEXT BOOKS

- [1]Kannaiah P. & Narayana K. C., "Manual on Workshop Practice", Scitech Publications, Chennai, 1999.
- [2]Venkatachalapathy, V. S., "First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.

# **REFERENCE BOOKS**

[1]Gopal, T.V., Kumar, T., and Murali, G., "A first course on workshop practice – Theory, Practice and Work Book", Suma Publications, Chennai, 2005.

# E-resources and other digital material:

<u>https://dsceme.files.wordpress.com/2016/08/workshop-practice-manual-2016-17- 1.pdf</u>
 <u>https://www.protosystech.com/rapid-prototyping.htm</u>

# 17MC1106A TECHNOLOGY AND SOCIETY

<b>Course Category:</b>	Institutional Core	Credits:	
<b>Course Type:</b>	Mandatory Learning	Lecture -Tutorial-Practice:	1 - 0 - 0
Prerequisites:		Continuous Evaluation:	100
		Semester end Evaluation:	
		<b>Total Marks:</b>	100

## **COURSE OUTCOMES**

# Upon successful completion of the course, the student will be able to:

CO1	Understand the origins of technology and its role in the history of human progress.										
CO2	Know the Industrial Revolution and its impact on Society										
CO3	Interpret the developments in various fields of technology till Twentieth Century.										
<b>CO</b> 4	Distinguish the impacts of Technology on the Environment and achievements of great scientists.										

# Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	РО 1	РО 2	РО 3	РО 4	РО 5	РО 6	РО 7	РО 8	РО 9	РО 10	РО 11	PO 12
CO1	1											
CO2		2	3									
CO3			2						3			2
<b>CO</b> 4			2						2			3

# UNIT – I

**Introduction**: Origins of technology, The Agriculture revolution, Technological contributions of ancient civilizations- Mesopotamian, Egyptians, Greeks, Romans, Indians and Chinese.

# UNIT - II

**Industrial revolution**: The social and political background, The technical background, Steam: The power behind the Indistrial Revolution, The revolution in Textile Indistry, The Imapact of Indutrial Revolution on Society.

# UNIT - III

**The Flowering of modern technology:** Manufacturing Technologies, Prime Movers, Internal Combustion Engines, Production of Metals and Alloys, The Birth of Electrical Technology, Twentieth Century: The Flowering of modern technology

# UNIT - IV

**Technology, Science and Society**: Impact of technology on society, The Impacts of Technology on the environment, Sustainable development.

## Achievements of famous scientists:

(World): Einestein, Newton, Faraday, Graham Bell, Edison, S.Hawking.

(India): CV Raman, S.Chandrasekhar, Aryabhatta, Homi J Bhabha, Vikram Sarabhai, APJ Abdulkalam, S.Ramanujan, M.Visweswarayya.

# TEXT BOOKS

[1]Dr. R.V.G Menon, "Technology and Society", Pearson Education, 2011

# **REFERENCE BOOKS**

[1]Quan-Haase, A., "Technology and Society: Inequality, Power, and Social Networks", Oxford University Press, 2013.

	LA	APL A	CE TR	ANSF	17 TORM	'MA12 S ANI	201 ) inti	EGRA		LCUL	US		
Course	LAPLACE TRANSFORMS AND INTEGRAL CALCULUSse Category:Institutional CoreCredits:4												
Course	e Type		Theor	y		Ι	Lectur	e -Tut	orial-F	Practic	<b>e:</b> 3	- 1 - 0	
Prereq	uisites	:	Vectors, Curve				Cor	ntinuo	us Eva	luatio	n:	30	
			Tracin	ng.			Seme	ster er	nd Eva	luatio	n:	70	
									Total	Mark	<b>s:</b>	100	
COUR	OURSE OUTCOMES												
Upon s	successful completion of the course, the student will be able to:												
CO1	Solve Linear Differential Equations using Laplace Transforms.												
CO2	Examine the nature of the Infinite series.												
CO3	Evaluate areas and volumes using Double, Triple Integrals.												
CO4	O4 Convert Line Integrals to Area Integrals and Surface Integrals to Volume Integrals.												
Contri (1 – Lo	bution ow, 2 -	of Co Mediı	ourse O 1m, 3 –	outcon High)	nes tov )	vards a	achiev	ement	of Pro	ogram	Outco	omes	
	<b>PO</b> 1	РО 2	<b>PO</b> 3	PO 4	РО 5	PO 6	<b>PO</b> 7	<b>PO</b> 8	РО 9	PO 10	PO 11	PO 12	
CO1	3	1											
CO2	3	1											
CO3	3	1											
CO4	3	1											
## UNIT I

**Laplace Transforms:** Introduction, Definition, Conditions for Existence, Transforms of Elementary functions, Properties of Laplace Transforms, Transforms of Periodic functions, Transforms of Derivatives, Transforms of Integrals, Multiplication by t<sup>n</sup>, Division by 't', Inverse Transforms, Method of partial fractions, Other methods of finding Inverse Transform, Convolution Theorem, Unit Step and Unit Impulse functions.

**Applications:** Evaluation of Improper Integrals, Solving Differential equations by Laplace Transform.

#### UNIT II

**Partial Differential Equations**: Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equations, Equations Solvable by Direct Integration, Linear Equations of First Order. **Sequence and Series**: Convergence of series, Comparison test, Integral test, D'Alembert's Ratio test, Cauchy's Root Test, Alternating series test, Absolute and Conditional convergence.

#### UNIT III

**Integral Calculus**: Double Integrals, Change of Order of Integration, Double Integrals in Polar Coordinates, Triple Integrals, Change of Variables. **Applications:** Area enclosed by Plane Curves, Volumes of Solids.

**Special Functions**: Beta Function, Gamma Function, Relation between Beta and Gamma Function, Error Function.

## UNIT IV

**Vector Calculus**: Scalar and Vector point functions, Del applied to Scalar point functions, Del applied to Vector point functions, Physical interpretation of Divergence, Del applied twice to point functions, Del applied to products of point functions. Integration of Vectors, Line Integral, Surface Integral, Green's Theorem in a plane, Stokes's Theorem, Volume Integral, Gauss Divergence Theorem, Irrotational Fields.

#### TEXT BOOKS

[1] B.S.Grewal, "Higher Engineering Mathematics, Khanna Publishers", 43<sup>rd</sup> Edition, 2014.

#### **REFERENCE BOOKS**

 [1].Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, 10<sup>th</sup> Edition,2015

- [2].B.V.Ramana, "Higher Engineering Mathematics", Tata MC Graw Hill, 1<sup>st</sup> Edition,2007
- [3].N.P.Bali, Dr.Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, 9<sup>th</sup> Edition,2014

#### **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1]. www.nptel videos.com/mathematics/ (Math Lectures from MIT, Stanford, IIT'S)
- [2]. nptel.ac.in/courses/122104017
- [3]. nptel.ac.in/courses/111105035
- [4]. Engineering Mathematics Open Learning Project. www.3.ul.ie/~mlc/support/Loughborough%20website/

#### 17CH1202A ENGINEEERING CHEMISTRY

Course	Categ	ory:	Instit	utional	Core					Credits	s: 3	
Course	Type:		Theor	ry			Lectu	re-Tut	orial-P	ractice	<b>e:</b> 3-0	-0
Prerequisites:Knowledge of Chemistry at Intermediate levelContinuo Semester en termediate										luation luation Marks	a: 30 a: 70 a: 100	)
COUR	SE OU	TCON	MES									
Upon s	uccess	ful con	npletio	n of th	ne coui	rse, the	stude	nt will	be ab	e to:		
CO1	Analy	ze vari	ous wa	ater tre	atment	metho	ds and	boiler	trouble	es.		
CO2	Apply mater utilisa	the tals antion.	princip nd app	oles of ly the	f spec knowl	troscop edge of	oic tec f conv	hnique entiona	s to I fuels	analy: for the	se dif eir eff	ferent ective
CO3	Apply electro	the des ar	knowl nd batte	edge eries fo	of wo or their	orking applica	princi ation ir	ples on variou	of con is techi	ducting nologic	g poly al field	mers, ds.
<b>CO4</b>	Evalu	ate cor	rosion	proces	ses as	well as	protec	tion m	ethods.			
Contri (1 - Lo	bution w, 2 - N	of Cou Aediui	1rse O n, 3 - I	utcom High	es tow	ards a	chieve	ment o	f Prog	ram O	utcom	es
	РО	РО	РО	PO	PO	PO	PO	PO	PO	PO	РО	PO
	1	2	3	4	5	6	7	8	9	10	11	12
<b>CO1</b>		3										
CO2	2											
<b>CO3</b>											3	

**CO4** 

2

#### **COURSE CONTENT**

#### UNIT I

**Water technology-I:** WHO standards - Water treatment for drinking purpose - sedimentation, coagulation, filtration, disinfection by chlorination, breakpoint chlorination and its significance - Desalination of brackish water - principle and process of electrodialysis and reverse osmosis, advantages and disadvantages.

Water technology-II: Boiler troubles - scales-formation, disadvantages and internal conditioning methods - phosphate conditioning, calgon conditioning and sodium aluminate, caustic embrittlement- reasons, mechanism and its control, and boiler corrosion – causes and control.

## UNIT II

**Spectroscopic Techniques and Applications:** Interaction of electromagnetic radiation with matter - Ultraviolet-visible spectroscopy: Frank-Condon principle, types of electronic transitions, Lambert-Beer's law – definition and numerical problems, problems on interpretation of UV-visible spectra of simple molecules of arenes, aldehydes and ketones. Infrared (IR) spectroscopy: Principle, types of vibrations, problems on interpretation of IR spectra of simple molecules of amines, alcohols, aldehydes and ketones.

**Fuel Technology:** Fuel-definition, calorific value- lower and higher calorific values, analysis of coal – proximate analysis and ultimate analysis, refining of petroleum, flue gas analysis by Orsat's apparatus, numericals based on calculation of air required for combustion

## UNIT III

**Conducting polymers:** Definition, examples, classification-intrinsically conducting polymers and extrinsically conducting polymers- mechanism of conduction of undoped polyacetylene, doping of conducting polymers- mechanism of conduction of p-doped and n-doped polyacetylenes – applications of conducting polymers.

**Electrochemistry:** Construction and working of Calomel electrode, silver-silver chloride electrode and principle, construction and working of glass electrode, determination of pH using glass electrode - Chemistry of modern batteries -  $\text{Li/SOCl}_2$  battery and  $\text{Li}_x\text{C/LiCoO}_2$  battery - construction, working and advantages, Chemistry of H<sub>2</sub>-O<sub>2</sub> fuel cell-advantages.

## UNIT IV

**Corrosion principles:** Introduction, definition, reason for corrosion, examples – electrochemical theory of corrosion, types of electrochemical corrosion – hydrogen evolution and oxygen absorption – corrosion due to dissimilar metals, galvanic series – differential aeration corrosion – pitting corrosion and concept of passivity.

**Corrosion control methods:** Cathodic protection- principle and types - impressed current method and sacrificial anode method, anodic protection-principle and method,

corrosion inhibitors – types and mechanism of inhibition – principle, process and advantages of electroplating and electroless plating.

#### **TEXT BOOKS**

[1] Shikha Agarwal, "Engineering Chemistry – Fundamentals and Applications", Cambridge University Press, New Delhi, 1<sup>st</sup> edition (2015).

#### **REFERENCE BOOKS:**

- [1] Sunita Rattan, "A Textbook of Engineering Chemistry", S.K. Kataria & Sons, New Delhi, First edition 2012.
- [2] P.C. Jain , "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Limited, New Delhi, 15<sup>th</sup> edition.
- [3] B.S. Bahl, G. D. Tuli and Arun Bahl, "Essentials of Physical Chemistry", S. Chand and Company Limited, New Delhi.
- [4] O. G. Palanna, "Engineering Chemistry", Tata McGraw Hill Education Pvt. Ltd., New Delhi.
- [5] Y.Anjaneyulu, K. Chandrasekhar and Valli Manickam, Text book of Analytical Chemistry, , Pharma Book Syndicate, Hyderabad.
- [6] H. Kaur, Spectroscopy, I Edition, 2001, Pragati Prakashan, Meerut.

#### **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1] http://www.cip.ukcentre.com/steam.htm
- [2] http://corrosion-doctors.org/Modi;es/mod-basics.htm
- [3] http://nopr.niscair.res.in/bitstream/123456789/5475/1/JSIR%2063%289%29%20 715-728.pdf
- [4] https://chem.libretexts.org/Core/Analytical\_Chemistry/Electrochemistry/Basics\_ of\_Electrochemistry
- [5] http://www.filtronics.com/blog/tertiary-treatment/stages-in-typical-municipalwater-treatment/
- [6] https://www.khanacademy.org/test-prep/mcat/physical-processes/infrared-andultraviolet-visible-spectroscopy/e/infrared-and-ultraviolet-visible-spectroscopyquestions
- [7] NPTEL online course, "Analytical Chemistry", offered by MHRD and instructed by Prof. Debashis Ray of IIT Kharagpur.
- [8] NPTEL online course, "Corrosion Part-I" offered by MHRD and instructed by Prof. Kallol Mondal of IIT Kanpur

#### 17CS1203 PROGRAMMING IN C

<b>Course Category:</b>	Institutional Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture -Tutorial-Practice:	3 - 0 - 0
Prerequisites:	Problem Solving	<b>Continuous Evaluation:</b>	30
	Methods.	Semester end Evaluation:	70
		Total Marks:	100

#### **COURSE OUTCOMES**

#### Upon successful completion of the course, the student will be able to:

<b>CO1</b>	Understand the fundamentals and structure of a C programming language
CO2	Apply the loops, arrays, functions and string concepts in C to solve the given problem.
CO3	Apply the pointers and text input output files concept to find the solution for the given applications.
CO4	Use the Enumerated, Datatypes, Structures and Unions.

# Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	<b>PO</b> 1	РО 2	РО 3	PO 4	РО 5	РО 6	РО 7	РО 8	РО 9	PO 10	РО 11	PO 12
<b>CO1</b>	3											
CO2		1	3									
CO3		1	3									
<b>CO</b> 4	3											

#### UNIT - I

**Introduction to the C Language :** Background, C Programs, Identifiers, Types, Variables, Constants, Input/Output, Programming Examples.

**Structure of a C Program**: Expressions, Precedence and Associatively, Evaluating Expressions, Type Conversion, Statements, Sample Programs.

Selection: Storage Class, Logical Data and Operators, Two -Way Selection, Multiway Selection, More Standard Functions

#### UNIT - II

**Repetition:** Concept of a Loop Loops In C, Loop Examples, Recursion, The Calculator Program.

Arrays: Concepts, Using Array in C, Inter-Function Communication, Array Applications, Two Dimensional Arrays, Multidimensional Arrays.

**Functions:** Functions in C, User Defined Functions, Inter Function Communication, Standard Functions, Scope.

**Strings:** String Concepts, C Strings, String Input/Output Functions, Arrays of Strings, String Manipulation Functions, String- Data Conversion.

#### UNIT - III:

**Pointers:** Introduction, Pointers For Inter Function Communications, Pointers to Pointers, Compatibility, Lvalue and Rvlaue.

**Pointer Applications**: Arrays and Pointers, Pointer Arithmetic and Arrays, Passing an Array to a Function, Memory Allocations Functions, Array of Pointers.

**Text Input/output**: Files, Streams, Standard Library Input/Output Functions, Formatting Input/output Functions and Character Input/Output Functions, Command-Line Arguments.

#### UNIT - IV:

**Enumerations:** The Type Definition(Typedef), Enumerated Types: Declaring an Enumerated Type, Operations on Enumerated Types, Enumeration Type Conversion, Initializing Enumerated Constants, Anonymous Enumeration: Constants, Input/Output Operators.

**Structures:** Structure Type Declaration, Initialization, Accessing Structures, Operations on Structures, Complex Structures, Structures and Functions, Sending the Whole Structure, Passing Structures through Pointers.

**Unions:** Referencing Unions, Initializers, Unions and Structures, Internet Address, Programming Applications.

## TEXT BOOKS

[1] Behrouz A. Forouzan & Richard F. Gilberg, "Computer Science A Structured Programming Approach using C", CENGAGE Learning, Third Edition.

#### **REFERENCE BOOKS**

- [1] Kernighan and Ritchie, "The C programming language", The (Ansi C Version), PHI, second edition.
- [2] Yashwant Kanetkar, "Let us C", BPB Publications, 2<sup>nd</sup> Edition 2001.
- [3] Paul J. Dietel and Dr. Harvey M. Deitel, "C: How to Program", Prentice Hall ,7<sup>th</sup> edition (March 4,2012).
- [4] Herbert Schildt, "C:The Complete reference", McGraw Hill, 4<sup>th</sup> Edition, 2002.
- [5] K.R.Venugopal, Sundeep R Prasad, "Mastering C", McGraw Hill, 2<sup>nd</sup> Edition, 2015

				1 ELE(	.7EC12 CTRO	204B(H NIC D	ECE) EVIC	ES				
Course C	Catego	ory:	Institut	ional (	Core					Credi	ts:	3
Course T	ype:		Theory				Lectu	re -Tu	torial-]	Practic	e: 3	-0-0
Prerequi	sites:		Engine	ering I	Physics	5	Co	ntinuo	ous Eva	aluatio	n:	30
							Sem	ester e	nd Eva	aluatio	n:	70
									Tota	l Marl	KS:	100
COURSE	E OUI	<b>FCO</b> I	MES									
Upon suc	cessfu	ıl cor	npletio	n of th	e cour	se, the	stude	nt will	be abl	e to:		
CO1	De	velop	a basic	under	standir	ng of s	emicor	nductor	r physi	cs.		
CO2	Un	Understand and analyze the operation of BJTs and FETs.										
CO3	Rea	alize	the prin	ciples	of two	termin	al devi	ices an	d PNP	N devi	ces	
Contribu (1 – Low,	tion o , 2 - N	of Co Iediu	urse Ou m, 3 – l	i <b>tcome</b> High)	es towa	ards ac	hiever	nent o	f Prog	ram O	utcom	ies
	PO	PO	PO	PO	PO	PO	PO	PO	РО	РО	PO	PO
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3		2	2								
CO2	2		2	2								
CO3	2		2	2								
COURSE UNIT – I Conductio	CON on ir	TEN n Se	T	luctor	s: Cc	onducti	vity	of a	Semi	conduc	tor,	Carrier

VR17

Concentrations in an Intrinsic Semiconductor, Donor and Acceptor Impurities, Charge densities in a semiconductor, Fermi level in a Semiconductor having Impurities,

Diffusion, Carrier life time, Continuity equation.

**Semiconductor Diode Characteristics :** Qualitative theory of P-N junction, p-n Junction as a Diode, Band Structure of an Open Circuited p-n Junction, Quantitative theory of P-N diode currents, The Volt Ampere Characteristics, The temperature dependence of P-N Characteristics, Diode Resistance, Space Charge or Transition Capacitance, Diffusion capacitances. Breakdown Diodes, The tunnel Diode.

#### UNIT - II

**Transistor Characteristics:** The Junction Transistor, Transistor Current Components, the Transistor as an Amplifier, The Common Base Configuration, The Common Emitter Configuration, The Common Collector Configuration.

**Transistor Biasing & Thermal Stabilization:** The Operating Point, Bias Stability, Collector to Base Bias, Self Bias, Stabilization against variations in  $V_{BE}$  and  $\beta$  for the Self Bias Circuit, Bias Compensation, Thermistor & Sensistor Compensation, Thermal Runaway and Thermal Stability.

#### UNIT – III

**Filed Effect Transistors:** Construction and Characteristics of JFETs, Transfer Characteristics, Specification Sheets (JFETs), Depletion-type MOSFET and Enhancement-type MOSFET, VMOS, CMOS, MESFETs.

**FET Biasing**: Introduction, Fixed Bias Configuration, Self Bias Configuration, Voltage Divider Biasing, Depletion-type MOSFET and Enhancement-type MOSFET.

#### UNIT – IV

**Other Two-Terminal Devices :** Schottky Barrier (Hot-Carrier) Diodes, Varactor (Varicap) Diodes, Solar Cells, Photodiodes, Photoconductive Cells, IR Emitters, Liquid-Crystal Displays, Thermistors

**PNPN Devices**: Silicon Controlled Rectifier, Basic Silicon Controlled Rectifier Operation, SCR Characteristics & Ratings, Silicon Controlled Switch, Light Activated Silicon Controlled Rectifier, Shockley Diode, DIAC, TRIAC and Uni-Junction Transistor, Phototransistors, Opto-Isolators.

#### TEXT BOOKS

- [1]Jacob Millman, Christos C Halkias & Satyabrata JIT, "Millman's Electronic Devices and Circuits", 4<sup>th</sup> Edition, TMH, 2015. (Unit I & II).
- [2]Robert L Boylested and Louis Nashelsky, "Electronic Devices and Circuit Theory", 10<sup>th</sup> Edition, Pearson India, 2009. (UNIT III & IV).

## **REFERENCE BOOKS**

- [1]Nandita Das Gupta and Amitava Das Gupta, "Semiconductor Devices Modelling and Technology", PHI Learning Pvt. Ltd., 2013
- [2]David A Bell., "Electronic Devices and Circuits", 5<sup>th</sup> Edition, Oxford University Press, 2008.

## **E-RESOURCES AND OTHER DIGITAL MATERIAL**

[1] http://www.nptelvideos.in/2012/12/basic-electronics-drchitralekha-mahanta.html

[2]http://nptel.ac.in/courses/117103063/

[3]http://nptel.ac.in/courses/117106033/

[4]http://nptel.ac.in/courses/117102061/

												VR17
17ME1205												
ENGINEERING GRAPHICS												
Cours	se Cate	egory:	Instit	utional	Core				Cı	redits:	Z	ł
						Le	cture-'	Tutori	al –Pra	actice:	2-(	)-4
Cours	е Туре	2:	Theo	ry & P	ractice		Cont	inuous	Evalu	ation:	3	0
	• • /						Semest	er end	Evalu	ation:	70	
Prere	quisite	S:	Math	ematic	S			Ĩ	otal N	larks:	10	)0
COUI	RSE O	UTCO	MES:									
Upon	succes	sful co	mpleti	on of t	he cou	rse, th	e stud	ent wil	l be ab	le to:		
C01	Under	rstand t	he Sca	les, co	nics an	d Cycl	oidal c	urves.				
$CO^2$	Draw	Orthog	ranhic	nroiec	tions	of noint	s Line	s Plan	es and	Solids		
							5, Line	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			1	
CO3	repres	rstand sentatio	n	nal vie	ews of	Solid	s, Dev	elopme	ent of	surface	es and	their
<b>CO4</b>	Const	ruct is	ometric	scale,	isome	etric pr	ojectio	ns ,isoi	metric	views	and co	onvert
	pictor	ial viev	vs to o	rthogra	phic p	rojectio	ons					
Contr ( 1– L	ibutioı ow, 2 -	ı of Co Mediı	urse C ım, 3 –	Outcom · High)	nes tow	vards a	chieve	ement (	of Prog	gram O	utcom	es
	PO 1	PO 9	PO 3	PO 1	PO 5	PO 6	PO 7	PO 8	PO q	PO 10	PO 11	PO 12
<b>CO1</b>	3		5	н 3	0			0	5	10	1	1~
CO2	2			3							2	
CO3	2			2							2	
CO4												
	1							1				

#### **COURSE CONTENT**

#### UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance

Scales: Construction of plain and diagonal Scales

**Conic Sections**: Construction of ellipse, parabola and hyperbola (Treatment is limited to Eccentricity or General method only)

Engineering Curves: Cycloidal curves - Cycloid, Epicycloid and Hypocycloid

#### UNIT-II

**Orthographic Projections:** Principles of Orthographic Projections –Projections of Points, Lines (Treatment is limited to First Angle Projection) and Projections of Plane regular geometric figures (Up to Plane Inclined to both of the Reference planes)

#### UNIT – III

**Projections of Solids**: Projections of simple solids such as Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions (Limited to Solid Inclined to one of the Reference planes)

**Sections of Solids**: Sections of solids such as Cubes, Prisms, Pyramids, Cylinders and Cones. True shapes of sections(Limited tothe solids perpendicular to one of the Principal Planes)

#### UNIT – IV

**Development of Surfaces**: Lateral development of cut sections of Cubes, Prisms, Pyramids, Cylinders and Cones

**Isometric Projections**: Isometric Projection and conversion of isometric views into Orthographic Projections (Treatment is limited to simple objects only)

**Conventions Auto CAD**: Basic principles only (Internal assessment only)

#### **Text Books**

- [1]N.D. Bhatt & V.M. Panchal, "Elementary Engineering Drawing", Charotar Publishing House, Anand. 49th Edition 2006
- [2]Basanth Agrawal & C M Agrawal," Engineering Drawing", McGraw Hill Education Private Limited, New Delhi

#### **Reference Books**

- [1]K. L. Narayana & P. Kannaiah, "Text Book on Engineering Drawing", Scitech publications (India) Pvt. Ltd., Chennai, 2nd Edition fifth reprint 2006
- [2]K. Venugopal, "Engineering Drawing and Graphics + Auto CAD", New Age International, New Delhi

[3]D M Kulkarni, AP Rastogi, AK Sarkar, "Engineering Graphics with Auto CAD", PHI Learning Private Limited, Delhi Edition – 2013

#### E-Resources and other digital material

[1]http://www.youtube.com/watch?v=XCWJ XrkWco, Accessed On 01-06-2017.

[2]http://www.me.umn.edu/courses/me2011/handouts/drawing/blancotutorial.html# isodrawing, Accessed On 01-06-2017.

[3]http://www.slideshare.net, Accessed On 01-06-2017.

[4]http://edpstuff.blogspot.in, Accessed On 01-06-2017.

			TUDI		17CH	1251 ISTD	<b>VTAT</b>		торі	7			
Course Category:Institutional CoreCredits:1.5													
Course T	vne•	Lab	oratory			Lecture - Tutorial-Practice:						0 - 3	
Prerequis	ites:	Kno	wledg	e of			Conti	niioiis	Eval	uation		0 30	
Trerequis	10051	cher	nistry	practic	cals	Semester end Evaluation:						70	
		at in	termed	diate le	evel			Г	Fotal I	Marks	: 1	00	
COURSE	OUTC	OMES											
Upon suc	cessful c	complet	tion of	f the c	ourse,	the st	udent	will b	e able	e to:			
CO1	Ana	lyze qu	ality p	arame	eters of	water	: samp	les fro	m diff	erent s	ources	5	
CO2	Perf	form qu	antitat	tive an	alysis	using	instrur	nental	metho	ods.			
CO3	App	bly the tings an	know d phot	ledge tochen	of me	chanis eactior	sm of ns.	corros	sion ir	hibitio	n, me	etallic	
Contribut (1 – Low,	Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)												
	РО	РО	PO	PO	PO	PO	PO	РО	PO	PO	PO	PO	
	1	2	3	4	5	6	7	8	9	10	11	12	
CO1				3									
CO2					2								
CO3		2											
	1	1	1	1	1	1	1	1	1	11		1	_
COURSE	CONTE	ENT											
List of Exp	oerimen	ts:											
1. Deter	rminatio	n of tot	al alka	linity	of wat	er sam	ple						
2. Determination of chlorides in water sample													
3. Deter	Determination of hardness of water sample												
4. Determination of available chlorine in bleaching powder													

- 5. Determination of copper in a given sample
- 6. Determination of Mohr's salt Dichrometry
- 7. Determination of Mohr's salt Permanganometry
- 8. Determination of purity of boric acid sample
- 9. Conductometric determination of a strong acid using a strong base
- 10. pH metric titration of a strong acid vs. a strong base
- 11. Determination of corrosion inhibition efficiency of an inhibitor for mild steel
- 12. Chemistry of Blue Printing
- 13. Preparation of Urea-Formaldehyde resin

#### **REFERENCE BOOKS**

- [1] *S.K. Bhasin and Sudha Rani*, "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 2<sup>nd</sup> edition.
- [2] *Sunitha Rattan*, "Experiments in Applied Chemistry", S.K. Kataria & Sons, New Delhi, 2<sup>nd</sup> edition.

#### 17CS1252 COMPUTER PROGRAMMING LABORATORY

<b>Course Category:</b>	Institutional Core	Credits:	1.5
<b>Course Type:</b>	Laboratory	Lecture -Tutorial-Practice:	0 - 0 - 3
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		<b>Total Marks:</b>	100

#### **COURSE OUTCOMES**

#### Upon successful completion of the course, the student will be able to:

CO1	Implement the use of programming constructs in a structured oriented programming language
CO2	Analyze and implement user defined functions to solve real time problems
CO3	Implement the usage of pointers and file operations on data
CO4	Implement the user defined data types via structures and unions to solve real life problems

# Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	<b>PO</b> 1	РО 2	РО 3	PO 4	РО 5	РО 6	РО 7	РО 8	РО 9	PO 10	РО 11	PO 12
<b>CO1</b>	1	2	3									
CO2		2	3									
CO3		2	3									
<b>CO</b> 4		2	3								1	

#### **COURSE CONTENT**

# CYCLE – I : PROGRAMMING CONSTRUCTS AND CONTROL STRUCTURES

- 1. Introduction to C Pogramming:
  - a) Use of Turbo C IDE
  - b) The Structure of C Program with Sample program
- 2. Data Types and Variables:
  - a) Programs to usage of keywords and identifiers in c
  - b) Programs on declaration of variables, rules for naming a variable, constants and different type of constants, data types
  - c) Programs to perform on various operators in C
- 3. Branching and Selection:
  - a) To specify the conditions under which a statement or group of statements should be executed.
  - b) To choose exactly one out of two statements (possibly compound statements) to be executed; specifies the conditions under which the first statement is to be executed and provides an alternative statement to execute if these conditions are not met.
  - c) To choose one statement (possibly compound) to be executed from among a group of state- ments (possibly compound); specifies the conditions under which each statement may be executed and may contain a default statement (in an else clause at the end) to be executed if none of these conditions are met. Note that in the absence of a final else clause, it may be the case that none of the statements are executed.
- 4. Unconditional control Transfer statements in C:
  - a) Design and develop programs that use of goto Statement
  - b) Design and develop programs that the use of Break Statement
  - c) Design and develop programs that use of Continue Statement
- 5. Looping constructs:

Design and develop programs based on

- a) Iterative loops using While, Do While, For, Nested For
- b) Selection Statement using the switch-case Statement
- c) Multiple way selections that will branch into different code segments based on the value of a variable or expression
- 6. Arrays
  - a) Design and develop programs which illustrates the implementation of singledimensional arrays and Multi dimensional arrays
- 7. Strings

- a) Create programs to initialize strings and usage of them for various input, output operations.
- b) Design and develop programs to handle String functions

# **CYCLE - II: ADVANCED PROGRAMMING CONSTRUCTS**

1.Concept of user defined functions

- a) Design and develop programs depending on functions both user defined and standard library functions in C with different approaches.
- 2. File handling operations
  - a) FILE structure
  - b) Opening and closing a file, file open modes
  - c) Reading and writing operations performed on a file
  - d) File Pointers: stdin, stdout and stderr
  - e) FILE handling functions: fgetc(), fputc(), fgets() and fputs() Functions

## 3. Pointers:

- a) Programs on declaration of pointers and their usage in C
- b) Programs to relate between arrays and pointers and use them efficiently in a program
- c) To pass pointers as an argument to a function, and use it efficiently in program
- 4. Command Line Arguments
  - a) Design and develop programs that accept arguments from command line to perform different kinds of operations
- 5. Structures and Unions
  - a) Programs to define, declare and access structure and union variables
  - b) Design and develop programs to work with pointers to access data within a structure

Programs to pass structure as an argument to a function

# TEXT BOOKS

 [1] Ashok N Kamthane, "C And Data Structures", Pearson Education; First edition, 2008

# **REFERENCE BOOKS**

- [1]Brain W Kernighan and Dennis Ritchie, "The C Programming language", Pearson Education India,2015
- [2] David Griffiths and Dawn Griffiths, "Head First C": A Brain Friendly Guide, O:Reilly media, 2012

## **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- [1]Introduction to Programming C: http://nptel.ac.in/courses/106104128/
- [2] C-Programming IIT Kharagpur lectures https://www.youtube.com/watch?v=S47aSEqm\_0I&list=PLeCxvb23g7hrw27X1 ekHtfygUTQ0TmFfP
- [3]Numerical Methods and Programing by Prof.P.B.Sunil Kumar, Department of Physics, IIT Madras https://www.youtube.com/watch?v=zjyR9e-N1D4& list=PLC5DC6AD60D798FB7

# 17MC1206B PROFESSIONAL ETHICS & HUMAN VALUES

<b>Course Category:</b>	Mandatory Learning	Credits:	
<b>Course Type:</b>	Theory	Lecture -Tutorial-Practice:	2 - 0 - 0
Prerequisites:		<b>Continuous Evaluation:</b>	100
		Semester end Evaluation:	
		<b>Total Marks:</b>	100

#### **COURSE OUTCOMES**

#### Upon successful completion of the course, the student will be able to:

<b>CO1</b>	Know the moral autonomy and uses of ethical theories.
CO2	Understand morals, Honesty and character.
CO3	Understand about safety, risk and professional rights.
CO4	Know the ethics regarding Global issues related to Environment, Computers and weapon's development.

# Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)

	РО 1	РО 2	РО 3	РО 4	РО 5	РО 6	РО 7	РО 8	РО 9	РО 10	РО 11	РО 12
<b>CO1</b>	2											
CO2								2				
CO3					3							
CO4											2	

#### **COURSE CONTENT**

#### UNIT I

**Engineering Ethics**: Senses of 'Engineering Ethics' - variety of moral issues- 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.

#### UNIT II

**Human Values**:Morals, Values and Ethics - Integrity- Work Ethic – Service Learning -Civic Virtue - Respect for Others - Living Peacefully - caring – Sharing - Honesty -Courage - Valuing Time - Co-operation - Commitment –Empathy - Self-Confidence -Character - Spirituality.

#### UNIT III

**Engineering as Social Experimentation**: Engineering as experimentation – engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study, Safety, Responsibilities and Rights: Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – the three mile island and chernobyl case studies. Collegiality and loyalty – respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

#### UNIT IV

**Global Issues**: Multinational corporations- Environmental ethics- computer ethics weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

#### TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York (1996).

2. Govindarajan M, Natarajan S, Senthil Kumar V. S., "Engineering Ethics", Prentice Hall of India, New Delhi(2004).

#### **REFERENCE BOOKS**

[1]Baum, R.J. and Flores, A., "Ethical Problems in Engineering, Center for the studyof the Human Dimensions of Science and Technology", Rensellae Polytechnic Institute, Troy, New York, 335 pp. eds. (1978)

[2]Beabout, G.R., Wennemann, D.J., "Applied Professional Ethics: A Developmental Approach for Use with Case Studies", University Press of America Lanham, MD, 175 pp (1994).

#### 17MA1301: COMPLEX ANALYSIS & NUMERICAL METHODS

<b>Course Category:</b>	Institutional Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial -Practice:	3 - 1 - 0
Prerequisites:	Algebra of Complex numbers,	<b>Continuous Evaluation:</b>	30
	convergence of infinite series,	Semester end Evaluation:	70
	theory of equations	Total Marks:	100

Course Outcomes	Upon successful completion of the course, the student will be able to:CO1Determine analytic and non-analytic functions and understand														
	CO1	CO1Determine analytic and non-analytic functions and understand the concept of complex integration.AnalyzeTaylorAnalyzeTaylorTaylorTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylorAnalyzeTaylo													
	CO2	<ul> <li>CO2 Analyze Taylor and Laurent series and evaluation of real definite integrals using residue theorem and understand the concept of transformations.</li> <li>CO3 Solve Algebraic and transcendental, system of equations and understand the concept of polynomial interpolation.</li> </ul>													
	CO3														
	CO4	CO4 Understand the concept of Numerical differentiation and integration. Solve initial and boundary value problems numerically.													
Contribution of Course		PO         PO<													
Outcomes towards	CO1         3         2         2         3														
achievement of ProgramCO23222														3	
Outcomes (1 – Low,	CO3	3	2			3						2		3	
2 - Medium, 3 - High)	CO4	3	2			3						2		3	
Course Content	UNIT Comj Analy integr (15Hn UNIT Taylo calcul residu Stanc Invers UNIT Nume Introc equat: Inter Differ	<b>Fil:</b> <b>plex</b> tric tric tric tric <b>rs</b> ) <b>Fil:</b> r's sec lation the the <b>laton</b> sion a <b>Fil:</b> <b>rs</b> <b>fil:</b> <b>rs</b> <b>fil:</b> <b>rs</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>fil:</b> <b>f</b>	Anal functi functi , C orem orem tran nd re <b>Met</b> n, N - Gau ion: 1 s, Sy	Lau Lau esidu ). sforr flecti ewto ss Eli Introc	Intr Har y's rent's es, e natio on - I s: So n -H imina ductic lic F	roduc moni integ seri valua <b>ns:</b> Biline lutior Raphs tion I on, F Relatio	etion, c fur ral es, Z tion Trans ear trans con r Metho inite cons,	con inctio theor Zeros of re- slation ansfor Alget netho od - C Diffe	tinuit ns, rem, and al de n - rmati oraic od, S Gauss rence erence	y, C Orth Ca sing finite Mag on. (1 and soluti s - Se es - 1 es o	Cauch ogona uchy uchy ularifice inte inte <b>15hrs</b> Tran on c idel i Forw f a	al sy-Ria al sy 's i ties. grals ation s) scence of sin terati ard, I polyn	eman ystem ntegr Resid (by and lenta multa ve m Back nomia	n equans, Co al for due the applyin Rotat l Equat meous ethod. ward, C al, Nev	ations. mplex rmula. eorem, ng the tion – tions : linear Central wton's

	formulae for interpolation, Central difference interpolation formulae –Gauss's, Sterling's, Bessel's formulae Interpolation with unequal intervals – Lagrange's and Newton's Interpolation formulae. (15hrs) UNIT – IV Numerical Differentiation And Integration: Finding first and second order differentials using Newton's formulae. Trapezoidal rule and Simpsons 1/3 Rule. Numerical Solutions of Differential Equations: Taylor's series method Picard's method. Euler's method, Runge - Kutta method of 4th order, Boundary value problems, Solution of Laplace's and Poisson's equations by iteration.(15hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. B.S.Grewal, "Higher Engineering Mathematics", 42<sup>nd</sup> Edition, Khanna Publishers, 2012.</li> <li>Reference Books:</li> <li>1. Krezig, "Advanced Engineering Mathematics", 8<sup>th</sup> Edition, John Wiley &amp; Sons.2007,</li> <li>2. R.K.Jain and S.R.K.Iyengar, "Advanced Engineering Mathematics", 3<sup>rd</sup> Edition, Narosa Publishers.</li> <li>3. N.P.Bali, Manish Goyal, "A Text book of Engineering Mathematics", 1<sup>st</sup> Edition, Lakshmi Publications (P) Limited, 2011</li> <li>4. H.K.Das, Er. RajnishVerma, "Higher Engineering Mathematics", 1<sup>st</sup> Edition, S.Chand&amp; Co., 2011.</li> <li>5. S. Sastry, "Introductory Methods of Numerical Analysis", PHI, 2005.</li> </ul>
E-resources and other digital material	<ol> <li>faculty.gvsu.edu/fishbacp/complex/complex.html</li> <li>nptelvideolectures/iitm.ac.in</li> </ol>

#### **17EC3302: ANALOG ELECTRONICS**

<b>Course Category:</b>	Core		Credits:	3
<b>Course Type:</b>	Theory		Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17PH1102-	Engineering	<b>Continuous Evaluation:</b>	30
_	Physics,	17EC1204B-	Semester end Evaluation:	70
	Electronic Dev	vices	Total Marks:	100

Course outcomes	Upo	n suc	cessfi	ul cor	npleti	ion of	the c	ourse	, the s	studer	nt will	l be al	ble to	:								
	CO1	O1 Analyze single stage amplifiers using BJT and FET at Low and Hi Frequencies.													High							
	CO2	Ana	nalyze multistage amplifiers using BJT.																			
	CO3 Design and analyze Feedback amplifiers & Oscillators									sign and analyze Feedback amplifiers & Oscillators using BJT.												
Contribution of Course		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							
Outcomes towards	CO1	1	3												3							
achievement of	CO2	1	3												3							
Program Outcomes (1 – Low, 2 - Medium, 3 - High)	CO3	1	3												3							
Content	Trai Trai Circ Simj Com Emir FET Com Drai UNI Trai Trar Vali Circ Trar Follo FET Freq Hou UNI Mul Amp	nsiston uit U plified imon tter R igura n con T II nsiston dity c uits ( uits (	or at r Hyb sing l d Coll esista Lov tion, l figura or at r Mo of Hyb Curren r An at Hig High ies an rs, Fr c, Ban	Low rid M h Para mmor lector unce. v Fu Self E tions. Hig del, brid π nt Ga nplifie gh Freq id the Ampli requent id Pas	Free Forder, ameter Correque Bias C (15 H h Fr Hybrit: Mod in, C er R equen [uenc Corr fifers: ancy I ss of (	equen The The rs, Er itter H figur encies onfigu lours) reque id II del, Va curren espon cies. ites: T imon : Cl Respo Casca	cies: h Par nitter Hybrid ation, : JF uration ncies: Concernition t Gai use, The C Drain assifi nse of ded S	Two amete Follc d Mo Cor ET S n, Vol The luctar on of n wit The Comm a FET cation of an Stages	Port ers, A ower, A ower, A ower, A del, S mmon Small ltage I ltage I h Res Gain- non S Amp Amp , The	Dev nalys Mille Simpl Simpl Divide Divide orid D The id $\pi$ P sistive Band ource Differ RC (	ices is of $7^{\circ}$ ers Th ified itter nal I er Con pi ( $\pi$ ) Hybr Parame e Loa width e FET at H nplifie r, Ste Coupl	and I Trans leorer Calcu Amp Model nfigur ) Con id II eters. id, Sin Pro T Amp igh Fr ers, ep Ro ed An	Iybri istor n and ilation lifier l, Fi ation, mmor Cap The 0 ngle oduct, plifier reque Disto espon nplifi	d Ma Ampl its E ns for with xed Com acitar CE SI Stage En r at I ncies	odel, ifier bual, the an Bias mon hitter ces, nort- CE hitter High (15) in f an ffect							

	of Emitter Bypass Capacitor on Low Frequency Response, High Frequency Response of Two Cascaded CE Transistor Stages, Multistage CE Amplifier Cascade at High Frequencies, cascode Amplifier.( <b>15 Hours</b> ) <b>UNIT IV</b> <b>Feedback Amplifiers:</b> Classification of Amplifiers, The Feedback Concept, The Transfer Gain with Feedback, General Characteristics of Negative Feedback Amplifiers, Method of Analysis of a Feedback Amplifier, Voltage Series Feedback, Current Series Feedback, Current Shunt Feedback, Voltage Shunt Feedback. <b>Oscillators:</b> Sinusoidal Oscillators, The Phase Shift Oscillator Using BJT, A General Form of Oscillator Circuit, The Wein Bridge Oscillator, Hartley &Colpitt's Oscillators Using BJT.( <b>15 Hours</b> )
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Jacob Millman and Christos C. Halkias, "Integrated Electronics", 2nd Edition, 2008, Tata McGraw Hill Publication. (Units I,II,III&amp; IV).</li> <li>Reference Books:</li> <li>1. Pohert L. Powlasted and Louis Nashelsky, "Electronic Davises and Circuit."</li> </ul>
	<ol> <li>Robert L Boylested and Louis Nashelsky, Electronic Devices and Circuit Theory", 10th Edition, 2009, Pearson India.</li> <li>Donald L. Schilling and Charles Belove, "Electronic Circuits - Discrete and Integrated", 3rd Edition, 2002, TMH.</li> </ol>
E-resources and other digital material	<ol> <li>http://nptel.iitm.ac.in/courses.php?branch=Ece</li> <li>http://web.cecs.pdx.edu/~ecce2xx/ECE221/Lectures/ Dept.</li> </ol>

#### **17EC3303: NETWORK THEORY**

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	14EE1105: Basics of	Continuous Evaluation:	30
	Electrical Engineering	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upo	n suc	cessfi	ul cor	npleti	on of	the c	ourse	, the s	studer	t will	l be al	ole to	:		
	CO1	CO1 Analyze the AC and DC circuits by applying appropriate theorems														
	CO2	D2    Analyze two-port network parameters      D3    Design different resonant circuits for the given specification														
	CO3															
	CO4	Ana	Analyze the DC transient response of RL, RC and RLC circuits													
Contribution of Course		PO         PO<														
Outcomes towards	CO1															
achievement of Program	CO2	CO2       3       1       2         CO3       3       2       2         CO4       3       2       2														
Outcomes (1 – Low	CO3															
2 - Medium, 3 - High)	CO4															
Course Content	UNI D.C theo Mill A.C Supe Pow UNI Two adm para com UNI Stea seric impo Rese Q fa UNI Tra	T I Circ rem, man's Circ erpos: ver Tr T II Pon ittanc meter nectio T III ody S es RL edanc onand ctor. T IV nsien	cuits The stheo cuits ition ansfe rt Ne e pa rs, H on of t tate 2 , RC e and ce: S t An	& N venin rem a & Ne theor r Theo etwor ramet ybrid wo po Analy and phas eries alysis	etwor 's th ind M twor em, T orem. 'k: F ers, 0 para ort ne RLC or no reson	rk The neorer aximu k The Fheve Celatic Open meter twork f AC circu tation ance,	n, N um Po eoren enin's onship circu s, Re s. Circ uits, p Para	ms: fortom ower ' ns: N theo o of it in elation (15F) uits: oaralle llel re	Super i's th Trans odal a rem, two npedan n bet Irs) Respo el RL sonar ential	positi neoren fer Tl and L Norte (15) port nce p ween onse , RC nce, c (15) nce, c	ion the m, Theore coop to on's Hrs) varia para to sim and oncep Hrs)	heorer Celleg m. metho theore ables, meters, meter nusoid RLC ot of b	m, Ro en's ods of em, M Sho Tran • sets al exe with pand v nitior	ecipro theo anal Maxir rt cin nsmis , Par citatio com width	ocity rem, ysis, num rcuit sion allel on – plex and time	

	constant, RL circuit, RC circuit with DC excitation, evaluating initial condition procedure, second order differential equations, homogeneous and non-homogeneous problem solving using RLC elements with DC excitation. (10Hrs)
Text books and Reference books	<ul> <li>Text Books: <ol> <li>Jr William H Hayt&amp; Jack Kemmerly "Engineering Circuit Analysis", 6<sup>th</sup> edition, McGraw-Hill, 2000.</li> </ol> </li> <li>Reference Books: <ol> <li>M. E.VanValkenburg "Network Analysis" 3<sup>rd</sup>edition, PHI, 2009.</li> <li>A Sudhakar and SP Shyam Mohan, "Circuits and Networks: Analysis and Synthesis", 4<sup>th</sup> edition, TMH, 2002.</li> </ol> </li> </ul>
E-resources and other digital material	<ol> <li>http://nptel.iitm.ac.in/courses/webcoursecontents/IIT%20kharagp ur/basic%20electrical%</li> <li>http://nptel.iitm.ac.in/video.php?subjectId=108102042</li> <li>http://www.ece.umd.edu/class/enee204/LectureNotes/LectureM ain.htm</li> </ol>

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC1204:Electronic	<b>Continuous Evaluation:</b>	30
	Devices	Semester end Evaluation:	70
		Total Marks:	100

#### **17EC3304: DIGITAL CIRCUIT DESIGN**

Course outcomes	Upo	n suc	cessfi	ıl con	npleti	on of	the co	ourse,	the s	tuden	t will	be ab	le to:			
	CO1	Understand, analyze and design various combinational and sequential circuits.														
	CO2	2 Understand the use of Verilog HDL for the description of behavioural model of circuits functionality.														
	CO3	3 Realize complex logic functions using PLDs.														
Contribution of Course		PO 1PO 2PO 3PO 4PO 5PO 6PO 														
Outcomes towards	CO1															
achievement of Program	ent m CO2 2 2 2 2 2															
Outcomes (1 – Low, 2 - Medium, 3 - High)	CO3	2														
Content	UNI oth Municonv Num definicance Gat map implifunce UNI Oth McC Cor proce multi HDD User beha UNI Sym	IT II: nber versio nbers, nition onical e leve , pro- lemer ction.( IT II: er m Clusky nbin cedure tiplier L Mo r def aviora T III: chro	Syste system	ems a ctal a ary colea standa nimiz of sum n, co s) zation 1) Tec nal 1 ign p gnitud for C Prim leling	and I nd H odes. n Alg rd for ation as sin other n me chniqu Logic roced e com ombi itives . (121	<ul> <li>Booles</li> <li>Basingebra,</li> <li>ms, ocimis, ocim</li></ul>	an A ecima c def basic ther l e map cation o l trodu binary or, de nal C te le	lgebr l num initio c theo ogic ( o meth , don evel ariabl ction, / add ccoder Circui vel r	a: I hbers, ns of rems, operat hod, f 't car imp e Ent con- er-sub rs, enc ts: M nodel quent	Binary Com Boo prop cions, our v e con oleme ereed mbina otracte coders lodule ing,	v num plem lean erties digita ariabl dition ntatio Mapp tiona or, de s and : e decl dataff	nbers, ents, Algel , Boo Il logi le maj ls, NA ns, oing ( 1 circ ecima multij aratio low	Nur Sign ora, J lean c gat p, fiv AND Exc VEM cuits, l add plexe on,Ga mode	nber- ed Bi Axion funct es. e var and I lusive I), Qu ana er, bi rs te De eling, elem	Base nary natic ions, iable NOR >-OR uine- lysis inary elays, and ents:	

	<ul> <li>latches, flip-flops, analysis of clocked sequential circuits, design procedure and synthesis using flip-flops.</li> <li><b>Registers and counters:</b> Registers, shift registers, ripple counter, synchronous counters, ring counter, Johnson counters, counters and counters with unused states.</li> <li><b>Synthesizable HDL Models of Sequential Circuits:</b> Behavioral modeling of flipflops, latches, state diagrams, shift registers and counters; Structural description of clocked sequential circuits.(15hrs)</li> </ul>
	<ul> <li>UNIT – IV:</li> <li>Memory and Programmable Logic: Introduction, Random-Access Memory, Memory Decoding, Error Detection and Correction, Read-Only Memory, Programmable Logic Array, Programmable Array Logic, Sequential Programmable Devices – SPLD, CPLD and FPGA.</li> <li>Digital Integrated Circuits: Introduction, Special Characteristics, Bipolar Transistor Characteristics, Transistor-Transistor Logic, Emitter Coupled Logic, Metal Oxide Semiconductor, Complementary MOS, CMOS Transmission Gate Circuits, Switch level modeling with HDL.(15hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. M. Morris Mano, Michael D. Ciletti, "Digital Design", 4<sup>th</sup> edition, Prentice Hall, 2007.</li> <li>Reference Books:</li> <li>1. Brown, Stephen D. "Fundamentals of digital logic with Verilog design". Tata McGraw-Hill Education, 2007.</li> <li>2. Thomas L. Floyd "Digital Fundamentals", 11<sup>th</sup> Edition, Pearson Education India, 2015.</li> </ul>
E-resources and other digital material	<ol> <li>http://www.ece.ubc.ca/~saifz/eece256.html</li> <li>http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT- %20Guwahati/digital_circuit/frame/index.html.</li> </ol>

#### 17HS2305 (D) – PHILOSOPHY

<b>Course Category:</b>	Humanities elective	Credits:	1
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	1-0-0
Prerequisites:		Continuous Evaluation:	100M

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Unc	lersta	nd ma	ijor p	hilosc	phica	ıl issu	es.						
	CO2	Appreciate the philosophical doctrines of western thinkers.													
	CO3	Unc	Understand the eminence of Indian classical thought.												
	CO4	Aap	preci	iate re	lation	betw	een s	cience	e and v	values					
Contribution of Course Outcomes		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
achievement of	CO1						2								
Outcomes	CO2						2								
$\begin{array}{c} (1 - Low, \\ 2 - Medium, \end{array}$	CO3						2								
3 - High)	CO4								2						
Course Content	UNIT What' UNIT Introd UNIT Philos	II: III: luctic III: uctio – IV ophy	I s Philosophy : Definition, Nature, Scope and Branches II: uction to Western philosophy : Ancient Greek and Modern philosophy III: uction to IndianThought: Six systems – Modern philosophers – IV:												
Text books and Reference books E-resources	<b>Text H</b> [1] " T [2] " <i>A</i> <b>Refer</b> [1] " S [2] " T	Book The st An Intence Six sy The p	ook: he story of philosophy ",Will Durant, Simon & Schuster 1926 n Introduction to philosophy ",O.O.Fletcher, Word Public Library,2010 nce Books: ix systems of Indian Philosophy ", DH Dutta , he pleasures of philosophy, Will Duran, Simon & Schuster,1929												
and other digital material	[1]J. K Availa	. Aut ble: <u>h</u>	hor. ( <u>attp://</u>	day, m www.(	onth, <u>URL</u>	year) )	. Titl	e (edit	tion) [7	Гуре о	f medi	um].			

#### 17HS2305 (A) – YOGA & MEDITATION

<b>Course Category:</b>	Humanities elective	Credits:	1
<b>Course Type:</b>	Practical	Lecture - Tutorial - Practice:	1-0-0
Prerequisites:		<b>Continuous Evaluation:</b>	100M

Course		Upon successful completion of the course, the student will be able to:													
outcomes	CO1	Equi	ip bett	er atti	tude a	and be	havio	ur.							
	CO2	Imbibe set of values enabling a balanced life focused on an ethical material life.													
CO3 Develop levels of concentration through mediation															
	CO4	CO4 Apply conscience for the missions of life													
Contribution of Course Outcomes towards		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
achievement of	CO1						2								
Outcomes	CO2						2								
(1 – Low, 2 - Medium,	CO3						2								
3 - High)	CO4						2								
Content	CO3       2       2       2       2         CO4       2       2       2       2       2         UNIT I :       Understanding Yoga : Orientation, Introduction to Values , The positive impact of yo Application of Values in real life , Universal values       (Lec-demo pattern with illustrations representing Yogic Postures and value system related pictorial is followed)         UNIT II:       Yogic Practices: Yoga, Self and Ultimate goal of yoga, Introduction to various types or yoga, Integration of values in Yoga         (Activity based processes with Assasanas and Pranayama are implemented).         UNIT III:         Practice of Meditation: Art of Meditation, Observation, Introspection, Contemp Meditation and Concentration (Activity based processes involving Mediation sessions followed bydemonstration implemented).							`yoga , em s of mplation ions ar							

	UNIT IV: Towards professional excellence through Yoga and meditation: Stress Management, Choices we make, Excellence and Integration (Lec-demo pattern is followed).
Text books	
and Reference	Text Book(s):
books	1.Common Yoga protocol, Ministry of Ayush, Govt of India
	2. Journey of the Soul- Michael Newton, 2003, Llewellyn
	Reference Books:
	1. Lectures from Colombo to Almora, Swami Vivekakanada, 2010 Ramakrishna
	Mission
	2. Essays of Ralph Waldo Emerson, 1982, Eastern press
	3. Eclectic materials Offered by English Dept.
E-resources and other digital material	www.heartfulness.org accessed on 27 <sup>th</sup> April 2018 www. <i>ayush.gov.in accessed on</i> 27 <sup>th</sup> April 2018 www. belurmath.org <i>accessed on</i> 27 <sup>th</sup> April 2018

#### 17HS2305 (J) – PSYCHOLOGY

<b>Course Category:</b>	Humanities elective	Credits:	1
Course Type:	Theory	Lecture - Tutorial - Practice:	1-0-0
Prerequisites:	Introduction to Philosophy Psychological Processes	<b>Continuous Evaluation:</b>	100M

Course outcomes		Upc	on suc	cessfi	ıl con	npleti	ion of	the co	ourse,	the stu	ident v	will be	able to	):	
	CO1	Rela	ate bio	ologic	al and	l soci	o-cult	ural fa	actors	in und	erstan	ding hu	ımanB	Behaviou	r.
	CO2	Und	lersta	nd the	natu	re of s	sensor	y proc	cesses,	types	ofatte	entions	•		
	CO3	Explain different types of learning and the procedures, distinguishes between different types of memory,											1		
	CO4	Den solv	Demonstrate an understanding of some cognitive processes involved in Problem solving and decision-making.										roblem		
Contribution of Course		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
towards	CO1						2								
achievement of Program	CO2						2								
Outcomes (1 – Low,	CO3						2								
2 - Medium, 3 - High)	CO4						2								
Course Content	UNIT Introd bases UNIT Senso UNIT Cogn UNIT Thinki	I: luctio of bel II: ory an III: ition a – IV ing, p	: iction: Psychology as a scientific study of behaviour. Biological and socio cultural f behaviour, fields of psychology I: y and perceptual processes: Sensation, attention and perception II: ion and Affect: Learning and memory. Emotion and motivation - IV									cultural			
Text books and Reference books	Text I 1Zimb Refer 1. Bar 2. Coc Gat 3. Felo New	Book: pardo, ence on, R on, D. eway lman, v Yor	, P. G Book . A. ( , &M to m , R. S k: M	. (201 s: 2006) itterer ind an . (201 cGraw	3). Ps . Psyc ;, J. O d beh 3). Ps / Hill.	sycho holog (200 aviou sycho	logy a gy (5tl 07). Ir ır. Nev logy a	nd Lit h Ed.) atrodu w Dell nd yo	fe (20t . New ction t hi: Cer ur life	h Ed.). Delhi: o Psyc 1gage. (2nd E	New Pears holog d.).	York: I son Edu y:	Pearson	n Educat ı.	ion

#### 17HS2305 (I) – FOREIGN LANGUAGE – GERMAN

<b>Course Category:</b>	Humanities elective	Credits:	1
<b>Course Type:</b>	Theory/Practical	Lecture - Tutorial - Practice:	1-0-0
Prerequisites:		Continuous Evaluation:	100M

Course outcomes		Upor	n succ	essful	comp	letion	ofthe	e cour	se, the	e stude	ent wi	ll be a	ble to	:	
	CO1	Lear	n basi	cs of (	Germa	n Lan	guage	•							
	CO2	Writ	Write German Writing												
	CO3	Unde	erstan	d Geri	nan H	earing	5								
	CO4	Forn	n sente	ence in	n Prese	ent , p	ast and	l futu	re tens	se					
Contribution of Course Outcomes		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
achievement of	CO1										2	2			
Program Outcomes (1 – Low,	CO2										2	2			
2 - Medium, 3 - High)	CO3										2	2			
c ingi)	CO4										2	2			
Course Content	UNIT Alpha UNIT Prepo UNIT Past T UNIT Future	<ul> <li>'I: bets, Numbers, Exact articles and not exact Articles</li> <li>'II: sitions, Present Tense</li> <li>'III: 'ense and about family</li> <li>'- IV: e Tenses</li> </ul>													
Text books and Reference books	Text [1] St	<b>Book</b> udio d	<b>ook:</b> lio d A1Cornelsen Goyalaas Publications New Delhi.												
E-resources and other digital material															

#### 17TP1306: LOGIC & REASONING

<b>Course Category:</b>	Institutional Core	Credits:	1
<b>Course Type:</b>	Learning by Doing	Lecture -Tutorial-Practice:	0 - 0 - 2
Prerequisites:		<b>Continuous Evaluation:</b>	100
-		Semester end Evaluation:	0
		Total Marks:	100

#### **COURSE OUTCOMES**

ТЬ	on successful	completion	of the	0011160	the student	will be able to:
U	Jon Successiui	completion	or the	course,	the student	will be able to.

- **CO1** Think reason logically in any critical situation
- **CO2** Analyze given information to find correct solution
- **CO3** | To reduce the mistakes in day to day activities in practical life
- **CO4** Develop time-management skills by approaching different shortcut methods
- **CO5** Use mathematical based reasoning to make decisions
- **CO6** Apply logical thinking to solve problems and puzzles in qualifying exams in any competitive exam.

# Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 - High)

-														
	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
CO1		2				2								
CO2														
CO3								2						
CO4									2					
CO5	2													
CO6	1													

#### **COURSE CONTENT**

UNIT I :

- 1. Series Completion,
- 2. Coding-Decoding,
- 3. Blood Relation Blood,
- 4. Puzzles test
#### UNIT II:

- 1. Direction sense test,
- 2. Logical Venn diagrams,
- 3. Number test, ranking test,
- 4. Mathematical operations

#### **UNIT III:**

- 1. Arithmetical Reasoning,
- 2. Inserting missing character,
- 3. Syllogism.

### UNIT IV: Non – Verbal:

- 1. Water images,
- 2. Mirror images,
- 3. Paper folding,
- 4. Paper cutting,
- 5. Embedded Figures,
- 6. Dot situation,
- 7. Cubes & Dice

#### **TEXT BOOK**

1. R. S. Aggarwal, "Verbal and non-verbal reasoning", Revised Edition, S Chand publication, 2017 ISBN:81-219-0551-6

17EC3308:	SIGNALS	& SYSTEMS
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<b>Course Category</b>	•	Programme Core Credit											dits:	3	
Course Type:		Theo	ory				L	ecture	e - Tu	torial	-Prac	tice:		3-0-	0
Prerequisites:		14M And 14M Anal Meth	14MA1101:LinearAlgebraContinuous Evaluation:3And Differential Equations,14MA1301:Complex714MA1301:ComplexTotal Marks:14Analysis & NumericalMethods14										30 70 100		
Course	Upo	on suc	cessf	ul cor	npleti	on of	the c	ourse	, the s	studer	nt will	l be al	ble to	:	
	CO1	Clas	ssify t	he sig	gnals	and sy	ystem	is base	ed on	their	prope	erties.			
	CO2	Ana Fou	lyze rier tr	the sp ansfo	bectra rms.	l chai	racter	istics	of si	gnals	using	g Fou	rier s	eries	and
	CO3	Ana of c	lyze 1 onvol	the fre ution	equen and c	cy res correla	spons ation	e of li opera	inear tions	systei on di	ms an fferen	d app it sign	ly the als.	conc	epts
	CO4	App syst	ly the	e Trai	nsfori	n tecl	hniqu	es to	analy	ze th	e dise	crete	time	signal	ls &
Contribution of Course		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
Outcomes towards	CO1	3													1
achievement of	CO2	3													1
Outcomes	CO3	3	1												1
(1 – Low, 2 - Medium, 3 - High)	CO4	3													1
Course Content	UNI Intr Con Inde Unit Intr Con Disc Syst (15] UNI Fou Con Seri Fou Rep The Fou	IT I: roduc tinuo penda t Step roduc ntinuc crete cems: Hrs) IT II: rier s rier verge es. rier tresen Four rier tr	tion ( us-Ti ent v func tion ( ous-tin time Conv series serie ence of tation ier tra ansfo	to Sig me ariabl tions. to Sys me a LTI volution : s re of the form: of p ansfor rm.(1	nals: and e, Ex and I Syste on inf prese Fou eriod rm fo <b>5Hrs</b>	Discre poner Discre ms: T tegral entation rier S ic sig r peri )	ete-Tintial ete-tin The ( , Prop On ( Series nals: odic	Time and S me s Conve perties of C , Pro The signal	sign Sinusc System Dution s of I Contin pertie Conti	als, idal s ns, B n sun Linear uous- s of inuou	Trans signal Basic n, Co r Tim ctime Conti s-time es of	sform syste ontinu- e Inva peri inuou e Fou the c	ation it Imj em p ous T ariant iodic s tim rier t ontinu	of pulse roper Time syste sign e Fou ransfe	the and ties. LTI ems. nals, urier

	UNIT III: Frequency Analysis of Linear Systems: Distortion less Transmission, Ideal
	filters, Causality and Physical reliability, Paley-Wiener criterion, Relation between Bandwidth and Rise time
	Correlation: Signal Comparison, Convolution and Correlation, Properties of Correlation functions, Correlation functions for Non-finite Energy Signals, Properties of Energy and Power spectral density spectrums. (15Hrs) UNIT – IV Z–Transforms: Introduction, Z-transform, region of convergence for the Z- transform, Inverse Z-transform: Properties of Z-transform, Analysis and characterization of LTI systems using Z-transforms Sampling Theorem: Introduction, The sampling theorem, Reconstruction of a signal from its samples using Interpolation, The effect of Under sampling: Aliasing.(15Hrs)
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. Alan V.Oppenheim, Alan S. Willisky, "Signals &amp; Systems", 2<sup>nd</sup> edition, Prentice-Hall of India Private Limited, 2015. (Units: I, II &amp;IV).</li> <li>2. B P Lathi, "Signals and systems and communications", BS Publications, 2008. (Units: III)</li> <li>Reference Books:</li> <li>1. Simon Haykin and Barry Van Veen, "Signals and Systems", 2<sup>nd</sup> edition John Wiley,2008.</li> </ul>
E-resources and other digital material	<ol> <li>www.nptel.iitm.ac.in/courses.php?branch=Ece</li> <li>www.cdeep.iitb.ac.in</li> </ol>

# 17EC3351: ANALOG ELECTRONICS LAB

<b>Course Category:</b>	Core	Credits:	1.5
<b>Course Type:</b>	LAB	Lecture - Tutorial -Practice:	0-0-3
Prerequisites:	Electronic Devices, Analog	Continuous Evaluation:	30
	Electronics.	Semester end Evaluation:	70
		Total Marks:	100

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

Course outcomes	Upo	n suc	cessfi	ul cor	npleti	on of	the c	ourse	, the s	studer	nt will	be al	ole to	:	
	CO1	Analyze various electronic components, diode and transistor circuits and observe their operation practically.													
	CO2	Design and analyze various transistor amplifier circuits and oscillators.													
	CO3	Des	Design and analyze feedback amplifier circuits.												
Contribution of Course		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
Outcomes towards	CO1			2	3	2				2					2
achievement of	CO2			2	3	2				2					2
Outcomes (1 – Low.					2					2					2
2 - Medium, 3 - High)	03			2	3	2				2					
Course Content	1. ( 2. 4 3. ( 4. ( 5. ( 6. ( 7. ( 8. I 9. I 10. I 11. I 12. I 13. I	<ul> <li>Characteristics of PN junction diode and Zener diode.</li> <li>Analysis of Bridge rectifier with and without filter.</li> <li>Characteristics of the transistor in CB configuration.</li> <li>Characteristics of the transistor in CE configuration</li> <li>Characteristics of JFET.</li> <li>Characteristics of UJT.</li> <li>Obtain the bandwidth of CE amplifier using with and without feedback.</li> <li>Design of RC Phase shift oscillator.</li> <li>Design of current shunt feedback amplifier using Multisim.</li> <li>Design of wein bridge and colpitt's oscillator using Multisim.</li> <li>Frequency response of two stage RC coupled amplifier using Multisim.</li> </ul>									•				
Text books and Referencebook s	1. Ja an 2. Ja W	ncob 1 nd Dig ncob /avefo	Millm gital ( Milli orms,	nan an Circui man 3rd E	nd Cl ts and and Edition	nristos l Syst Hert n, TM	s C H ems" bert IH, 20	Halkia , TMI Taub, 003.	us, "Iı H, 200 , "Pu	ntegra 03. 11se,	ited Digi	Elec tal a	tronic nd	es:An Swite	alog hing
E-resources and other digitalmaterial	1.sha	aikan	war.w	veebly	.com	/uploa	ads/3/	/9/2/2	/3922	423/p	odclab	omanı	ial.pc	lf	

# 17EC3352: DIGITAL CIRCUITS LAB

<b>Course Category:</b>	Programme Core	Credits:	1.5
<b>Course Type:</b>	Practical	Lecture -Tutorial-Practice:	0-0-3
Prerequisites:	17EC3304:Digital	<b>Continuous Evaluation:</b>	30
	Circuits and Systems	Semester end Evaluation:	70
		Total Marks:	100

Course	Upor	n suc	cess	ful c	ompl	etion	ofth	ne co	urse,	the st	uden	t wil	l be a	ble to	:
outcomes	CO1	Appl	y and	1 veri	fy the	conc	ept c	of dig	ital c	ircuit	s pra	ctical	ly.		
	CO2	Deve	lop s	kill to	o buil	d and	trou	blesh	oot d	ligital	circi	uits.	-		
			•							C					
Contribution of		PO	PO	PO	PO	PO	РО	РО	РО	РО	PO	PO	РО	PSO1	PSO2
Course		1	2	3	4	5	6	7	8	9	10	11	12		
Outcomes	CO1			2	1	2				2				2	
towards															
achievement of															
Program	000			2	1									2	
Outcomes	02			2	1	2				2				2	
(1 – Low,															
2 - Medium.															
3 - High)															
Course	1. 1	Nome	nclati	ire of	digita	I ICS.	speci	ficati	ons. s	tudv o	of the	data	sheet.	conce	pt of
Content	, T	V <sub>cc</sub> an	d gro	und, v	verifica	ation of	of the	truth	tables	s of lo	gic ga	ates u	sing T	TL IC	CS.
	2.	Verifi	catior	n of lo	gic ga	tes us	ing di	screte	e com	poner	its		U		
	3. 1	Implementation of the given Boolean function using logic gates in SOP and													
	1	POS forms.													
	4. 1	Design and implementation of Adders and Subtractors using logic gates.													
	5. 1	Design and implementation of 4-bit Magnitude Comparator using IC 7485.													
	6. 1	. Design and implementation of code converters using logic gates													
		i		BCD 1	to exce	ess-3	code a	and vi	ce ve	rsa	0 0	U			
		ii		Binary	to gr	ay and	1 vice	-versa	a						
	7. 1	Desig	n and	l impl	lement	tation	of N	Iultip	lexer	and 1	De-m	ultiple	exer i	using	logic
	Į	gates a	and st	udy o	f IC74	150 a	nd IC	7415	54.			-			-
	8. 1	Desig	n and	l impl	lement	tation	of e	ncode	r and	l decc	oder u	using	logic	gates	and
	5	study	of IC	7445 a	and IC	27414	7								
	9. 1	Verifi	catior	n of sta	ate tab	oles of	RS, .	JK, T	and I	) flip-	flops	using	NAN	VD & 1	NOR
	5	gates.													
	10.0	Const	ructio	n and	l verif	icatio	n of 4	4-bit	ripple	cour	ter a	nd M	od-10	) / Mc	d-12
		Ripple	e coui	nters.											
	11.1	Desig	n and	imple	ementa	tion c	of 3-b	it syn	chron	ous uj	o/dow	n cou	inter.		
	12.1	Desig	n and	limp	lemen	tation	of S	hift 1	registe	er (To	veri	ify Se	erial 1	to Par	allel,
		Parall	el to	Serial	, Seri	al to	Serial	and	Paral	lel to	Paral	llel C	onver	ters) 1	ising
		Flip-F	lops.		1.	,• •		., .	• •		· ·	-		. ,.	
	13.1	Design	n of a	ny co	mbina	tional	cırcu	it usii	ng Ve	rılog l	Hardy	vare I	Jescri	ption	
		Langu	age			,· •		•,		<b>X</b> 7 ·1	**	r 1			<i>.</i> .
	14.	Design	n of	any	seque	ential	circi	ut u	sıng	Veril	og H	lardw	are l	Descri	otion
		Langu	age												

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

<b>Course Category:</b>	Institutional Core	Credits:	1
<b>Course Type:</b>	Practical	Lecture -Tutorial-Practice:	0- 0-2
Prerequisites:	Technical English	<b>Continuous Evaluation:</b>	30
	&Communication skills -	Semester end Evaluation:	70
	14H51104	Total Marks:	100

# 17HS1353: COMMUNICATION SKILLS LABORATORY

COU	RSE (	OUTC	OME	ŻS										
Upon	succe	essful	comp	letion	of the	cours	se, the	stude	ent wi	ll be a	ble to:			
CO1	Exec	cute ra	tional	pronu	inciati	on of s	speech	sound	ls incl	uding	accenti	lation.		
CO2	App	ly eler	nents	of list	ening	compr	ehensi	on in	profes	sional	enviro	nment	s.	
CO3	Deve	elop tł	ne abil	ities o	of ratio	nal arg	gumen	tation	and sl	kills of	public	speak	ing.	
CO4	Dem com	onstra petitiv	ate pro re exai	oficien ninati	cy in on	the el	ement	s of p	rofess	ional	comm	unicat	ion inclu	ding the
Contr (1 – L	ontribution of Course Outcomes towards achievement of Program Outcomes – Low, 2 - Medium, 3 – High)													
	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
CO1						3				3				
CO2			2	2	2	3	3	1		3	2			
CO3	3		2	3	2	3	3	2		3	2			
CO4	2	1	2	2	1	3	2	3	2	3	3	2		

# COURSE CONTENT/TASK

# UNIT:I :Elements of Spoken Expression and processes of ListeningComprehension:

- Speech Mechanism
- Articulation of vowels and consonants
- Patterns of Accentuation

Types and processes of Listening comprehension

#### UNIT II: : Patterns of Substantiation and Refutation in Public Speaking:

- Group Discussion(Open and Monitored)
- Pyramid Discussion
- PNI

Seminar Talk and Power Point Presentation

### UNIT III: Professional Communication:

- Self Affirmation
- Advanced Composition including Memo and e-mail
- Résumé Preparation

Corporate ethic of Non-Verbal Communication

# UNIT IV: Life Skills and Vocabulary for Competitive Examinations:

- Select Life Skills(50)
- Select Logies, Isms, Phobias and Manias (25 each)
- Sentence Completion and Double Unit Verbal Analogies (50 items)

Fundamentals of Syllogisms(Descriptive and Pictorial)

### TEXT BOOKS

- 1. Martin Cutts, Oxford Guide to Plain English, 7th Impression, OUP, 2011
- Exercises in Spoken English, Prepared by Department of Phonetics and Spoken English, CIEFL, OUP, 21<sup>st</sup> Impression, 2003

### **REFERENCE BOOKS**

- 1. Stephen R Covey, The 7 Habits of Highly Effective people, II edition, (Pocket Books) Simon & Schuster UK Ltd, 2004
- 2. Eclectic Learning Materials offered by the Department

### **E-RESOURCES AND OTHER DIGITAL MATERIAL**

- 1. ODll Language Learner's Software, 27-6-2012 Orell Techno Systems
- 2. Visionet Spears Digital Language Lab software Advance Pro, 28-01-2015
- 3. www.natcorp.ox.ac.uk, British National Corpus accessed on 28-11-2017

<b>Course Category:</b>	Institutional Core	Credits:	-
Course Type:	Theory Mandatory course	Lecture - Tutorial - Practice:	2-0-0
Prerequisites:	Concern on Conservation and Preservation of Environment	Continuous Evaluation: Semester end Evaluation: Total Marks:	46 S1 + 46 S2 3 A+ 5 HA 100

# **17MC1307: ENVIRONMENTAL STUDIES**

Course outcomes		Upor	n succe	essful	compl	etion of	of the c	course	, the st	udent	will be	able t	to:
	CO1	Unde degra	erstand	l the va n mana	arious igeme	natura nt	ıl resou	urces,	analyz	e and	explor	e	
	CO2	Unde	erstand	l the E	cosyst	ems a	nd nee	d of B	iodive	rsity			
	CO3	Realiand i	ize and ts mar	d Explo	ore the	e Prob	lems re	elated	to Env	vironm	ental p	ollutio	on
	CO4	Appl Acts	y the l associ	Role of a ted with the second	f Infor /ith Er	mation	n Tech ment.	nolog	y and a	analyzo	e socia	l issue	es,
Contribution of		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
towards	CO1	1											1
Program Outcomes	CO2						3		3				
(1 – Low, 2 - Medium,	CO3					1	3		3				
3 - High)	CO4								3	3			1
Course Content	UNI	Т -І			<u> </u>	<u> </u>	<u> </u>	<u></u>		<u> </u>			<u> </u>
	The Def Nee	Multion finition ed for j	Multidisciplinary Nature of Environmental Studies inition, scope and importance ed for public awareness.										
	Natu	iral Ro	esourc	es									
	Re	newał	ole and	d Non	-renev	vable	Resou	rces:					
	Na	tural r	esourc	es and	assoc	iated p	oroblen	ns.					
			(a) Fo Ti an	rest r mber d triba	esourc extrac 1 peop	es: U tion, r ole.	lse an nining	d ove , dam	er-exp s and	loitatic their c	on, de effects	foresta on fo	ation. prests
			(b) Wa	ater roound	esourc water,	es: U flood	lse and ls, dro	d ove ought,	er-utili confl	zation icts ov	of s ver wa	urface ater, d	and lams-

benefits and problems.	benefits	and	problems.
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- (c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources.
- (d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.
- (e) Energy resources: Growing energy needs, renewable and nonrenewable energy sources, use of alternate energy sources.
- (f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

#### UNIT II

#### 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 the following ecosystem: (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d)Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) **Biodiversity and Its Conservation** Introduction, definition: genetic, species and ecosystem diversity. Biogeographically classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.

Biodiversity at global, National and local levels.

India as a mega-diversity nation.

Hot-spots of biodiversity.

Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts.

Endangered and endemic species of India.

Conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

### UNIT III

#### **Environmental Pollution**

Definition

Causes, effects and control measures of

- (a) Air pollution
- (c) Soil pollution
- (e) Noise pollution (g) Nuclear hazards
- (b) Water pollution
- (d) Marine pollution
- (f) Thermal pollution

Solid waste management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Diaster management: Floods, earthquake, cyclone and landslides.

#### UNIT IV

#### Social Issues and the Environment

From unsustainable to sustainable development.

Urban problems related to energy.

Water conservation, rain water harvesting, watershed management.

Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions.

Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Wasteland reclamation.

Consumerism and waste products.

#### **Environment 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.

#### Human Population and the Environment

Population growth, variation among nations. Population explosion—Family Welfare Programme. Environment and human health. Human rights. Value education. HIV/AIDS. Women and Child Welfare. Role of Information Technology in environment and human health.

Field Work/Case Studies {<u>NOT TO BE INCLUDED IN SEMESTER END</u> <u>EXAMS</u>}

Visit to a local area to document environmental assets-

	river/forest/grassland/hill/ mountain. Visit to a local polluted site—Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc.
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. Text book for ENVIRONMENTAL STUDIES for under graduate courses of all branches of higher education – ErachBharucha For University Grants Commission. First edition 2004.</li> </ul>
	Reference Book: 1 Anjaneyulu Y. Introduction to Environmental sciences, B S Publications PVT Ltd, Hyderabad 2004
E-resources and other digital material	collegesat.du.ac.in/UG/Envinromental%20Studies_ebook.pdf

# **17EC3401: PROBABILITY THEORY AND RANDOM PROCESSES**

<b>Course Category:</b>	Programme Core	Credits:	4
<b>Course Type:</b>	Practical	Lecture -Tutorial-Practice:	3-1-0
Prerequisites:	17EC3308 SIGNALS AND SYSTEMS	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	Upon	on successful completion of the course, the student will be able to:												D:	
	CO1	Dev ran	velop dom	o the varia	e pro ables	obab and	ility com	dist pute	ribut the s	ion statis	and tical	den para	sity mete	functio ers.	ons of
	CO2	CO2 Characterize systems driven by a stationary random process using autocorrelation and power spectral density functions.												using	
	CO3	Ana con	Analyze and model random noise processes in typical communication systems												
Contribution of Course Outcomes		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
towards achievement of	CO1	3												3	
Program Outcomes	CO2	3												3	
(1 – Low, 2 - Medium, 3 - High)	CO3	3												3	
Course Content	UNIT-I Probability: Probability introduced through Sets and Relative Frequency, Joint Probability and Conditional Probability, Independent Events, Combined Experiments, Bernoulli trials													uency, Events,	
	<b>Random Variables:</b> The Random Variable Concept, Distribution Function and Density function, Q Function, Error Function, The Gaussian Random Variable, Other Distribution and Density Examples. Conditional Distribution and Density Functions.												bution ussian itional		
	<b>Operations on One Random Variable:</b> Expectation, Moments, Functions that give Moments, Transformations of a Random Variable. (15Hrs)													ments, riable.	
	<b>UNIT-II</b> <b>Multiple Random Variables</b> : Vector Random Variables, Joint Distribution and its Properties, Joint Density and its Properties, Conditional Distribution and Density, Statistical Independence, Distribution and Density of Sum of Random Variables, Central Limit Theorem (Proof not expected)												Joint perties, dence, Limit		
	<b>Oper</b> Funct	ation	<b>is o</b> of R	n M andc	l <b>ultij</b> m \	o <b>le</b> Zaria	<b>Rano</b> bles,	dom Joii	Vai nt C	r <b>iabl</b> harac	es:	Expe stic 1	ected Func	Value tions, .	of a Jointly

	Gaussian Random Variables.(12Hrs)
	UNIT-III Random Process: Random Process Concept, Stationary and Independence, Correlation Functions, Gaussian Random Process, Poisson Random Process. Random Process Spectral Characteristics: Linear system with random inputs, Power Density Spectrum and its properties, Relationship between Power Spectrum and Auto Correlation Function, Cross Power Density Spectrum and its properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Random signal response of linear systems, Spectral characteristics of system response. (15 Hrs)
	<b>UNIT – IV</b> <b>Linear Systems with Random Inputs:</b> Linear System Fundamentals, Random Signal Response of Linear Systems, System Evaluation Using Random Noise, Spectral Characteristics of System Response, Noise Bandwidth, Band pass, Band-Limited, and Narrowband Processes, Sampling of Processes, Modeling of Noise Sources, Incremental Modeling of Noisy Networks, Modeling of Practical Noisy Networks.(12Hrs)
Text books and Reference books	<ul> <li>Text Book:</li> <li>Peyton Z. Peebles, "Probability, Random Variables &amp; Random Signal Principles", 4<sup>th</sup> Edition, TMH, 2002. (Units - I, II, III, IV)</li> <li>Reference Books:</li> <li>Athanasios Papoulis, S.Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4<sup>rd</sup> Edition, TMH, 2002. (UNITS –I,II,III)</li> <li>B.P. Lathi, "Signals, Systems &amp; Communications", B.S. Publications, 4<sup>th</sup> Edition, 2009.</li> </ul>
E-resources and other digital material	<ol> <li>http://nptel.ac.in/courses/117105085/</li> <li>https://www.stat.berkeley.edu/~aldous/134/gravner.pdf</li> </ol>

# 17EC3402: ANALOG INTEGRATED CIRCUITS AND APPLICATIONS

Course Category:	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC1204B: Electronic	Continuous Evaluation:	30
	Devices	Semester end Evaluation:	70
	17EC3302: Analog Electronics	Total Marks:	100

Course outcomes	Upo	Upon successful completion of the course, the student will be able to:													
	CO1	Und	lerstar	nd the	basic	conc	epts o	of Dif	feren	tial A	mplif	ier cir	cuits		
	CO2	Able	e to d	esign	filter	circui	its for	spec	ific ap	plica	tions.				
	CO3	Und to an volt	lerstan nalog age re	nd the conve gulat	basic erters ors	es of a (DAC	inalog C) and	, to di l Gair	igital o n knov	conve wledg	erters e in d	(ADC lesign	C), ar ing a	nd dig stabl	ital e
	CO4	Und	Understand the applications of PLL and special ICs.												
Contribution of Course		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
Outcomes towards	CO1	1	2											2	2
achievement of Program	CO2	1	3	2										2	2
Outcomes	CO3	1	3	2										2	2
(1 – Low, 2 - Medium, 3 - High)	CO4	1	2											2	2
Course Content	UNI Ope diffe amp Ope char Ope Instr Integ UNI Con Regg Mul Acti Intro Vari	CO4122UNIT - IOperational Amplifier: Introduction, Differential amplifier, DC analysis of differential amplifier, CMRR improvement methods, Basic Information of Op- amp, The ideal Operational Amplifier.Operational amplifier characteristics:DC characteristics, AC characteristics.Operational amplifier Applications:Basic Op-amp Applications, Instrumentation Amplifier, Sample and Hold Circuits, Differentiator, Integrator. (15 Hrs)UNIT - II Comparators and Waveform Generators:Introduction, Comparator, Regenerative Comparator (Schmitt Trigger), Square Wave Generator. Active Filters: Introduction, RC active filters (first and second order), Transformations, State Variable Filter .											is of Op- AC ions, ator, table		

	UNIT – III D-A and A-D Converters: Introduction, Basic DAC Techniques A-D Converters, DAC/ADC specifications Voltage Regulators: Introduction, Series Op-amp Regulator, Protection Techniques, IC Voltage Regulators, 723 General Purpose Regulators, Switched mode power supply.(12 Hrs)
	<ul> <li>UNIT – IV</li> <li>Applications of Special ICs:</li> <li>555 Timer: Introduction, Description of Functional Diagram, Monostable operation, Astable Operation, Schmitt Trigger.</li> <li>Phase Locked Loops: Introduction, Basic Principles, Phase Detector/ Comparator, Voltage Controlled Oscillator (566), Low Pass Filter, Monolithic PLL (565), PLL Applications. (15 Hrs)</li> </ul>
Text Books and References Books	<ul> <li>Text Books:</li> <li>1. D. Roy Choudhary, Shail Jain, "Linear Integrated Circuits", 4<sup>th</sup> edition, New Age International Pvt. Ltd., 2010.</li> <li>Reference Books</li> <li>1. Ramakant A. Gayakwad, "OP-AMPs and Linear Integrated Circuits", 4<sup>th</sup> edition, Prentice Hall, 2000.</li> <li>2.Sergio Franco, "Design with operational amplifiers and analog integrated circuits", 3<sup>rd</sup> edition. McGraw-Hill, 2002.</li> </ul>
resources and other digital material	<ol> <li>Freevideolectures.com &gt; Electrical Engineering &gt; UC Berkeley</li> <li>nptel.ac.in/courses/122104013/main1.html</li> </ol>

# **17EC3403A: TRANSMISSION LINES AND WAVEGUIDES**

<b>Course Category:</b>	Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17PH1102(a)	<b>Continuous Evaluation:</b>	30
	Engineering Physics	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Und term	erstan ninal c	d the ondit	e cha ions a	racter nd co	istics mpute	of tl e then	ne tra n.	insmi	ssion	lines	und	ler va	rious
	CO2 Characterize the transmission lines at high frequencies with different and calculate them analytically and using Smith Chart.													erent	loads
	CO3	Analyze the phenomena of wave propagation in parallel conducting planes as a prelude to that in guided structures.													lanes
	CO4 Determine the wave propagation characteristics in waveguide struct from their analysis.													ctures	
Contribution of Course		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
Outcomes towards	CO1	2													
achievement of Program	CO2	2		1											
Outcomes	CO3	2		1											
(1 – Low, 2 - Medium, 3 - High)	CO4	2		1											
Course Content	UNI Trai Gend Wav Less Refl Tran Refl (15) UNI Trai High for t Stan Line and Line Smit UNI Guid	CO4       2       1       1       1         UNIT I       Transmission Lines: A Line of Cascaded T-Sections, Transmission Line - General Solution, Physical Significance of the Equations; Infinite Line, Wavelength, Velocity of Propagation, Waveform Distortion, The Distortion Less Line, Telephone Cable, Inductance Loading of Telephone Cables, Reflection on a Line not Terminated in Z <sub>o</sub> , Reflection Coefficient, Input and Transfer Impedance, Open and Short Circuited Lines, Reflection Factor and Reflection Loss, Insertion Loss, T and II Section equivalents to Lines. (15 Hrs)         UNIT II       Transmission Line at Radio Frequencies: Parameters of Open Wire Line at High Frequencies, Parameters of Coaxial Lines at High Frequencies, Constants for the Line of Zero Dissipation, Voltages and Current on Dissipation Line, Standing Waves, Standing Wave Ratio, Input Impedance of the Dissipation Less Line, Input and Output Impedance of Open and Short Circuited Lines, Power and Impedance Measurement on Lines, Reflection Losses on the Unmatched Line, Single Stub Matching on a Line, Double Stub Impedance Matching , Smith Charts.(15 Hrs)													

	Transverse Magnetic Waves, Characteristics of TE and TM Waves, Transverse Electromagnetic Waves, Velocities of Propagation, Attenuation in Parallel Plane Guides.(15 Hrs) UNIT-IV Rectangular Waveguides: Transverse Magnetic Waves, Transverse Electric Waves, Impossibility of TEM Waves in Hollow Waveguides, Wave Impedance and Characteristic Impedance, Attenuation Factor and Q - Factor of Wave Guide. Circular Waveguides: TE and TM Waves in Circular Waveguides, Wave Impedance and Characteristic Impedance, Dielectric slab waveguides. (15 Hrs)
Text books and Reference books	<ul> <li>Text books</li> <li>1. John D Ryder, "Networks Lines and Fields", 2009, PHI. (Units - I &amp; II)</li> <li>2. E C Jordan and K G Balmain, "Electromagnetic Waves and Radiating Systems", 2ndedition, 2013, PHI. (Units - III &amp; IV)</li> <li>Reference Books:</li> <li>1. M N O Sadiku, "Elements of Electromagnetic", 3<sup>rd</sup> edition, 2009, Oxford University Press.</li> <li>2. T Anil Kumar, "Networks and Transmission Lines" 2004, Pearson Education.</li> </ul>
E-resources and other digital material	<ol> <li><u>http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT- %20Guwahati/em/index.htm</u></li> <li><u>http://nptel.iitm.ac.in/video.php?subjectId=117101056</u></li> <li><u>http://www.cdeep.iitb.ac.in/nptel/Electrical%20&amp;%20Comm%20Engg/Trans</u> mission%20Lines%20and%20EM%20WaveTOC.htm</li> <li><u>http://www.mike-willis.com/Tutorial/PF2.htm</u></li> <li><u>http://www.learn-about-electronics.com/waveguide-transmission.html</u></li> </ol>

### **17EC3403: ELECTROMAGNETIC THEORY AND TRANSMISSION LINES**

Course	Programme Core	Credits:	3
Category:			
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-1-0
Prerequisites:		<b>Continuous Evaluation:</b>	30
_		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon	Upon successful completion of the course, the student will be able to:												
	CO1	Apply app type of ch static elec	oropria arge c tric fi	ate ph listrib elds.	ysical ution	law o to solv	f elec ve the	trostat engin	tics de eering	pendi prob	ng up lems i	on th involv	ie ving	
	CO2 Apply appropriate physical law of magnetostatics depending up type of current distribution to solve the engineering problems inv static magnetic fields and also analyze & classify the time v electromagnetic fields by applying appropriate Maxwell equation													
	CO3	O3 Evaluate the electric and magnetic fields at interface between two different media by applying appropriate boundary condition.												
	CO4 Demonstrate and compute various parameters for lines using either a Smith chart or classical theo matching networks for loaded transmission lines.											insmis Iso de	ssion sign	
Contribution of Course		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
Outcomes towards	CO1	3												
achievement of Program	CO2	2		2										
Outcomes (1 – Low,	CO3	2		2										
2 - Medium, 3 – High)	CO4	2		2										
Course Content	UNIT Electri Contin Applie Maxw Energ Poisso UNIT Magn Hlustr Magnu	I costatics: ( nuous Cha cations of vell's Equat y Density i on's and La II netostatics: re's law, M etic Vecto ative Proble vell's Equa	Coulo rge Gauss ions n Elec place' Biot Aagne r and ems. <b>tions</b>	mb's Distrit s Law for sta ctrosta 's Equ - Sava ctic flu d Sca : Mag	Law pution , Elec ttic fid atic Fid ations art's I art's I art g netic I	and I s, Electric P elds, I elds, I Illust Law, A nsity, potenti	Field ectric Potent Conti rative Amper Maxv ials, ion an	Intens Flux ial, Ro ial an- nuity Probl re's ci vell's Force nd Far	ity, E Der elatior d Fiel Equati ems. rcuit equat due aday's	Electri nsity, n Betw d of I ion, R law, ions f to 1 s Law	c Fie Gaus Ween Electr elaxa Appli for sta magne	ld du ss's E an ic Di tion T ication atic fi etic fi etic fi	ie to Law, d V, pole, `ime, `ime, `ime, time,	

	of Ampere's Law, Maxwell's Equations, Conditions at a Boundary Surface, The Wave Equation for a Conducting Medium, Solution for Free-Space Conditions, All Relations Between E & H, Uniform Plane-Wave Propagation, Uniform plane waves, Illustrative Problems.
	<b>UNIT III</b> <b>EM Waves:</b> Sinusoidal Time Variations, Conductors and Dielectrics, Polarization, Reflection by a Perfect Conductor-Normal Incidence, Reflection by a Perfect Conductor-Oblique Incidence, Reflection by a Perfect Dielectric - Normal Incidence, Reflection by a Perfect Insulator - Oblique Incidence, Brewster angle, Total internal reflection, Surface impedance, Skin depth, Poynting's Theorem, Illustrative Problems.
	<b>UNIT IV</b> <b>Transmission Lines:</b> A Line of Cascaded T-Sections, Transmission Line - General Solution, Physical Significance of the Equations; Infinite Line, Waveform Distortion, The Distortion Less Line, Inductance Loading of Cables, Reflection on a Line not Terminated in $Z_o$ , Reflection Coefficient, Standing Wave Ratio, Input Impedance of the Dissipation Less Line,UHF Lines as Circuit Elements; $\lambda/4$ , $\lambda/2$ , $\lambda/8$ Lines – Impedance Transformations, Significance of Zmin and Zmax, Single Stub Matching on a Line, Double Stub Impedance Matching , Smith Chart- Configuration and Applications, Illustrative Problems.
Text Books and References Books	<ul> <li>TEXT BOOKS:</li> <li>1. Elements of Electromagnetic, Matthew N.O. Sadiku, Oxford Univ. Press, 6<sup>th</sup> edition.(Unit –I,II).</li> <li>2. Electromagnetic Waves and Radiating Systems– E.C. Jordan and K.G. Balmain, PHI, 2<sup>nd</sup> edition.(Unit –II,III).</li> <li>3. Networks, Lines and Fields – John D. Ryder, PHI, 2<sup>nd</sup>edition.(Unit –IV).</li> <li>Reference Books</li> <li>1. Engineering Electromagnetics –Nathan Ida, Springer (India) Pvt. Ltd., New Delhi, 2<sup>nd</sup>edition,2005.</li> <li>2. Engineering Electromagnetics –William H. Hayt Jr. and John A. Buck, TMH, 7th ed., 2006.</li> <li>3. Electromagnetics- Joseph A Edminister, Schaums Outlines Series, 2<sup>nd</sup> Edition, 2010.</li> </ul>
E-resources and other digital material	<ol> <li><u>http://nptel.ac.in/courses/108106073/</u></li> <li><u>https://www.youtube.com/playlist?list=PLl6m4jcR_DbOx6s2toprJQx1</u> <u>MORqPa9rG</u></li> <li><u>https://freevideolectures.com/course/3288/electromagnetic-theory</u></li> <li><u>https://freevideolectures.com/course/2326/transmission-lines-and-emwaves</u></li> <li><u>http://www.mike-willis.com/Tutorial/PF2.htm</u></li> <li><u>http://nptel.ac.in/downloads/117101057/</u></li> <li><u>http://nptel.ac.in/downloads/115101005/</u></li> </ol>

<b>Course Category:</b>	Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3307:Signals &	Continuous Evaluation:	30
	Systems	Semester end Evaluation:	70
		Total Marks:	100

## **17EC3404: ANALOG COMMUNICATIONS**

Course outcomes	Upo	pon successful completion of the course, the student will be able to:													
	CO1 Analyze and compare different analog modulation schemes for the efficiency and bandwidth										their				
	CO2	2 Evaluate various parameters of AM, FM and PM modulation techniques.													
	CO3	O3 Analyze the noise in AM and FM receivers.													
Contribution of Course		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
Outcomes towards	CO1	3												1	2
achievement of	CO2	3				3								1	2
Program Outcomes (1 – Low, 2 - Medium, 3 - High)	CO3	3				3								1	2
Content	Moc Desc Band Desc Moc AM Envo UNI SSB Desc Met Vest of V Com UNI Ang Moc Tran FM of FI	<b>Iulati Iulati</b> criptid         d-Sup         criptid         lulate         recei         elope         T II:         & V         criptid         hod,         tigial         /SB Inparis         T III         le Mulation         smiss         Wave         M Wave         De-en	ion T on, G opress on, C d Wa ver m Dete SB N On, G Side- Modu on of : Modu on of : Modu on of : Modu on, S sion I es, Ph aves. ver m	<b>Sechn</b> enera sed Genera ves, G nodel, ction. <b>Iodul</b> Genera Bandu lated Sandu Spect Bandy ase L Comp nodel, sis in	iques tion c Carrie tion Costas SNR (15hr ation crimic Mod Wav ditude n: F rum vidth cocked pariso Nois FM.(	: Amy of AM of D s Loop for c s) s: Sin of natior ulatio e, En e Mod reque Anal of FM d Loo n of A ie in 1 15hrs	plitud I wav Iodula SBSC p. ohere agle S SSE met on, Fr velop lulatio ncy ysis, <i>I</i> , Ge p (PI AM a FM r	le Mc res, D ation: C way nt rec ide B 3-SC thod, equer e De bar te bar con Te Mod Narr conerat LL), L nd FN ecepti	odulat etecti Tin ves, C eptio and N Wav Dem ncy D tectio chniq ulatio row ion o Limitin I.	ion: ' on of ne a Coher n, No Aodul ve, 1 odula omain n of ues.( n: S Banc f FM ng IF	Fime, FAM nd l ent d ise in lation Frequ tion n Des VSB 12hrs Single FM Wave FM	Freque etecti AM : Freque ency- of SS cripti Wave ) Tor 1, W es, De Wave Effect	uency s. Do ency on o receiv Juenc Discr BB-SC on, C e Plu ne I Videba emod s, Ap	y Dor buble Dor f DS vers u y Dor rimina C Wa Jenera s Car Frequ and ulatic plicar -empl	main Side main BSC using main ation aves, ation rrier, ency FM, on of tions hasis

	<b>UNIT – IV</b> <b>Radio Transmitters:</b> Classification of Radio Transmitters, AM Radio Transmitters, Carrier frequency requirements of Radio Transmitter, Master Oscillator, Methods of frequency modulation, Armstrong FM Transmitter. <b>Radio Receivers:</b> Receiver Types, AM Receivers, FM Receivers-Comparison with AM Receivers, Amplitude limiting, Basic FM demodulators, Radio detector.(14hrs)
Text books and Reference books	<ul> <li>Text books:</li> <li>1. Simon Haykin. "Introduction to Analog and DigitalCommunication Systems", 3<sup>rd</sup>edition, 2009, John Wiley and Sons.(Units - I, II, III)</li> <li>2. George Kennedy, Electronic Communication Systems, sixth edition, Tata McGraw Hill Edition -2017</li> </ul>
	<ul> <li>Reference books:</li> <li>1. Taub and Schilling, "Principles of Communication Systems", 2nd edition, 1986, TMH.</li> <li>2. Sam Shanmugam, "Analog and Digital Communication Systems", 1992, John Wiley.</li> </ul>
E-resources and other digital material	<ol> <li>http://nptel.iitm.ac.in/video.php?subjectId=117102059</li> <li>http://web.engr.oregonstate.edu/~magana/ECE461-561/index.htm</li> </ol>

<b>Course Category:</b>	Institutional Core	Credits:	1
<b>Course Type:</b>	Learning by Doing	Lecture -Tutorial-Practice:	0 - 0 - 2
Prerequisites:		<b>Continuous Evaluation:</b>	100
		Semester end Evaluation:	0
		Total Marks:	100

	Upor	Upon successful completion of the course, the student will be able to:													
	CO1	How	conve	rsation	s are n	nade									
	CO2	Usage of grammar													
Course Outcomes	CO3	Etiquettes and manners													
	CO4	Speaking Skills													
Contribution of Course		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSO 1	PSO 2
Outcomes towards	CO1									3	3				
achievement of Program Outcomes	CO2										3				
(1 – Low, 2 - Medium.	CO3										3				
3 – High)	CO4									3	3				
Course Content	Unit 1. Be Introd -Impo Begin -Self -Intro Funct -Seek -Aski -Mak staff 2. Jus -Give -To p Unit 3. Str -Stru -Forr 4. Ern	ginner ductior ortance inners C Introd oducing tional C cing Pe ing Dir ing Re in colle st a min e a topi oresent <b>II</b> ucturin cture o nation rors in	s, Fund of spe Conver uction g each Conver rmissi rection equests ege or nute: ic and the top	ctional oken E sation -Introd other i rsation on froi -Direct -Reque outside ask the pic in a formin er tong tences	, Situat nglish ucing t n a tea n Seni tion fro ests for e. studen a struct	tional ( in the Self m (Pai ors Te om stra t borro nt to ta ured m ences d pit fa lish	Conver placen r Activ achers inger o wing b lk imp nanner.	resations nents and vity) and oth r from books, a romptu	s nd Gro her sup Helpli applica 1.	oup Dis periors ne tions, Englisl	cussio (Team or any	n Activit other h	ty) elp fro	m offic	e:

	<ul> <li>-Difficulty in right usage of words.</li> <li>-Difficulty in Pronunciation-Phonetic differences in mother tongue and English –areas to improve.</li> <li>-Idioms and Phrase –Frequently used Idiom and Phrases which help to enhance the quality of presentation and make the presentation meaningful.</li> <li>-Meaning of frequently used Idioms and Phrases.</li> <li>Unit III</li> <li>4. Introduction to different ways of speaking.</li> <li>-Elocution, Debate and Extempore</li> <li>Principles of Elecution and its chellene comparison in presentation</li> </ul>
	-Principles of Elocution and its challenges practice in session.
	-Principles of Extempore - its pitfalls- practice session.
	Unit IV
	5. Etiquette
	-Need of Etiquette in Social arena
	-Dining Etiquette
	-Social Etiquette in conversation -formal and informal gathering.
	-Book a table etc.
	6. Versant Test
	-Mode of versant Test,
	-Aim of the test and various methods it follows
	-Practice session.
Reference	Reference Books:
books	[1] KamaleshSadanand, "A Spoken English", VOL 1&2; Orient BlackSwan, Second Edition,2014.
	[2] "Communicative English"; Pearson; 2010

VR17

Being a training program, the scope is broader and the pedagogue is not limited to the reference mentioned above.

VRSEC

# **17EC3406: PULSE AND SWITCHING CIRCUITS**

<b>Course Category:</b>	Core		Credits:	3
<b>Course Type:</b>	Theory		Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17PH1102-	Engineering	<b>Continuous Evaluation:</b>	30
	Physics,	17EC1204B-	Semester end Evaluation:	70
	Electronic De	vices	Total Marks:	100

Course	Upon successful completion of the course, the student will be able to:														
	CO1	Analyze, and verify the conversion efficiency of Power Amplifiers.													
	CO2Analyze and verify the response of Linear & Non-Linear Wave shape circuits to different inputs.CO3Analyze and verify the states of Multivibrator Circuits.											ping			
Contribution of Course		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
Outcomes towards	CO1		2	2											2
achievement of Program	CO2		2	2											2
Outcomes	CO3		2	2											2
(1 – Low, 2 - Medium, 3 - High)	CO4		2	2											2
Content	UNI Pow AB UNI Lind for S RC UNI Non Two Soun and UNI Mul Fixe Mul Gate Mul	IT II: ver A ortior ver Ar Opera IT II: ear W Squar Circu IT-III o Inde rce an Pract: IT IV Itivibr ed Bia tivibr e Wid tivibr	mpli n, Hig nplifi ition. /ave # e, Ex it for e, Ex it for ear V pendend d Di ical C : rator ator, dth c ator,	fiers: gher ( er, Ef (10 H Shap poner Squa Squa Vave ent Le iode 1 Clamp s: ansist Schn of a Expre	Clas Drder fficier rs) ing: T ntial & re, Ex Shap evels, Resist ing C	ss A Harm hcy, P The H &Ram poner ing: The C ances ircuit	Larg nonic ush-F igh p np Inp ntial d Clipp Clamp s into s.(10	e Sig Gene Pull A ass Ro puts, I & Rar ing C Ding C Acco Hrs) ltivib: e Mo oled I ncy o	gnal mplif C Cir Low J np In Circuit Opera ount, rator, nosta Monc f osci	Ampl n, Tra fiers, cuit, pass F puts.( as, Di tion, A Cl Self ble N ostable llatio	ifiers, unsfor Class The H C Ci 10 H ode C Clamp ampi Bias Jultiv e Mu ns.(15	Second mer ( B An High p rcuit, rs) Clippe ping C ng Ci Tran ibrato ultivib 5 Hrs)	ond Coup nplifi ass F The rs, C Circuit rcuit sistor ors (co rator	Harm led A lers, C Low lippin its Ta Theo r Bist operat c, Ast	ionic udio Class rcuit pass ng at king orem table ion), table

Text books and Reference books	<ol> <li>Text Books:</li> <li>Jacob Millman and Christos C Halkias, "Integrated Electronics: Analog and Digital Circuits and Systems", TMH, 2003. (UNIT-I for Power amplifiers).</li> <li>Jacob Millman and Herbert Taub, "Pulse, Digital and Switching Waveforms, 3<sup>rd</sup> Edition, TMH, 2003. (UNIT II, III &amp; IV).</li> </ol>
	<ol> <li>Reference Books:         <ol> <li>Robert L Boylested and Louis Nashelsky, "Electronic Devices and Circuit Theory", 8<sup>th</sup> Edition, 2002, PHI.</li> <li>Deshpande, "Electronic Devices and Circuits", Tata McGraw-Hill.</li> <li>A. Anand Kumar, "Pulse and Digital Circuits", 2<sup>nd</sup> Edition, PHI, 2008.</li> </ol> </li> </ol>
E-resources and other digital material	<ol> <li>http://nptel.iitm.ac.in/courses.php?branch=Ece.</li> <li>http://web.cecs.pdx.edu/~ece2xx/ECE221/Lectures/.</li> <li>http://newton.ex.ac.uk/teaching/CDHW/Electronics2/ElectronicsResource s.html.</li> </ol>

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# 17EC3451: ANALOG INTEGRATED CIRCUITS LAB

<b>Course Category:</b>	Core	Credits:	1.5
<b>Course Type:</b>	LAB	Lecture - Tutorial -Practice:	0-0-3
Prerequisites:	17EC1204B: Electronic	<b>Continuous Evaluation:</b>	30
	Devices, 7EC3302:Analog	Semester end Evaluation:	70
	Electronics.	Total Marks:	100

Course Outcomes	Upo	n suc	cessfi	ıl con	npletio	on of	the co	ourse,	the st	udent	will	be abl	le to:			
	CO1	Und 565,	erstar , IC 5	nd the 66) ar	conc nd use	epts of them	of line for d	ar int iffere	egrate nt app	ed cir olicati	cuits ons	and sp	pecial	IC's	(IC	
	CO2	Desi	ign os	cillate	ors, w	vavefc	orm ge	enerat	ors ar	nd filt	er ciro	cuits ı	ising	IC74	1	
	CO3	Use the concepts of A/D, D/A converters and design voltage regulators														
	CO4	Design the circuits using 555 timers for particular application														
Contribution of Course		PO       PO <th< th=""></th<>														
Outcomes towards	CO1															
achievement of Program	CO2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2 <th2< th="">         2         <th2< th=""> <th2< th=""></th2<></th2<></th2<>															
Outcomes	CO3	3 2 2 2 2														
(1 – Low, 2 - Medium, 3 - High)	CO4			2	2					2				2	2	
Course Content		<ol> <li>Data 1.</li> <li>Data 2.</li> <li>Data 2.</li> <li>Data 3.</li> <li>Data 5.</li> <li>Data 5.</li></ol>	esign esign esign esign tegrat esign esign esign esign esign esign esign esign esign	and v and v of UJ of Cla of a d and V or, Di of Fu of Fu of Fu of Tri of Mc of A b. of Vo of 4-b	erifica erifica T rela ass-B iffere /erific ifferen ll way trume angul onosta ctive bit R - t of O	ation ation comp ntial a cation ntiato re reci entation ar wa ible an Filter Regu - 2R I p-Am	of Lin of No n osci lemen ampli of Aj r). tifier v on An vefor nd Scl rs usi lator v Ladde p Par	hear w n-Lin Illator ntary s fier. pplica using pplific m ger hmitt ng Oj using r D-A amete	vave s ear w symm tions 741 I er usin herato Trigg p-Am IC 72 Convers.	hapin ave s netry p of O C. ng Op rs usi er cir p (Se 3. verter	g circ hapin oush-j o-amp -Amp ng 74 cuit u econd	pull po p (Add p. 1 IC. sing 7 Orde	uits ower der, S 741 IC er LP	ampli Subtra C. F &	ifier. ictor, HPF	

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

## **17EC3452: ANALOG COMMUNICATIONS LAB**

<b>Course Category:</b>	Programme Core	Credits:	1.5
Course Type:	Practical	Lecture - Tutorial-Practice:	0-0-3
Prerequisites:	17EC3404: Analog	<b>Continuous Evaluation:</b>	30
	Communications	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upor	Upon successful completion of the course, the student will be able to:													
	CO1	Expe	rime	ntal v	verific	ation	of v	ariou	ıs An	nplitu	de m	odula	ation	techr	iques
	001	using	, hard	lware	and s	simul	ation			1					1
	CO2	Expe	rime	ntal v	erific	ation	of va	rious	Freq	uency	y moo	dulati	on te	chniq	ues
		using	, hard	lware	and s	simul	ation		-					-	
Contribution		РО	РО	PO	PO	PO	PO	PO	PO	РО	PO	PO	PO	PSO1	PSO2
of Course		1	2	3	4	5	6	7	8	9	10	11	12		
Outcomes	CO1			2	1	2				2				2	2
towards	$CO^2$			2	1	2				2				2	2
achievement				2	1	2				2				2	2
of Program															
Outcomes															
(1 - Low,															
2 - Medium,															
3 - Hign)															
Course	Expe	Experiments using Hardware (using Discrete Components):													
Content	Experiments using marturate (using Distrete Components).														
Content	1. Amplitude Modulation and Demodulation														
	2. Frequency Modulation and Demodulation														
	3. DSB SC Modulation and Demodulation														
	4.	SSI	B SC	Mod	ulatio	n and	l Den	nodul	ation						
	5.	Pre	Emp	hasis	- De	Empl	hasis	Circu	iits						
	6.	Des	sign c	of Miz	xer										
	7.	AG	C ch	aracte	eristic	S									
	Expe	rimei	nts us	sing S	Softw	are(u	ising	Lab	VIE	W):					
	8.	Am	plitu	de M	odula	tion a	and D	emoc	lulati	on					
	9.	Fre	quen	cy Mo	odulat	tion a	ind D	emoc	lulati	on					
	10	DS	B SC	Mod	lulatic	on and	d Der	nodu	lation	l					
	_														
	Expe	rimei	<u>its us</u>	sing S	specia	alizec	<u>1 Eq</u> t	<u>iipm</u>	ent (I	viatla	<u>b):</u>				
	11	. Am	plitu	de M	odula	tion a	and D	emoc	lulati	on					
	12	. Fre	quen	cy Mo	odulat	tion a	nd D	emod	lulati	on					
	13	DS	B SC	Mod	lulatic	on and	d Der	nodu	lation	l					
	14	. Vei	ificat	tion o	of San	npling	g The	orem	l						
	15	. Vei	ificat	tion o	of Co	nvol	ution	and (	Corre	lation	l				

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

# 17MC1407A / 17MC1307 B – INDIAN CONSTITUTION

<b>Course Category:</b>	Humanities elective	Credits:	1
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	2-0-0
Prerequisites:		Continuous Evaluation:	100M

Course outcomes		Upor	n succe	essful	compl	etion	of the	course	e, the s	studen	t will l	be able	e to:											
	CO1	Knov	w the f	ùndan	nental	law of	f the la	nd																
	CO2	Unde	erstand	how	fundar	nental	rights	are pi	rotecte	ed														
	CO3	Perce	eive th	e struc	cture a	nd for	matior	n of th	e India	an Gov	vernme	ent Sys	stem											
	CO4	Expla conse	plain when and how an emergency can be imposed and what arethe sequences.													plain when and how an emergency can be imposed and what arethe nsequences.								
Contribution of Course Outcomes towards		PO 1	D         PO         PO </th <th>PSO 2</th>											PSO 2										
achievement of	CO1						2																	
Program Outcomes	CO2						2																	
(1 – Low, 2 - Medium,	CO3						2																	
3 - High)     CO4     2																								
Content	UNIT Introd Const: Const: UNIT Funda to equ the rig UNIT legisla Parlia Presid Perspe Local UNIT Emer	I: luction itution itution II: ament ality, s th of l III: tive an menta ent of ectives Self C IV: gency	n to alism, of Ind al rigi scheme ife and ife and Naturn d fina ary for India of the Soverr Provis	Cons Histo lia. nts: So e of th l perso re of ncial p rm of , Ame const iment	cheme e functional lil the In power gover itutior : Cons Natio	on of perspe- of the lament perty u ndian s betw men nt of nal am- stitution	fundational Sconerger	amenta amenta at to co Article titutio e Unic ndia: ' onstitu ents in heme	leaning onstitu al righ ertain 21, w n: Fe on and The C utional India in Ind	g of tion of ts, sch freedo rits ju: deral states onstitu powo ia	the of Ind	Consti ia, Sa of the s der An ion. ure an oowers d Proc	tution lient fundar ticle 1 d dist and s cedure	Law feature mental 19, sco tributic status of status of tributic	and es of right pe of on of of the orical									
Text books and Reference books	Text [1] D Allaha Refer	Book( r. J.N abad, E ence E	<b>s):</b> Panc Edition <b>Books</b> :	ley, C 2018	Constit	utiona	l Law	of I	ndia p	oublisł	ned by	v Cent	tral la	w Ag	ency,									

	, 111 /
[1] V.N Shukla's, Constitution of India Eastern Book Company, Lucknow.	
[2] M.P. jain, Indian Constitution Law, Wadhwa and Company, Nagpur.	
[3] D.D. basu, Constitution of India, Wadhwa and Company, Nagpur	

<b>Course Category:</b>	Program Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-1-0
Prerequisites:	17EC3308:Signals and	<b>Continuous Evaluation:</b>	30
	systems	Semester end Evaluation:	70
		Total Marks:	100

# **17EC3501: LINEAR CONTROL SYSTEMS**

Course	Upo	n suc	cessfi	ıl con	npletio	on of	the co	urse,	the st	udent	will	be abl	e to:												
outcomes	CO1 Understand the concepts of feedback control systems for model physical systems Determine and analyze the stability of linear systems using the													leling	g of										
	CO2	Det don	ermin nain a	ne an analy	d ana sis.	lyze	the s	tabili	ty of	linea	ır sys	tems	using	g tim	ie										
	CO3	<sup>3</sup> Determine and analyze the response of linear systems using f domain analysis.											etermine and analyze the response of linear systems using frequency omain analysis.												
	CO4	Desi desi	esign and evaluate the compensators for linear systems to meet the sired specifications.																						
Contributio n of Course	ributio         PO         PO <t< th=""></t<>																								
Outcomes towards	CO1	2	1	2																					
achievemen t of	CO2	3	2																						
Program	CO3		2	3																					
Outcomes (1 – Low, 2 - Medium, 3 – High)	CO4	3	2	2																					
Course Content	UNI Intro Syst Syst Tim Mat Elec Resp Flow UNI Tim Syst	IT-I oducti ems, ems e Var hemat etric ponse v Graj IT-II e Dor ems,	on: E Applic Effect - Line ying S tical Netwo and phs. nain A	Basic cation t of Fe ear V Syster Mode orks, Trans Analy cal T	Comj s, Op eedba ersus ns. eling Mod fer Fu (1 sis of est S	oonen Den I ck on Nonl of F leling unctic l6Hrs Cont ignals	ts of Loop Syste linear Physic of ons of ) rol Sys	a Co Contr em Pa Contr al Sy Mech Line	ontrol rol S ramet rol S ystem aanica ar Sy s: Tim Time	Syste ystem ters, T ystem s: In 1 Sy stems ne Res Respo	em, E Is, Cl Types Is, Ti trodu- stem 5, Blo	Examp losed of Fe me Ir ction, Elen ck Di ck Di	oles o Loop edbac ivaria Equ nents, agran	of Co co Co k Co nt Vo ation Imp ns, Si uous Syst	ntrol ntrol ersus s of pulse ignal Data										

	<ul> <li>Steady State Error, Unit Step Response and Time Domain Specifications, Transient Response of Prototype Second Order System, Effect of Adding Poles and Zeros to Transfer Functions, Dominant Poles of Transfer Function.</li> <li>Stability of Linear Control Systems: Introduction Bounded Input – Bounded Output Stability, Zero Input and Asymptotic Stability of Continuous Data Systems, Methods of Determining Stability Routh-HurwitzCriterion. (14 Hrs)</li> <li>UNIT- III</li> <li>Root-Locus Technique: Introduction, Basic Properties of the Root Loci, Properties and Construction of the Root Loci, Some Important Aspects of the Construction of the Root Loci.</li> <li>Frequency-Domain Analysis: Introduction, Mr, Wr, Bandwidth of the Prototype Second-Order System, Effect of adding Poles and Zeros to the Forward-Path Transfer Function, Nyquist Stability Criterion, Nyquist Criterion for Systems with Minimum-Phase Transfer Functions, Relative Stability, Stability Analysis with the Bode Plot.(16Hrs)</li> </ul>
	<b>UNIT – IV</b> Design of Control Systems: Introduction, Design with the Phase-Lead Controller, Design with the Phase-Lag Controller, Design with the Lead-Lag Controller. State Variable Analysis: Introduction, State Transition Matrix, State Transition Equation, Relation Between State Equations and Transfer Functions, Characteristic Equation, Eigen Values and Eigen Vectors, Controllability of Linear Systems, Observability of Linear Systems, Relationship among Controllability, Observability and Transfer Functions. (14Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Benjamin C. Kuo, "Automatic Control Systems", 7th edition, PHI, 2013.</li> <li>Reference Books:</li> <li>1. J Nagrath&amp; M Gopal, "Control Systems Engineering", 3<sup>rd</sup> edition, New Age International, 2003.</li> <li>2. K Ogata, Modern Control Engineering, 4th edition, Pearson Education, 2003.</li> </ul>
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/108101037/</li> <li>https://nptel.ac.in/courses/Webcourse-contents/IIT- Delhi/Control%20system%20design%20n%20principles/index.htm</li> <li>http://en.wikibooks.org/wiki/Control_Systems</li> <li>http://www.ebookpdf.net/linear-control-systems-ppt_ebook</li> </ol>

17EC3502: DIGITAL C	COMMUNICATIONS
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<b>Course Category:</b>	Program Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-1-0
Prerequisites:	17MA1401:Probability Theory and Random Processes, 7EC3404:Analog Communications	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100
	0 0 1 1 1 1 0 1 1 0 1 0 1 0		

Course outcomes	Upo	n suce	cessfu	l com	pletio	n of th	ne co	urse, t	he st	udent	will	be at	ole to	:	
	CO1	Iden	tify th	e con	stitue	nts of	a dig	ital co	ommı	inicat	tions	syste	m		
	CO2	Ana and	lyze & Detec	tion n	onstra nethoc	ite var ls.	rious	metho	ods o	f base	eband	l digi	tal tra	ansmis	ssion
	CO3 Analyze & demonstrate various methods of band pass digital transmission and Detection methods.														gital
	CO4	Understand the basics of information theory. Design different error control coding schemes for the reliable transmission of digital information over the channel.													
Contribution of Course		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
Outcomes towards	CO1	3												2	2
achievement	CO2	3												2	2
Outcomes	CO3	3												2	2
(1 – Low, 2 - Medium, 3 – High)	CO4	3												2	2
Course Content	UNI Puls Mod Puls Base Nois Base UNI Sign Grar AW0 Dete Rece	T-I e Mo lulatic e Cod eband eband teband T-II al SI m-Sch GN ( ection eiver,	odulat on, Di le Moo Pulse iter s Binar Dace midt Chann of Si Proba	ion: fferer dulatio e Trar ymbol y Trar <b>Analy</b> Orth el int gnals bility	Quant tital F on. asmiss I Inte nsmis sis: F ogona to a in No of Er	izatio Pulse Sion: N erferen sion, ( ntrodu lizatio Vecto Dise - ror.(1)	n Pr Code Matcl ice, Corre iction on I r Ch Max 2 Hr	ned fi Nyqu lative n, Geo Procection imum s)	, Pu lulation lter, ist's Leve ometra lure, , Lilo n Liko	lse ( on, a Propo crite el Coo ric R Cor celiho	Code nd A erties rion ding. epres	Mod dapti , Erro for (12 H eentat	dulat ive I or Ra Disto Irs) ion o of ( ions, ng, (	ion, I Differe ate Du ortion of Sig Contin Cohe Correla	Delta ential ne to less nals, uous erent ation

	<b>UNIT-III</b> Passband Data Transmission: Introduction, Passband Transmission Model, Coherent Phase Shift Keying – BPSK, QPSK, Offset QPSK, $\pi/4$ -shifted QPSK, M-ary PSK, Hybrid Amplitude/Phase Modulation Schemes – M-ary QAM, Square Constellations, Coherent Frequency Shift Keying - Binary FSK, MSK, GMSK, Detection of Signals with Unknown Phase, Non-Coherent Orthogonal Modulation, Non-Coherent Binary Frequency Shift Keying, Differential Phase Shift Keying, Comparison and Applications of Digital Modulation Schemes. (12 Hrs)
	UNIT-IV Information Theory: Introduction, Uncertainty, Information and Entropy, Properties of Entropy, Extension of Discrete Memoryless Source, Source Coding Theorem, Data Compaction – Prefix Coding, Huffman Coding, Lempel-Ziv Coding, Discrete Memory Less Channels, Mutual Information, Properties of Mutual Information, Channel Capacity, Channel Coding Theorem, Information Capacity Theorem (Statement and formula). Error Control Coding: Introduction, Linear Block Codes, Cyclic Codes. (12Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Simon Haykin, "Communication Systems", John Wiley &amp; Sons, 4th edition, 2007.(Units - I, II, III &amp; IV)</li> <li>Reference Books:</li> <li>1. Bernard Sklar, "Digital Communication", 2nd edition, Pearson Education, 2013.</li> <li>2. Taub and Schilling, "Principles of Communication Systems", 2nd edition, TMH, 1986</li> </ul>
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/117101051/</li> <li>https://nptel.ac.in/courses/117105077/</li> <li>http://www.ece.utah.edu/~npatwari/ece5520/lectureAll.pdf</li> </ol>

# 17EC3503: VLSI DESIGN

<b>Course Category:</b>	Program Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial -Practice:	4-0-0
Prerequisites:	17EC3302:Analog Electronics,	<b>Continuous Evaluation:</b>	30
	17EC3304:Digital Circuits	Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upor	Upon successful completion of the course, the student will be able to:													
	CO1	CO1 Analyze VLSI fabrication processes and CMOS Logic Design.													
	CO2 Identify the physical circuit parameters and analyze the effects of parasitic on overall performance of the circuit.														rasitic
	CO3	Design the different memory modules at transistor level for given specifications													
Contribution of Course		PO 1	PO 2	РО 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Outcomes towards achievement	CO1			2									2		
of Program Outcomes	CO2			2		2							2	2	
(1– Low, 2-Medium, 3 – High)	CO3					2								2	
Course Content	UNIT Intro CMC Basic Curro Threa Conc inver NMC one BiCM UNIT MOS and Capa and H UNIT Scali	CO322UNIT-IIntroduction to MOS Technology: VLSI Design Flow, NMOS fabrication, CMOS fabrication, BICMOS technology.Design Flow, NMOS fabrication, CMOS fabrication, BICMOS technology.Basic Electrical Properties Of MOS and BICMOS Circuits: Drain-to-Source Current Ids versus Voltage Vds relationships, Aspects of MOS Transistor Threshold voltage Vt, MOS Transistor Transconductance gm and Output Conductance gds, MOS Transistor Figure of Merit, Pass Transistor, NMOS inverter, Pull-Up to Pull- Down Ratio for and NMOS Inverter driven by another NMOS Inverter, Pull-up to pull- down ratio for and NMOS Inverter Driven by one or more Pass Transistors, Alternative forms of Pull-up, CMOS Inverter, BiCMOS inverters, Latch-up in CMOS Circuits.(12 Hrs) UNIT-IIMOS Circuit Design Processes: MOS Layers, Stick Diagrams, Design Rules and Layout Basic Circuit Concepts: Sheet Resistance Rs, Standard Unit of Capacitance, The Delay Unit, Inverter Delays, Driving Large Capacitive Loads, and Propagation Delays.(12 Hrs)													

	for Device Parameters. Subsystem Design and Layout: Architectural Issues, Switch Logic, Gate Logic, Examples of Structured Design (Combinational Logic). (10 Hrs) <b>UNIT-IV</b> <b>Sub system Design Process:</b> Adder enhancement techniques - Carry look-ahead (CLA) adder, Serial Adder, Carry Select adder, Carry skip adder. <b>Multipliers</b> - The modified Booth's multiplier, Wallace tree multiplier, 4-bit Braun multiplier, Twos complement multiplication using Baugh-Wooley method. <b>Memory, Registers and Aspects of System Timing</b> - A three transistor dynamic RAM cell, A one transistor dynamic memory cell, A pseudo static RAM/register cell, Four transistor dynamic and six transistor static CMOS memory cells <b>Test and Testability</b> - Testing Combinational and Sequential Logic. (15 Hrs)
Text books and Reference books	<ul> <li>Text books: <ol> <li>Douglas A. Pucknell, "Basic VLSI Systems and Circuits", Prentice Hall of India, 3rd Edition, reprint 2008.</li> <li>Neil H. E. Weste, David Harris, Ayan Banerjee, "CMOS VLSI Design, 3<sup>rd</sup> Edition, Pearson Education 2009.</li> </ol> </li> <li>References: <ol> <li>Weste &amp; Eshraghian, "Principles of CMOS VLSI Design", Addison Wesley, 2nd Edition, 2008.</li> <li>John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley &amp; Sons, Reprint 2009.</li> </ol> </li> </ul>
E- resources and other digital material	<ol> <li>http://www.cdeep.iitb.ac.in/nptel/Electrical%20&amp;%20Com m%20Engg/VLSI%20Design/Course %20Objective.htm</li> <li>http://www.cdeep.iitb.ac.in/nptel/Electrical%20&amp;%20Com m%20Engg/VLSI%20Design/TOC.ht m</li> <li>http://nptel.iitm.ac.in/video.php?subjectId=117106092</li> </ol>

(12Hrs)

## **17EC2504A: COMPUTER ARCHITECTURE AND ORGANIZATION**

<b>Course Category:</b>	Open Elective I	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3 - 0 - 0
Prerequisites:	14CS1103:Introduction to	<b>Continuous Evaluation:</b>	30
	Computing, 14EC3304:	Semester end Evaluation:	70
	Digital Circuits and	Total Marks:	100
	Systems		

Course outcomes	Upor	Upon successful completion of the course, the student will be able to:													
	CO1	Demonstrate computer functional units, its operation and also interpret machine coding of functional units.													
	CO2	Evaluate the performance of CPU, Memory and I/O operations													
	CO3	App proc	Appreciate the computer arithmetic and pipelined architecture of processors.												
Contribution of Course		PO         PO<												PSO2	
Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO1	3												1	
	CO2	1												1	
	CO3	2												2	

Course UNIT-I Content Register Transfer and Microoperations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Micro operations, Shift Microoperations, Arithmetic Logic Shift unit. Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction cycle. Memory Reference Instructions. Input-Output and Interrupt, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic. (12Hrs)

#### **UNIT-II**

Overlapped Register Windows.

Microprogrammed Control: Control Memory, Address Sequencing, Microprogram Example, Design of control unit. **Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation Program control, Reduced Instruction Set Computer (RISC),
	UNIT-III Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access(DMA), Input-Output Processor(IOP), Serial Communication. Memory Organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.(12 Hrs)
	UNIT-IV Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating-Point Arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations. Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors. (12Hrs)
Text books and Reference	<ul> <li>Text Books:</li> <li>1. M. Moris Mano. (2007), "Computer System Architecture" 3rd edition, Pearson/ PHI.(Unit – I to IV).</li> </ul>
books	<ul> <li>Reference Books:</li> <li>1. William Stallings, "Computer Organization and Architecture Designing for Performance", 9<sup>th</sup>Edition, Pearson Education, 2013.(Refer for Internal Memory Technology)</li> <li>2. Carl Hamacher, ZvonkoVranesic and SafwatZaky, "Computer Organization", 5<sup>th</sup>Edition, Tata McGraw Hill, 2002.</li> <li>3. Hayes, J.P., "Computer Architecture and Organization", 3<sup>rd</sup>Edition, Tata McGraw Hill, 1998.(Refer for Design of Arithmetic Logic for Computers)</li> </ul>
E-resources and other digital material	<ol> <li>http://nptel.iitk.ac.in/courses/Webcourse-contents /IITKANPUR/CompArchitecture/page2.htm</li> <li>http://nptel.ac.in/courses/Webcourse-contents/IIT- %20Guwahati/comp_org_arc/web/</li> <li>http://williamstallings.com/ComputerOrganization/styled-7/</li> </ol>

# **17EC2504B: ELECTRONIC MEASUREMENTS & INSTRUMENTATION**

<b>Course Category:</b>	Open Elective I	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3 -0-0
Prerequisites:	17EC1204B: Electronic Devices	<b>Continuous Evaluation:</b>	30
	17EC3302: Analog Electronics	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upor	Upon successful completion of the course, the student will be able to:													
	CO1	1 Emphasize the basic electronics measurement concepts & Design the different analog and digital electronics voltmeters.													
	CO2	O2 Design the Measurement of different bridges.													
	CO3	O3 Identify and use different analyzers oscilloscopes & generators to make measurements and analyze measurement													
	CO4	Analyze the basic concepts of Transducers and Data Acquisition System based on application													
Contribution of Course		PO 1	РО 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
Outcomes towards	CO1	2		3										2	2
achievement of Program	CO2	2												2	2
Outcomes (1 – Low.	CO3	2	2											2	2
2 - Medium, 3 – High)	CO4		3 2 2 2												
Course Content	UNI Basic chara Anal Indic DC Seric Instr Mult Aver UNI Brid Max Brid	T-I c Ele acterist ysis, L cating D Voltme es and S uments ci-range cage res T-II ges: In well, H ge.	etron ics-S imitin instru- ter, Shunt for I AC pond ntrod	ic tatic ng ern men Mult type Veas voltn ling v	Meas & I ror. ts: D i-ran uring neter voltm n to ing, V	suren Dynai C A ge v g Bas s, Tru eters Br Wien	nent mic oltme ic Pau ue RN idge Brid	Co Meas ter, l eter, rame VS v Mea ge, V	ncep suren Multi Exte ters- oltmo ( asure Vage	ts: nent, -rang nding AC eter, (12 H (12 H ment r Gro	Intro Erro ge An g vo Voltm Peak Irs)	oduction or An mme ltmet respo Wh Conn	ion nalys ter, A er, C s Usi ondir	Perform is, Stat Aryton Dhm m ng Rect ng voltn one, K n, Resc	mance istical shunt, eter – tifiers, neters, Celvin, onance

	Digital Voltmeters: - Introduction to DVM, Ramp, Stair Case Ramp, Integrating, Continuous Balance, Successive Approximation Resolution and Sensitivity of Digital Meters. (12 Hrs)
	UNIT-III Oscilloscopes: Basic principle of Oscilloscope, Block diagram, Cathode Ray Tube, Time-frequency – phase angle measurements using CRO, Dual beam CRO, Dual Trace CRO, Digital Storage Oscilloscope, Digital Frequency meter, Period measurement, Universal Counter Signal generator – AF Oscillator, Function Generator, Square and Pulse generator. Signal Analysis: Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzer, Logic Analyzer (14 Hrs)
	<b>UNIT-IV</b> Transducers as Input Elements to Instrumentation Systems: Classification of Transducers, Selecting a Transducer, Strain gauges, Potentiometer, Inductive and Capacitive Transducers, Temperature Measurements – Thermistor, Thermocouple: Photovoltaic, Photoconductive, Photo emissive transducer, Piezoelectric Transducer Data Acquisition Systems: Introduction, Objectives of Data Acquisition system, single channel data acquisition system, Multi channel DAS, Computer based DAS. (14 Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. H S Kalsi, "Electronics Instrumentation, TMH, 1995. (Units I, II, III, IV)</li> <li>Reference Books:</li> <li>1. Albert D. Helfrick and William D.Cooper "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2003.</li> <li>2. A K Sawahney, "Electrical and Electronics Measurement and Instrumentation", DhanpatRai, 2000.</li> <li>2. 3. Ernest O. Doebelin, "Measurement Systems- Application and Design" Tata McGrawHill-2004.</li> </ul>
E-resources and other digital material	1.https://nptel.ac.in/courses/108106070 2.https://nptel.ac.in/courses/108106070

# **17EC2505A: ARTIFICIAL NEURAL NETWORKS**

Course Category:	Open elective II (Inter Disciplinary)	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:		<b>Continuous Evaluation:</b>	30
-		Semester end Evaluation:	70
		Total Marks:	100

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Und	nderstand the significance of ANNs to solve nonlinear problems.												
	CO2	Desi	Design an MLP Network for the given problem. Distinguish various unsupervised algorithms and use them appropriately												
	CO3	Dist													
	CO4	Solv	ve association problems using Neural Networks												
Contribution of Course		PO 1	РО 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
Outcomes	CO1	2													
achievement of	CO2		1												
Program Outcomos	CO3		1												
(1 – Low, 2 - Medium, 3 – High)	CO4		2												
Content	UNI Sup Sep Mod UNI Sup Prel proj Mui (12) UNI UNI UNI UNS Qua Top	roduc uron, works oervis arabil difica (T-II oervis limina pagati ltilaye Hrs) (T-III super untize pologi	etion: Neura s, Eva ed L ity, tions. ed L uries, on Al er Net vised rs, C cally	Histo: I Net luatio: <b>cearni</b> Perce <b>earni</b> Back Igorith works <b>Lea</b> ounter Orga	ry of I Arch n of N ing - ptron (1 ng: N (1 ng: N (1) ng: N (1) ng (1) n ng (1) n n ng (1) n n n n n n n n n n n n n n n n n n n	Neura nitectu letwor - Sin Tra 12Hrs Multil opagat etting sting, : W pagati Net	l Netw res, N ks, In gle I ining ) ayer ion A the P Predic inner- on N works	vorks, Neural Iplem L <b>ayer</b> Alg Netw Algori arame ction I Take- letwor s, Di	Struc Lean entation Net orithm vorks: ithm, eter V Netwo All ks, A stance	ture a rning, on. <b>work</b> n, G Clas alues, orks, F Netwo Adapti e-base	nd Fu App s: P luaran lti-lew ssifica , App olyne orks, ive H	uncti licati ercep ntee vel I ation olicat omia Lea Reson	on of otron of Discr usi ions. 1 Net	f a Sir of New s, Li Succ imina ng H Adap works g Ve e The Princ	igle iral near cess, tion, Back otive S. ector cory, cipal

	Component Analysis Networks.(12Hrs) UNIT-IV Associative Learning: Non-iterative Procedures for Association, Hopfield Networks, Optimization Using Hopfield Networks, Boltzmann Machines. Evolutionary Optimization: Optimization and Search, Evolutionary Computation, Evolutionary Algorithms for Training Neural Networks. (12Hrs)
Text books and Reference books	<ul> <li>Text books:</li> <li>1. KishanMehrotra, Chilukuri K. Mohan, Sanjay Ranka, "Elements of Artificial Neural Networks", 2<sup>nd</sup>edition, Penram International Publishing (India) Pvt. Ltd, 1990. (Units - I, II, III &amp; IV)</li> </ul>
	<ul> <li>Reference books:</li> <li>1. J. M. Zurada, "Introduction to Artificial Neural Systems", 3rd edition Jaico Publications.</li> <li>2. B. Yegnanarayana, "Artificial Neural Networks", PHI, New Delhi, 2001.</li> </ul>
E-resources and other digital material	<ol> <li>http://nptel.iitm.ac.in/video.php?subjectId=117105084</li> <li>http://en.wikipedia.org/wiki/Artificial_neural_network</li> <li>http://freevideolectures.com/Course/2677/Neural-Networks-and-Applications/1</li> <li>http://machine-learning.martinsewell.com/ann/</li> <li>http://neurosci.wikidot.com/artificial-neural-network</li> </ol>

<b>17EC2505B: PRINCI</b>	PLES OF EMB	<b>BEDDED SYSTH</b>	EMS
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Course Category:	Open elective II (Inter Disciplinary)	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3 - 0 - 0
Prerequisites:	17EC1204: Basic Electronic	<b>Continuous Evaluation:</b>	30
	Engineering	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upor	Upon successful completion of the course, the student will be able to:													
	CO1	Reco syste	Recognize the basic building blocks and components of embedded systems and microcontroller.												
	CO2	Reco and	Recognize and define the categories, properties, features, design criteria and example hardware of embedded systems.												
	CO3	Defi diffe	Define and design digital systems and circuits of embedded systems, differentiate the properties of embedded systems and microcomputers.												
	CO4	Reco them	Lecognize the design requirements from user perspective, and relate nem to real time operating systems.												
Contribution of Course		PO         PO<													
Outcomes towards	CO1			2										2	
achievement of Program Outcomes	CO2			2										2	
(1 - Low, 2 - Medium,	CO3				2	2								2	
3– High)	CO4				2	2								2	
Course Content	UNI Intro Tech Purpo single proce UNI Gene Prog Instru Singl LCD Real-	<b>F-I</b> ductic nolog ose Pi e-purp essors <b>F-II</b> eral-Pu rammu ction e-Pur , Key .Time	on to y, IC cocess pose arpose er's -Set I pose pad a Cloc	em tech sors: proc Proce Proce and S ks. Ir	beddo molo Hard essor occess w, essors essor Stepp ntel 8	ed s gy, I ware des cors Deve (AS s - er M 086 a	ysten Desig , Cor ign, ign, - S elopm IPs),( Perip otor ind Ir	ns: ( n tec nbina Opti oftwa ient Gener bheral Cont ntel 8	Comm hnol- ttiona miza are, Env ral-Pu s, U rolle 051 b	non ogy, il log tion Basic viron urpos ART rs, A based	Design Tradic, Second of ( c Annent, e Pro , Pul nalog appl:	gn N e-off equer Custo rchite Aj ocesso lse V g-to-I icatio	Aetric s, Cu ntial 1 om s (12 H ccture pplica or De Vidth Digita ons.	es, Pro ogic, C ingle-pu Irs) e, Ope ation-Sp sign Sta Modu I Conv (1:	cessor Single- ustom urpose ration, pecific andard lators, erters, 5 Hrs)

	<ul> <li>UNIT-III</li> <li>Memory - common memory types, Advanced RAM, Interfacing: Terminology and Basic Protocol Concepts, Microprocessor Interfacing: Interrupts, Direct Memory Access, Arbitration. Multi-level bus architectures.(10 Hrs)</li> <li>UNIT-IV</li> <li>Digital Camera Example - User's and Designer's perspective, Requirements specification, Design. Introduction to Real Time Operating Systems - OS and RTOS basics, Real time operating system architecture. (10 Hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text Books</li> <li>1. Frank Vahid, Tony Givargis, "Embedded System Design", J Wiley India, 2005.</li> <li>2. David E Simon, "An Embedded Software Primer", Pearson Education, 1999.</li> </ul>
	<ul> <li>Reference Books</li> <li>1. K V K K Prasad, "Embedded Real Time Systems: Concepts, Design Programming", Dreamtech Press.</li> <li>2. Wayne Wolf, "Computers as Components: Principles of Embedded Computing System Design", 3rd edition, Morgan Kaufmann publishers, 2012.</li> </ul>
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/108102045/</li> <li>http://www.engppt.com/2012/01/embedded-system-design-unified.html</li> <li>http://www.di.univr.it/documenti/OccorrenzaIns/matdid/matdid575941.pdf</li> </ol>

#### **17TP1507: PERSONALITY DEVELOPMENT**

Course Category:	Institutional Core	Credits:	1
Course Type:	Learning by Doing	Lecture - Tutorial -Practice:	0 - 0 - 2
Prerequisites:	-	<b>Continuous Evaluation:</b>	100
		Semester end Evaluation:	0
		Total Marks:	100

Course	Upon	Upon successful completion of the course, the student will be able to:													
outcomes	CO1	Unc	lersta	nd th	e cor	porat	e etic	luette							
	CO2	Mal	ce pro	esenta	ations	s effe	ctive	ly wit	th app	propr	iate b	ody	langu	age	
	CO3	Beo	Be composed with positive attitude Understand the core competencies to succeed in professional and personal life												
	CO4	Und pers													
Contribution of Course		PO 1	D       PO       PO												
Outcomes towards	CO1	CO1     2     3     1       CO2     2     3     2     3													
of Program Outcomes	CO2														
(1 - Low, 2 - Medium, 3 - Me	CO3														
High)	CO4									2	3				
Course Content	Unit- 1. A Self-J Activ 2. Co Verba Unit- 3.Self Ange Hats, 4. Et Socia Etiqu Unit- 5. St Note	I naly Introc ity), Introc ity), Introc ity), Introc Intro Introc Introc Introc Intro Introc Intro Intr	tical luctic Self - inica mmun nage nage n Bui tique tique rd O	Thin on, SI - Ana tion S nicati ment Iding ette, pera Note T	king hapin lysis Skills on; N Skills an; N S	& Li g Yo , Dev Mon V Is ss M dersh iness Meth g, Mi	steni ung elopi Verbal anag ip Qu s Et ods nutes	ng Sl Mind ng Po Com emen ualitio iquet	kills s - A ositiv nmun nt, Ti es tte, '	Tall e Atti icatic me	c by itude, on (B Mana phon Email	Azin , Perc ody I agema ae E	nPren ceptio Langu ent, S tique	nji (Lis on. nage) Six Th ette, D Writing	tening inking Dining

	<ul> <li>6. Verbal Ability Synonyms, Antonyms, One Word Substitutes-Correction of Sentences- Analogies, Spotting Errors, Sentence Completion, Course of Action- Sentences Assumptions, Sentence Arguments, Reading Comprehension, Practice work</li> <li>UNIT-IV</li> <li>7.Job-Oriented Skills -I Group Discussion, Mock Group Discussions</li> <li>8.Job-Oriented Skills –II Resume Preparation, Interview Skills, Mock Interviews</li> </ul>
Text books and Reference books	<ol> <li>Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.</li> <li>S.P. Dhanavel, English and Soft Skills, OrientBlackswan, 2010.</li> <li>R.S.Aggarwal, A Modern Approach to Verbal &amp; Non-Verbal Reasoning, S.Chand&amp; Company Ltd., 2018.</li> <li>Raman, Meenakshi&amp; Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.</li> </ol>
E-resources and other digital material	<ol> <li>www. Indiabix.com</li> <li>www.freshersworld.com</li> </ol>

# **17EC3551: DIGITAL COMMUNICATIONS LAB**

<b>Course Category:</b>	Program Core	Credits:	1.5
<b>Course Type:</b>	Practical	Lecture - Tutorial - Practice:	0-0-3
Prerequisites:	14EC3504: Digital	<b>Continuous Evaluation:</b>	30
-	Communication	Semester end Evaluation:	70
	14EC3406: Analog	Total Marks:	100
	Communication		

Course Outcomes	Upon successful completion of the course, the student will be able to:												to:		
	CO1	Hand	s on ex	perie	ence o	on va	riou	s digi	tal m	odul	ation	tech	niqu	es	
	CO2	Hand	nds on experience on various coding techniques												
Contribution of Course Outcomes towards		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
achievement of	CO1			2	3	2				2				3	2
Outcomes (1 – Low, 2 - Medium, 3 – High)	CO2			2	3	2				2				2	2
Course Content	Liss <u>Exp</u> 1. (2) 2. (2) 3. (2) 4. (2) 5. (2) 6. (2) 7. (2) <u>Exp</u> 8. (2) 9. § 10. II 11. II 12. II	<ul> <li>List of Lab Exercises:</li> <li>Experiments using Hardware: <ol> <li>Generation and Detection of ASK, FSK and PSK.</li> <li>Generation and Detection of PCM.</li> <li>Generation and Detection of TDM</li> <li>Generation and Detection of DM</li> <li>Generation and Detection of QPSK</li> <li>Generation and Detection of DPCM</li> <li>Generation and Detection of ADM</li> </ol> </li> <li>Experiments using MATLAB/LABVIEW: <ol> <li>Generation and Detection of ASK, FSK and PSK.</li> <li>Source Encoder and Decoder</li> <li>Design and verification of Linear Block Code-Encoder and Decoder</li> </ol> </li> </ul>													

# 17EC3552: VLSI DESIGN LAB

<b>Course Category</b>	:	Progra	ım Co	ore				Credits:						its:	1.5	5
<b>Course Type:</b>		Practic	cal				L	ectur	e - T	utori	al -Pı	ractic	e:		0-0	0-3
Prerequisites:		14EC3 System 14EC3	3304 ns 3604:	Digital VLSI I	Circu Desig	iits & n		Continuous Evaluation:30Semester end Evaluation:70Total Marks:100							0	
Course outcomes	Upo	n succe	essfu	l comp	letio	n of t	the co	ourse	, the	stud	ent w	vill b	e ab	le to:	:	
	CO1	Mod impl	Model a digital system using Hardware Description Language an mplement using FPGA and CPLD devices.											e and		
	CO2	Char anal	Characterize CMOS digital circuits and verify DC and transier analysis											nsient		
Contribution of Course		PO 1	O         PO         PO </th <th>)1</th> <th>PSO2</th>										)1	PSO2		
Outcomes towards	CO1			3	3	2				2				2		2
achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO2		2 2 2 2 2 2 2 2 2											2		
Course Content	Sim veri Basi Basi Desi	ulate a fy the <u>c Com</u> 1. 8 to 2. BC 3. 4 bi <u>c Sequ</u> 4. JK 5. Mo 6. Dig 7. Uni 5. Mo 6. Dig 7. Uni 1. Inv 10. Seq ify the formin 11. Inv 12. NA	and and bination $\frac{1}{2}$ and $\frac{1}{2}$ and $\frac{1}{2}$ bination $\frac{1}$	Synthe gn on H tional ( tiority 1 7 Segn agnitud al Circu flop wi -N Up Clock al Shift System ALU w beration First In the Dete aracter C, Tran	esis t FPGA Enco nent $P$ e Con e Con its th a t Dow t regi s ith 8 ns t Firs ctor main ristic nsien	he for A/CP its der Displ mpar est bo n Co ster Ariti t Out using s of t an	ollov LD lay ator ench unter hmet ; FSN the d An	ic Of folloalys	mod perat owin is	ions, g di	4 Lo	ogic	Ope IOS	ratio	ons cui	and 2

# **17MC1507: BIOLOGY FOR ENGINEERS**

<b>Course Category:</b>	Humanities elective	Credits:	1
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	1-0-0
Prerequisites:		<b>Continuous Evaluation:</b>	100M

Course outcomes		Upo	on su	ccessfi	ul cor	npleti	on of	the c	ourse,	the st	udent	will be	able to	o:	
	CO1	Uno clas	lersta sifica	and thation c	ne bi of livi	ologi ng or	cal c ganisi	oncej ms	ots fr	om a	n eng	gineerir	ng pe	rspectiv	e and
	CO2	Der regi	Demonstrate the fundamentals of bio molecules like structure, function and regulation of biological processes												
	CO3	Uno tran	Understand the basic principles of Mendelian genetics, gene interactions and transfer/inheritance of genetic factors/genes												
	CO4	Exp imp	olain ortan	the p at dive	rocess of cellular respiration and photosynthesis, and illustrate rsified microorganisms and their classification										ustrate
Contribution of Course Outcomes		PO         PO<											PSO2		
towards achievement of	CO1							2						l	
Program Outcomes	CO2							2							
(1 – Low, 2 - Medium,	CO3							2							
3 - High)	CO4							2							
Course Content	Unit- Introd Fundar camera discove origina Classif Classif structu trophs, terrestr Unit- Bio mo Bio mo DNA/F transpo Enzym	CO4       2       2         Unit-I Introduction and Classification of Living organisms         Introduction:       (4 hours)         Fundamental differences between science and engineering draw a comparison between eye and camera, Bird flight and aircraft. Biological observations of 18th Century that lead to major discoveries-examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor.         Classification:       (4 hours)         Classification of living organisms based on (a) Cellularity - Unicellular or multi cellular (b)Ultra structure- prokaryotes or eukaryotes. (c) Energy and Carbon utilization –Auto trophs, hetero rophs, lithotrophs (d) Ammonia excretion – ammonotelic, urictelic, ureotelic (e)Habitat- aquatic, errestrial (e) Molecular taxonomy- three major kingdoms of life.         Unit-II Bio molecules and Enzymes         Bio molecules:       (4 hours)         Bio molecules:       (4 hours)         Bio molecules:       (4 hours)         Bio molecules and Enzymes         Bio molecules:       (4 hours)         Bio molecules:       (4 hours)         Bio molecules:       (4 hours)         Bio molecules:       (3 Hours)         Bio molecules:       (4 hours)         Bio molecules:       (3 Hours)         Bio molecules:       (3 Hours)         Bio molecules:       (3 Hours)    <													

	Enzyme kinetics and kinetic parameters.
	<ul> <li>Unit-III Genetics and Gene information Transfer Genetics: (4 hours)</li> <li>Mendel's laws of inheritance, Concept of segregation and independent assortment. Concept of allele, recessiveness and dominance. Gene interaction-Epistasis. Cell cycle and cell division- Meiosis and Mitosis. Transfer of genetic material from parent to offspring during cell division.</li> <li>Information Transfer: (4 hours)</li> <li>DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.</li> <li>Unit-IV Metabolism and Microbiology</li> <li>Metabolism: (4 hours)</li> <li>Exothermic and endothermic reactions versus endergonic and exergonic reactions. Respiration- Breakdown of glucose toCO2 + H2O (Glycolysis and Krebs cycle) Photosynthesis- synthesis of glucose from CO2 and H2O. Energy yielding and energy consuming reactions.</li> <li>Microbiology: (3 hours)</li> <li>Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Growth kinetics. Ecological aspects of single celled organisms .Microscopy.</li> </ul>
Text books and Reference books	<ul> <li>References:</li> <li>1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M,L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd</li> <li>2) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wileyand Sons</li> <li>3) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freemanand Company</li> <li>4) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman andcompany, Distributed by Satish Kumar Jain for CBS Publisher</li> <li>5) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C.Brown Publishers</li> </ul>

<b>Course Category:</b>	Core			Credits:	4
<b>Course Type:</b>	Theory			Lecture - Tutorial -Practice:	3-1-0
Prerequisites:	17MA1101:	Matrices	and	<b>Continuous Evaluation:</b>	30M
	Differential (	Calculus		Semester end Evaluation:	70M
	17EC3308:	Signals	and	Total Marks:	100M
	Systems				

#### **17EC3601: DIGITAL SIGNAL PROCESSING**

Course outcomes	Upon	succe	essful	comp	oletion	n of t	he co	urse	, the	stude	nt wi	ll be	able	to:	
	CO1	App DFT	ly DI	Γ and	l DIF	FFT	algo	rithn	ns fo	r effi	cient	com	putat	tion o	of the
	CO2	Desi	gn an	d ver	ify the	e freq	uenc	y res	pons	e of I	Digita	al IIR	Filt	ers.	
	CO3	Design and verify the frequency response of Digital FIR filters													
	CO4	Unc	Inderstand the concept of Multirate Digital Signal Processing												
Contribution of Course		PO 1	PO         PO<												
Outcomes towards	CO1	3													2
achievement of Program Outcomes	CO2	3				2									2
	CO3	3				2									2
(1 – Low, 2 - Medium, 3 – High)	CO4	1													1
Course Content	UNIT The Over Discr a Lir Prope Effic Effic the D FFT Algor UNIT Desig Appr filter	CO4       1         UNIT-I         The Discrete Fourier Transform - Its Properties and applications:         Overview of DTFT,Frequency Domain Sampling and Reconstruction of         Discrete Time Signals, The Discrete Fourier Transform (DFT), The DFT as         a Linear Transformation, Relationship of the DFT to Other Transforms,         Properties of the DFT, Linear Filtering methods based on the DFT.         Efficient Computation of the DFT- Fast Fourier Transform Algorithms:         Efficient Computation of the DFT: FFT Algorithms - Direct Computation of         the DFT, Divide-and-Conquer approach to Computation of the FFT, Radix-2         FFT Algorithms. Applications of FFT Algorithms – Use of the FFT         Algorithm in Linear Filtering and Correlation. (12Hrs)         UNIT-II         Design of IIR Filters from analog Filters: IIR filter Design by         Approximation of Derivatives. III. Filter Design by													

	used Analog Filters. Frequency Transformations - Frequency (12Hrs)									
	<b>UNIT-III</b> <b>Design of FIR Filters:</b> General Conditions, Design of FIR Filters - Symmetric & Anti-symmetric FIR filters, Design of Linear-phase FIR filters using Windows, Design of Linear Phase FIR filters by the Frequency- Sampling Method, Comparison of Design methods for Linear-Phase FIR filters.(12Hrs)									
	<ul> <li>UNIT-IV</li> <li>Structures for IIR Systems: Direct-Form Structures, Cascade Form Structures, Parallel-Form Structures</li> <li>Structures for FIR Systems: Direct Form Structures, Cascade Form Structures.</li> <li>Introduction to Multirate Digital signal Processing: Introduction, Decimation by a Factor D, Interpolation by a Factor I, Sampling rate conversion by a Rational Factor I/D. (12 Hrs)</li> </ul>									
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. John G. Proakis, &amp;Dimitris G. Manolakis, "Digital Signal Processing : Principles, Algorithms and Applications", 4th Edition, 2007, Prentice-Hall of India Private Limited, (Units - I, II, III &amp; IV)</li> <li>2. Oppenheim, Alan V., Ronald W. Schafer, and John R. Buck. Discrete-time signal processing, 2nd edition, Pearson Education.</li> </ul>									
	<ol> <li>Reference Books:         <ol> <li>Ifeacher E.C. &amp; Jervis B.W, "Digital Signal Processing, A Practical Approach", 3rd edition, 2003, Addison Wesley.</li> <li>Lonnie C Ludeman, "Fundamentals of Digital Signal Processing", John Wiley &amp; Sons, 2003.</li> <li>S K Mitra, "Digital Signal Processing: A Computer Based Approach", 2nd edition, 2003, TMH.</li> </ol> </li> </ol>									
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/108105055/</li> <li>http://nptel.iitm.ac.in/courses/Webcourse- contents/IITKANPUR/Digi_Sign_Pro/ui/TOC.htm</li> <li>http://ocw.mit.edu/resources/res-6-008-digital-signalprocessing- spring-2011/study-materials/</li> <li>http://www.ece.cmu.edu/~ee791/</li> <li>http://cobweb.ecn.purdue.edu/~ipollak/ee438/FALL04/notes/ notes.html</li> </ol>									

<b>Course Category:</b>	Programme Core	Credits:	4
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-1-0
Prerequisites:	17EC3304: Digital circuit design, 17EC2504/1:Computer Architecture and Organization.	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

# **17EC3602: MICROCONTROLLERS**

Course outcomes	Upo	Upon successful completion of the course, the student will be able to:													
	CO1	App	rehen	d the	interr	nal ar	chitec	ture	of 80	951 mi	icroc	ontro	ller.		
	CO2	Develop assembly language program for small applications using 8051.													
	CO3	Und appl	Understand the features of embedded systems, architecture of ARM and applications												
	CO4	Anal com	Analyze and understand the features of cortex M3 ARM and achieve competency in assembly programming.												
Contribution of Course		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
Outcomes towards	CO1	3												2	
achievement of Program Outcomes	CO2		2	2										2	
	CO3	3												2	
(1 – Low, 2 - Medium, 3 – High)	CO4		2	2										2	
Course Content	UN Intr Em 805 805 an type JUN pro UN I/O pro I/O Pro Ass	IT-I oduct bedde 1, Ac 1,Intr 8051 es anc MP, L grams IT-II Port grams grams grams	ion t ed Pro ddress oduct progra d direc OOP s.(12 H s.(12 H s.(12 H s.(12 H s.(12 H s.(12 H s.(12 H))))))))))))))))))))))))))))))))))))	o Co sing ion to am, I ctives and ( Hrs) gram 30511 ing i C, A in A C, In	omput ors, O Mode o 805 Progra s, Flag CALL ming: Progra n 805 ccess Assem terrup	ting: vervi s, A 1 ass um C g bits J nst Inst 805 ummi 1 C, ing o ibly ots pro	Insid iew of ssemile ounte and ructio	le the oly I y pro r and PSW ns A C: D c ope ROM C, { uming	e co 8051 Langu gram I RO I regi arithm cogra Data t eratio A sp 3051 g in a	omput Famuage ming M spa ster, I netic a mmin cypes ons in ace i Seria	er, 1 iily, I Prog , Ass ace in Regis and I g, I and t 805 n 80 al Po bly an	Micro Pin d ramn sembl n the ster E Logic (O b ime Logic (O b ime () 1 C, () 51 () ort I nd C.	ocontri escrip ning: ling a 8051 Banks Instru- bit m delay Data C, 80 Progra (1	anipul in 80 in 80 in 80 in 80 conve 51 T ammir 2 Hrs)	and of the e the nning data Stack, s and lation 51 C, ersion imers ng in

	<ul> <li>UNIT III:</li> <li>Introduction: Background of ARM and ARM Architecture, Instruction Set Development, Cortex-M3 Processor Applications.</li> <li>Overview of the Cortex-M3: Registers, Operation modes, built-in nested vectored interrupt controller, Memory map, Bus interface, MPU, The Instruction Set, Interrupts and Exceptions, Debugging support.</li> <li>Cortex-M3 Basics: Registers, Special Registers, operation mode, Exceptions and Interrupts, Vector tables, Stack Memory Operations.</li> <li>Instruction Sets: Assembly Basics, Instruction Descriptions, useful Instructions in the Cortex-M3.(12 Hrs)</li> <li>UNIT – IV:</li> </ul>
	<ul> <li>Memory Systems: Memory map, Memory Access Attributes, Default memory access permissions.</li> <li>Cortex-M3 Implementation overview: Pipeline, Detailed block diagram, Bus interfaces on the cortex-M3, Typical connections, Reset types and Reset signals.</li> <li>Exceptions: exception types, definitions of priority, vector tables, Interrupt inputs and pending behavior, fault exceptions.</li> <li>Cortex-M3 Programming: overview, typical development flow, using C, CMSIS, using Assembly. (12 Hrs)</li> </ul>
Text books and Reference books	<ol> <li>Text Books:</li> <li>Mohammed Ali Mazidi, Janice GillispieMazidiandRolin D. Mckinlay, "The 8051 Microcontroller and Embedded Systems", 2<sup>nd</sup> Edition, Pearson Education Asia, New Delhi, 2008. (Unit-I &amp;II).</li> <li>Joseph Yiu, "The Definitive guide to the ARM cortex-M3 Processor", 2<sup>nd</sup> edition,Newnes,Texas Instruments, 2010.</li> </ol>
	<ol> <li>Reference Books:         <ol> <li>Kenneth J Ayala, "The 8051 Microcontroller", 3<sup>rd</sup>edition, 2004, Cengage Learning.</li> <li>Vincent Mahout, "Assembly Language Programming ARM Cortex-M3", Wiley Publications.</li> <li>Stephen Welsh, Peter Knaggs, "ARM: Assembly Language programming" School of Design, Engineering and Computing.</li> </ol> </li> </ol>
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/108105102/</li> <li>http://www.datasheetarchive.com/8051-datasheet.html</li> <li>www.engenuics.com – ARM Cortex-M3 Assembly language.</li> </ol>

# 17EC4603/A: EMBEDDED SYSTEMS AND REAL TIME OPERATING SYSTEM

<b>Course Category:</b>	Program Elective 1	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17CS1203:Programming in	<b>Continuous Evaluation:</b>	30
	С	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upor	on successful completion of the course, the student will be able to:													
	CO1	Des	cribe	the e	embe	dded	syste	ms ar	nd de	velop	men	t proc	ess in	n-detail	
	CO2	Unc And Acq	Understand the Real Time systems and RTOS for Real Time Systems. And identify the transformation between RTOS and GPOS. Get Acquainted with key RTOS process												
	CO3	Get	Get Insight into the RTOS Task management practices												
	CO4	Rec	ecognize RTOS multi-tasking techniques												
Contribution of Course		PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Outcomes towards	CO1			2	2	3	1							3	3
achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO2			2		1								2	
	CO3		2	3	2	1								3	2
	CO4		2	3	2	1								3	2
Course Content	UNI Intro Embo Basic Linki into T Emb Targe Chip UNI Intro RTO Dispa RTO	<b>F-I</b> eddec cs of ing P Farge edde et Bo Debu <b>F-II</b> oduct S,the atche: S.	ion l Syst Deve roces t Em d Syst oot So aggin ion sche r- Sc	- Retems. elopin s, Ex beddo stem cenar g. to F duler hedul	eal I ng foi ecuta ed Sy Initi ios, 7 Real-7 - Sch ling A	Life r Em able a stem aliza Targe Time nedula	Exan <b>ibedd</b> and L s. <b>tion</b> et System <b>Op</b> able I ithms	nples led S inkin, - Tar stem erati Entiti s, Ker	of yster g For get S Softv ng S es- M rnel (	Emb ns - 0 mat, yster vare Syste fulti / Objec Hrs)	eddeo Over Map n Too Initia <b>ms</b> Taski	d Sy view ping ols an ilizati ( -Hist ing- (	of Li Exect and Im on S (10 H ory, Conte narac	s, Rea inkers a utable I nage Tra equence irs) Definitext Switt teristics	I-Time and the mages ansfer, e, On- ng an ching- s of an

	UNIT-III Task- Defining a Task, Task States and Scheduling- Ready State- Running State- Blocked State. Semaphores - Defining Semaphores- Binary Semaphores- Counting Semaphores- MUTEX: Ownership- Recursive Locking- Task Deletion Safety- Priority Inversion Avoidance. (9 Hrs)
	UNIT-IV Message Queues - Defining Message Queues, Message Queue States, Message Queue Content, Message Queue Storage Pipes- Pipe Control Blocks- Pipe States- Named and Unnamed Pipes Event Registers- Event Register Control Block, Signals- Signal Control Blocks. (8 Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Qing Li, Caroline Yao, "Real-Time Concepts for Embedded Systems", CMP Books, 2003.</li> <li>Reference Books:</li> <li>1. Albert Cheng, "Real-Time Systems: Scheduling, Analysis and Verification", Wiley Inderscience, 2002.</li> <li>2. Hermann Kopetz, "Real-Time Systems: Design Principles for Distributed Embedded Applications", Kluwer, 1997.</li> <li>3. Insup Lee, Joseph Leung, and Sang Son, (2008) "Handbook of Real-Time Systems", Chapman and Hall.</li> </ul>
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/106105036/</li> <li>https://www.udemy.com/courses/search/?src=ukw&amp;q=rtos</li> </ol>

#### **17EC4603/B: ADVANCED COMMUNICATION SYSTEMS**

<b>Course Category:</b>	Program Elective 1		Credits:	3
<b>Course Type:</b>	Theory		Lecture-Tutorial-Practice:	3-0-0
Prerequisites:	17EC3502:	Digital	<b>Continuous Evaluation:</b>	30
	Communication		<b>Semester End Evaluation:</b>	70
			Total Marks:	100

Course	Upo	n suc	cessi	ful c	comj	pletic	on of t	he co	ourse	, the s	tuder	nt wi	ll be a	ble to:	
outcomes	CO1	Dev the	velop capa	an city	und of t	ersta hese	nding MIM	of N O ch	4IM( annel	) chai ls.	nnel	mode	eling a	and dete	ermining
	CO2	CO2 Characterize and understand OFDM and OFDMA systems.													
	CO3	Ana for	Analyze and learn performance issues in OFDM and OFDMA systems for enhancing performance of advanced communication systems.												
	CO4	Ana tecl	Analyze MIMO systems and develop an understanding of diversity techniques, space-time coding, and multi-user MIMO												
Contribution of Course		РО 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
Outcomes towards	CO1	1												1	1
achievement of Program Outcomes (1– Low, 2-Medium, 3 – High)	CO2	1												1	1
	CO3	1												1	1
	CO4	1												1	1
Course Content	UNI MIM Corr coef SCM MIM chan UNI Intr trans OFE Dup UNI PAP and	<ul> <li>CO4</li> <li>UNIT-I</li> <li>MIMO Channel Models: Statistical MIMO model, Statistical model of Correlated MIMO fading channel, Generation of correlated MIMO channel coefficients, I-METRA MIMO channel model, 3GPP MIMO channel model, SCM MIMO channel model.</li> <li>MIMO Channel Capacity: Useful matrix theory, Deterministic MIMO channel capacity, Channel capacity of random MIMO channels. (12 Hrs)</li> <li>UNIT-II</li> <li>Introduction to OFDM: Single-carrier transmission, Multi-carrier transmission, Single-carrier vs. Multi-carrier transmission, Basic principle of OFDM, Coded OFDM, OFDMA-Multiple access extensions of OFDM, Duplexing. (13 Hrs)</li> <li>UNIT-III</li> <li>PAPR Reduction: Definition of PAPR, Distribution of OFDM Signal, PAPR</li> </ul>													

	<ul> <li>and filtering.</li> <li>Inter-Cell Interference Mitigation Techniques: Inter-cell Interference coordination technique, inter-cell interference randomization technique, Intercell interference cancellation technique. (12 Hrs)</li> <li>UNIT – IV</li> <li>Antenna Diversity and Space-Time coding Techniques: Antenna Diversity, Space-Time Coding (STC)-overview, Space-Time Block code (STBC).</li> <li>Multi-User MIMO: Mathematical model for multi-user MIMO System, Channel capacity of Multi-user MIMO system, Transmission methods for Broadcast channel.</li> </ul>
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. Yong Soo Cho, Jaekwon Kim, Won Young Yang, and Chung G. Kang, "MIMO-OFDM Wireless Communications with Matlab", John Wiley &amp; Sons (Asia) Pte Ltd, 2010. (Units - I, II, III, IV)</li> </ul>
	<ul> <li>Reference Books:</li> <li>1. Junyi Li, Xinzhou Wu, and Rajiv Laroia, "OFDMA Mobile Broadband Communications: A Systems Approach", Cambridge University Press, 1<sup>st</sup> Edition, 2013.</li> <li>2. Ramjee Prasad, "OFDM for Wireless Communications Systems", Artech House Inc, 2004.</li> <li>3. Hamid Jafarkhani, "Space-Time Coding: Theory and Practice", Cambridge University Press, 1<sup>st</sup> Edition, 2005.</li> </ul>
E-resources and other digital material	<ol> <li>https://onlinecourses.nptel.ac.in/noc16_ec19/preview</li> <li>https://ocw.mit.edu/courses/electrical-engineering-and-computer- science/6-452-principles-of-wireless-communications-spring-2006/</li> <li>https://web.stanford.edu/class/ee359/lectures.html</li> </ol>

<b>Course Category:</b>	Program Electiv	ve 1		Credits:	3
<b>Course Type:</b>	Theory			Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17PH1102	Engineer	ing	<b>Continuous Evaluation:</b>	30
	Physics,	17EC3	403	Semester end Evaluation:	70
	Transmission	Lines	and	Total Marks:	100
	Waveguides				

# **17EC4603/C: MICROWAVE ENGINEERING**

Course outcomes	Upon	Upon successful completion of the course, the student will be able to:													
	CO1	CO1 Understand the principle of operation of microwave sources.													
	CO2	Design the microwave passive components and characterize them using S- parameters.													
	CO3	Perform Microwave measurements to determine VSWR, Unknown impedance, Scattering parameters, and Q of the cavity													
Contribution of Course		РО 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
Outcomes towards achievement of Program Outcomes (1 – Low,	CO1		2												1
	CO2				2										1
2 - Medium, 3 - High)	CO3				2										1
Course Content	UNIT MIC Conv Modu Refle Elect Helix and C MIC Magr Field UNIT MIC Adap Trans wave	CO32UNIT-IMICROWAVELINEARBEAMTUBES(O-type):Limitations ofConventional Tubes at Microwave Frequencies, Two-cavity Klystron: VelocityModulation Process, Bunching Process, Output Power and Beam Loading,ReflexKlystron: VelocityModulation, Power Output and Efficiency,Electronic Admittance.Helix Traveling Wave Tube Amplifiers, Amplification Process, Wave Modesand Gain Considerations.MICROWAVECROSSEDFIELDTUBESMICROWAVECROSSEDFIELDTUBESMagnetron, Hartree condition, $\pi$ mode oscillations, Forward Wave CrossedField Amplifier, Backward Wave Oscillator.(13 Hrs)UNIT-IIMICROWAVEPASSIVECOMPONENTS:Coaxial connectors andAdapters,MatchedTermination, Rectangular toCircularWaveguideTransitions, WaveguideCorners, Bends and Twists, waveguide attenuators,								ns of elocity pading, ciency, Modes ndrical rossed s and eguide uators, Magic to S-					

	parameters ,Properties of S-parameters, S matrix of representation of multi port network, S-Matrix derivation for all components, Propagation in ferrites, Ferrite Devices, Faraday Rotation Isolator, Gyrator, Circulator, Directional Couplers, Coupler Parameters, Applications of Directional Couplers. Microwave Resonators: waveguide Cavity Resonators, Cavity Excitation and Tuning. (12 Hrs)
	<b>UNIT-III</b> <b>SOLID STATE DEVICES:</b> Gunn-Effect Diodes - GaAs Diode, Gunn Effect, Ridely-Watkins-Hilsun (RWH) Theory, Differential Negative Resistance, Two-Valley Model Theory, High-Field Domain, Modes of Operation. <b>AVALANCHE TRANSIT-TIME DEVICES:</b> Read Diode, Physical Description, Avalanche Multiplication, Carrier Current $I_o(t)$ and External Current $I_e(t)$ , Output Power and Quality Factor, IMPATT Diodes, Physical Structures, Negative Resistance, Power Output and Efficiency, TRAPATT Diodes, Physical Structures, Principles of Operation, Power Output and Efficiency, BARITT Diodes, Physical Description, Principles of Operation, Parametric Devices, Parametric Amplifiers, Applications. (10 Hrs) <b>UNIT – IV</b> <b>MICROWAVE MEASUREMENTS:</b> Power Measurement, Insertion Loss and Attenuation Measurement, Impedance Measurement, Slotted line VSWR measurement, VSWR through return loss measurements, Frequency
	Parameters. (10 Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Samuel Y.LIAO: Microwave Devices and Circuits - Prentice Hall of India - 3<sup>rd</sup>Edition, 2003. (Units -I&amp;III)</li> <li>2. Annapurna Das and SisirK.Das: Microwave Engineering - Tata McGraw-Hill, 2000. (Units -II&amp;IV)</li> </ul>
	<ul> <li>Reference Books:</li> <li>1. E. Collin: Foundations for Microwave Engg IEEE Press 2<sup>nd</sup>Edition (2002).</li> <li>2. David M. POZAR: Microwave Engg John Wiley &amp; Sons - 2<sup>nd</sup>Edition (2003)</li> </ul>
E-resources and other digital material	<ol> <li>1.http://technology.niagarac.on.ca/courses/elnc1730/microsolid.ppt</li> <li>2.http://www.intechopen.com/-/passive_microwave_components_ana_antenna</li> <li>3.http://home.sandiego.edu/~ekim/e194rfs01/</li> <li>4. http://www.slideshare.net/sarahkrystelle/lecture-notes-microwaves.</li> </ol>

<b>Course Category:</b>	Program Elective	1	Credits:	3
<b>Course Type:</b>	Theory		Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3302:	Analog	<b>Continuous Evaluation:</b>	30
	Electronics,	17EC3402:	Semester end Evaluation:	70
	Analog Integrated	l Circuits and	Total Marks:	100
	Applications			

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1 To understand the physics of MOSFET operation a characteristics.													on an	d its
	CO2 Analysis of SOI MOSFET electrical characteristics														
	CO3	То	o standard the advanced Nanoscale transistors												
Contribution of Course		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
Outcomes towards	CO1	2		1											
achievement of Program	CO2					2								1	
Outcomes (1 – Low, 2 - Medium, 3 – High)	CO3	2		2										2	
Course Content	UNIT MOS conta Invers Solut HFCV Midg substr quant UNIT Physi Appro Mode mobil (SILC Metal capac	<b>C-I</b> cts, sion, c v, N ap ga cate um c <b>C-II</b> <b>ics o</b> cximal, D lity C,TDI itanc	pacit Mod 1D of Pc on-id ate E dopin apaci apaci f M( ation etail mode DB, ce M es an	<b>DSFI</b> (Solution) (Construction) (Co	Ener Op trosta n's E ies in ode, ultrat e, MC ET: I b-thro effect High BTI), ET c istan	gy b eration Equat N Mo Poly- hin ( DS pa Drift- eshol ts in fie hevice ces, N	oand ons: of M ion, OS, -Silic gate-our ame Urame Diffu d cu MO Id e kage es an Meye	diag Accu IOS, CV oxide on c oxide ter e: usion rrent SFET ffects mec ad te r mod	ram umula Dep chara e fixe ontac and xtract App and C, Hi s an hanis chnoi del.	of Mation, letior, letior ed ch t, Elo t, Elo t inv tion.( roach slop gh fi d M sms in logy	Metal Dep A Ap stics harge ectro versio 10 H held a loSF h this	-Oxio pletio proxi of M s, in static on la rs) IV, Body and c ET n gat es, In	de-Se on, N matic MOS, terfac s of yer Grad effec lopin reliat e oxi atrinsi	micono Aidgap on, Aco LFCV cial ch non-un quantiz ual Ch et, Pao g depe pility ide, Hi ic MO (13 Hrs	luctor , and curate / and arges, iform ation, ation, annel &Sah endent issues gh-K- SFET S)

	<b>UNIT-III</b> <b>SOI MOSFET</b> :FDSOI and PDSOI, 1D Electrostatics of FDSOI MOS, VT definitions, Back gate coupling and body effect parameter, IV characteristics of FDSOI-FET, FDSOI-sub-threshold slope, Floating body effect, single transistor latch, ZRAM device, Bulk and SOI FET: discussions referring to the ITRS. (12 Hrs)
	<ul> <li>UNIT-IV</li> <li>Nanoscale Transistors: Diffusive, Quasi Ballistic &amp; Ballistic Transports, Ballistic planer and nano wire -FET modeling: semi-classical and quantum treatments.</li> <li>Advanced MOSFETs: Strain Engineered Channel materials, Mobility in strained materials, Electrostatics of double gate, and Fin-FET devices. (10 Hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. S.M. Sze&amp; Kwok K. Ng, Physics of Semiconductor Devices, Wiley.</li> <li>2. B. G. Streetman, S. K. Banerjee, Solid State Electronic Devices, Pearson, 2016.</li> </ul>
	<ul> <li>Reference Books:</li> <li>1. N. Arora, MOSFET modeling for VLSI Simulation: Theory and Practice, World.</li> <li>2. Yannis T sividis, Operation and Modeling of the MOS Transistor, Oxford University Press</li> </ul>
E- resources and other digital material	1. https://nptel.ac.in/courses/117106033/

<b>Course Category:</b>	Programm	ne Elective		Credits:	3
Course Type:	Theory			Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	Digital	Electronics	and	<b>Continuous Evaluation:</b>	30
	Circuits			Semester end Evaluation:	70
				Total Marks:	100

# 17EC4604/A: ADVANCED DIGITAL DESIGN

Course outcomes	Upo	on successful completion of the course, the student will be able to:													
	CO1	Design combinational and sequential logic.													
	CO2	Develop architectures for datapath controllers.													
	CO3	Unde	Understand post synthesis design tasks												
Contribution of Course		РО 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
Outcomes towards achievement	CO1	2	2											2	
of Program Outcomes	CO2			2	2									2	
(1 – Low, 2 - Medium, 3 – High)	CO3	1	1											2	
Content	Digi mac conv equi UNI	<b>Digital Design Methodology</b> - Glitches and Hazards, Design of sequential machines, state-transition graphs, design example: BCD to Excess-3 code converter, serial - line code converter for data transmission, state reduction, and equivalent states.(10Hrs) UNIT-II													
	Log Log circu edge of a meta enco UNI Desi	ic D ic –P uits, o e dete a lin astabi oder.( IT-II ign o mples	esign ropage cyclic cction ear ility 12Hn 12Hn 12Hn 12Hn 12Hn 12Hn 12Hn 12Hn	n wing gation c beh n, a c feedb and s rs) ard ary c	tn Bel n delay naviora ompari back s syncho ath C ounter.	navion and c ison o hift r rnizer	ral M contin lels of f style egiste s for llers gn of a	uous f flip es for r, ta asyn - Pa	s of assig -flops beha sks a chrou urtition C stor	Con nmer and viora and nous ned	nbina nts, la latcl l mo- funct sign seque rogra	itiona itches nes, c dellin ions, als, k ential im ma	and la yclic g, data switc eypad macl	1 Sequence of the sequence	design Hrs)

	<b>UNIT-IV</b> <b>Post synthesis Design Tasks -</b> Post synthesis design validation, post synthesis timing verification, elimination of ASIC timing violations, false paths, Dynamically Sensitized paths, system tasks for timing verification. (12 Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Michael D. Ciletti, "Advanced digital design with the Verilog HDL", Eastern economy edition, 2002, PHI.</li> <li>Reference Books:</li> <li>1. Stephen Brown &amp;ZvonkoVranesic, "Fundamentals of Digital logic with Verilog design", 2nd edition, 2007, Tata McGraw Hill.</li> <li>2. Ian Grout, "Digital systems design with FPGAs and CPLDs", 2011, Elsevier Publications.</li> <li>3. Palnitkar, S. Verilog HDL: a guide to digital design and synthesis (Vol. 1). 2003, Prentice Hall Professional.</li> </ul>
E-resources and other digital material	<ol> <li>http://www.eecg.toronto.edu/~jayar/pubs/brown/survey.pdf</li> <li>http://nptel.ac.in/courses/Webcourse- contents/IIT%20Kharagpur/Embedded%20systems/Pdf/Lesson-20.pdf</li> <li>http://www.ee.ic.ac.uk/pcheung/teaching/ee2_digital/fpga%20&amp;%20cpld%20 tutorial.pdf</li> <li>https://www.youtube.com/watch?v=CLUoWkJUnN0</li> </ol>

#### 17EC4604/B – IMAGE AND VIDEO PROCESSING

	<ul> <li>Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.</li> <li>Image Enhancement in Frequency Domain:Basics of Filtering in the Frequency Domain, Image Smoothing using Frequency Domain Filters, Image Sharpening Using Frequency Domain Filters, Homomorphic Filtering.</li> <li>Image Restoration: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the presence of Noise only - Spatial Filtering, Linear Position-Invariant Degradations, Inverse filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering. (12Hrs)</li> </ul>
	UNIT-IIIImage Compression:Fundamentals, Some Basic Compression Methods:Arithmetic coding, LZW coding, Run-Length coding, Symbol-Based coding,Bit-Plane coding, Block Transform coding, Predictive coding.Image segmentation:Fundamentals, Point, Line and Edge Detection,Thresholding, Region-Based Segmentation.(10 Hrs)
	<ul> <li>UNIT-IV</li> <li>Representation of Digital Video: Basics of video, Time varying image formation models: Three-Dimensional Motion models, Geometric Image Formation, Photometric Image Formation, Spatio-Temporal Sampling: Sampling for Analog and Digital Video.</li> <li>Two-Dimensional 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. (12 Hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Gonzalez and Wood, "Digital Image Processing", 3<sup>rd</sup>Edition, Pearson Education, 2009. (Unit I, II &amp; III)</li> <li>2. S. Jayaraman, S. Esakkirajan, T. Veerakumar, "Digital Image Processing",3rd Edition, Tata McGraw Hill Education Private Limited, 2009. (Unit I)</li> <li>3. M. Tekalp, "Digital Video Processing", 1stEdition, Prentice Hall International, 1995. (Unit IV)</li> <li>4. Yao wang, JoemOstarmann and Ya – quin Zhang, "Video Processing and Communications",1<sup>st</sup>Edition, Prentice Hall International, 2010. (Unit IV)</li> <li>Reference Books:</li> </ul>
	<ol> <li>Rafael C Gonzalez, Richard E. Woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", Tata McGraw Hill, New Delhi, 2010.</li> </ol>
E-resources and other digital material	<ol> <li>http://nptel.ac.in/courses/117105079/</li> <li>http://nptel.ac.in/courses/106105032/</li> <li>http://nptel.ac.in/courses/117104069/.</li> <li>https://nptel.ac.in/downloads/117104020/</li> </ol>

# **17EC4604/C MICROSTRIP LINES**

<b>Course Category:</b>	Program Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3403: Transmission	<b>Continuous Evaluation:</b>	30
	Lines and Waveguides	Semester end Evaluation:	70
		Total Marks:	100

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Understand the geometrical configuration of various planar transmission line structures.													
	CO2	Understand the various discontinuities in the planar transmission lines and their equivalent circuits.													
	CO3	Carry out approximate analysis of the planar transmission lines and their equivalent circuits.													
Contribution of Course		PO         PO<											PSO2		
Outcomes towards achievement	CO1		2												
of Program Outcomes (1 – Low.	CO2		1												
2 - Medium, 3 – High)	CO3		1												
Course Content	UNI' Micr Intro Meth Diffe TM Wave UNI' Micr Micr Micr Char Atter Micr (10H UNI' Micr Capa	<b>T-II</b> duction ods of erence Mod eguid <b>T-II</b> ostrip ostrip acterin uatic owav rs) <b>T-III</b> osrtii cosrtii	<b>pLin</b> on: P of Mi e Me e Mo e Mo <b>p Lin</b> of Tran stic on C e Into <b>p Li</b> ce E	es I planar crost thod, odel, odel. ( nes T Trans sitior Imp Consta egrate ne E valua	<b>F</b> Tran rip A Mic: Die (13Hi rans) sition ant.Fa edCir Discon tion,	<b>Quasi</b> - nsmis nalys rostri electr rs) <b>itions</b> s: crostri nce, abrica cuits, <b>ntinu</b> Mati	-Stat sion sis. Q p Dis ic-Lo s, Me Coa tip M Velo ation: , Mor	ic A Structorial spersion aded asur axial- feasur Docity Prinolith	ement to-M rement ic Inter crossfi	ses s, Mic c Ana Aodel ged nts an icros nts: S Effe Cir- cegrat	and crosticalyses als: Co Wav d Fa tripT: bubstr cuit ced Ci viscon	Dis rip Fi s of a ouple reguic brica ransit rate D Tech ircuit	persitield ( Mic d TE de N tion, W Dielectronolo Tech ties: ties:	ion M Configu rostrip: 2M Moo Iodel, Vavegu tric Con gies, H mologie Discon ty Indu	odels: ration, Finite le and Planar ide-to- nstant, nstant, Hybrid es.

	Evaluation, Characterization of Various Discontinuities, Open Ends, Gaps in a Microstrip, Steps in Width, Bends, T-Junctions, Cross Junctions. Compensated Microstrip Discontinuities: Step in Width, Bends, T-Junction. (13Hrs)
	<b>UNIT-IV</b> <b>Other Planer Transmission lines and Applications:</b> Introduction, Other Types of Microstrip Lines: Suspended and Inverted Microstrip Lines, Multilayered Dielectric Microstrip, Thin Film Microstrip (TFM), Valley Microstrip Lines, Buried Microstrip Line. Micro-strip Applications: Lumped Elements, Passive Components, Active Components, Packages and Assemblies. (9Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Ramesh Garg, Inder J. Bahl, Maurizio Bozzi, "Microstrip Lines and Slotlines", 3<sup>rd</sup> Edition, Artech House, 2013.</li> <li>Reference Books:</li> <li>1. H. Howe, Jr., Stripline Circuit Design, Artech House, Dedham, Mass., 1974.</li> <li>2. K. C. Gupta, R. Garg, and I. J. Bahl, Microstrip Lines and Slotlines, Artech House, Dedham, Mass., 1979.</li> </ul>

#### **17EC4604/D: COMPUTER NETWORKS**

Course Category:	Open Elective-1	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	4-0-0
Prerequisites:	17CS1252:Computer	<b>Continuous Evaluation:</b>	30
	programming lab	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Unc inte	lersta rconr	nd nectic	the on (O	servi SI) m	ices 10del.	and	inte	erface	es o	of th	ie C	)pen s	system
	CO2 Implement error detection and correction by using cyclic redundant check code for any frame to be transmitted.														dancy
	CO3	Write different Routing algorithms useful for Network layer.													
	CO4 Understand the basics of Domain name system, Electronic r World wide web.												ronic m	nail &	
Contribution of Course		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
Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO1	2	1											2	2
	CO2	2		1										3	2
	CO3	2	1											3	3
	CO4	2												3	3
Course Content	UNIT Introd Refered The P (10 Hi UNIT The I Corred Exam Media Multip Switch UNIT The	UNIT-I         Introduction:       Uses of Computer Networks, Network Hardware, The OSI         Reference Model, The TCP/IP Reference Model, Example Networks.         The Physical Layer:       Guided Transmission Media, Wireless Transmission.         (10 Hrs)         UNIT-II         The Data Link Layer:       Data Link Layer: Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols, Example Data Link Protocols.         Medium Access Control Sub Layer:       The Channel Allocation Problem, Multiple Access Protocols, Ethernet, Wireless LANS, Data Link Layer Switching.         UNIT-III													

	Congestion Control Algorithms, Internet working, The Network Layer in the Internet. (10 Hrs) UNIT-IV The Transport Layer: The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols: UDP, The Internet Transport Protocols: TCP. Application Layer: Domain Name System, Electronic Mail, The World WEB (12Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Andrew S Tanenbaum, "Computer Networks", 4<sup>th</sup> edition, Pearson Education.</li> <li>Reference Books:</li> <li>1. Behrouz A. Forouzan "Data Communications and Networking". 4<sup>th</sup> edition, TMH.</li> <li>2. S. Keshav, "An Engineering Approach to Computer Networks", 2<sup>nd</sup> edition, Pearson Education.</li> <li>3. W. A.Shay "Understanding Communications and Networks", 3<sup>rd</sup> edition, Thomson.</li> </ul>
E-resources and other digital material	<ol> <li>http://home.iitk.ac.in/~navi/sidbinetworkcourse/lecture1.ppt</li> <li>http://nptel.iitm.ac.in/courses/IITMADRAS/Computer_Networks/index.php</li> <li>http://www.ebookpdf.net/computer-networks-lecture- notestanenbaum_ebookhtml</li> </ol>

#### **17EC2605A: ARTIFICIAL NEURAL NETWORKS**

Course Category:	Open elective IV	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Und	erstan	d the	signif	icance	e of A	NNs t	o solv	e non	linea	r pro	blem	s.	
	CO2	2 Design an MLP Network for the given problem.													
	CO3	Distinguish various unsupervised algorithms and use them appropriately													
	CO4	O4 Solve association problems using Neural Networks													
Contribution of Course		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
Outcomes	CO1	2													
towards achievement of	CO2		1												
Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO3		1												
	CO4		2												
Course Content	<ul> <li>UNIT-I</li> <li>Introduction: History of Neural Networks, Structure and Function of a Single Neuron, Neural Net Architectures, Neural Learning, Application of Neural Networks, Evaluation of Networks, Implementation.</li> <li>Supervised Learning – Single Layer Networks: Perceptrons, Linear Separability, Perceptron Training Algorithm, Guarantee of Success, Modifications. (12Hrs)</li> <li>UNIT-II</li> <li>Supervised Learning: Multilayer Networks: Multi-level Discrimination, Preliminaries, Back propagation Algorithm, Classification using Back propagation Algorithm, Setting the Parameter Values, Applications. Adaptive Multilayer Networks, Boosting, Prediction Networks, Polynomial Networks. (12Hrs)</li> <li>UNIT-III</li> <li>UNIT-III</li> <li>UNIT-III</li> <li>UNIT-III</li> <li>UNIT-III</li> <li>UNIT-III</li> <li>UNIT-III</li> <li>UNIT-III</li> <li>UNIT-III</li> </ul>											tion, ack bive cory,			

	Component Analysis Networks.(12Hrs)
	<ul> <li>UNIT-IV</li> <li>Associative Learning: Non-iterative Procedures for Association, Hopfield Networks, Optimization Using Hopfield Networks, Boltzmann Machines.</li> <li>Evolutionary Optimization: Optimization and Search, Evolutionary Computation, Evolutionary Algorithms for Training Neural Networks. (12Hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text books:</li> <li>2. KishanMehrotra, Chilukuri K. Mohan, Sanjay Ranka, "Elements of Artificial Neural Networks", 2<sup>nd</sup>edition, Penram International Publishing (India) Pvt. Ltd, 1990. (Units - I, II, III &amp; IV)</li> </ul>
	<ul> <li>Reference books:</li> <li>3. J. M. Zurada, "Introduction to Artificial Neural Systems", 3rd edition Jaico Publications.</li> <li>4. B. Yegnanarayana, "Artificial Neural Networks", PHI, New Delhi, 2001.</li> </ul>
E-resources and other digital material	<ul> <li>7. http://nptel.iitm.ac.in/video.php?subjectId=117105084</li> <li>8. http://en.wikipedia.org/wiki/Artificial_neural_network</li> <li>9. http://freevideolectures.com/Course/2677/Neural-Networks-and-Applications/1</li> <li>10. http://machine-learning.martinsewell.com/ann/</li> <li>11. http://neurosci.wikidot.com/artificial-neural-network</li> </ul>

#### 17EC2605 B: GLOBAL NAVIGATIONAL SATELLITE SYSTEM

<b>Course Category:</b>	Open Elective-IV	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	-	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	CO1 Understand global navigational satellite systems													
	CO2	Unc	Understand Indian regional Navigational Satellite System												
	CO3	Bevelop GNSS Receiver													
Contribution of Course		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
Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO1	2													1
	CO2		2												1
	CO3			2											1
Course Content	CO321UNIT I: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, [12] UNIT II: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,														
	UNIT III:														
-------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------														
	<ul> <li>Navigation with Indian Constellation (NavIC): overview, space segment, NavIC control segment, Geodesy and time system, Navigation services, signals, applications and NavIC user equipment.</li> <li>GNSS Receiver: Acquisition: Single Trial 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.</li> <li>UNIT – IV:</li> </ul>														
	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, Psedorange error budgets. [10]														
Text books and Reference books	<ol> <li>Text Books:         <ol> <li>Elliott D. Kaplan, Christopher J. Hegarty, Understanding GPS/GNSS principles and applications, third edition, artech house publishers, Boston, 2017.</li> </ol> </li> <li>Reference Books:         <ol> <li>G S Rao, Global Navigational satellite system, Tata McGraw-Hill education private Ltd, New Delhi, 2010</li> <li>ISRO-IRNSS-ICD-SPS-1.1, Bangalore, 2017</li> <li>Bhatta, B., 2010. Global Navigation Satellite Systems: Insights Into GPS, Glonass, Galileo, Compass, and Others, BS Publications, New Delhi.</li> <li>Grewal, M. S., Weill, L. R., Andrews, A. P., 2006. Global Positioning Systems, Inertial Navigation, and Integration, John Wiley &amp; Sons, New York.</li> <li>Hofmann-Wellenhof, B., Lichtenegger, H., Wasle, E., 2008. GNSS – Global Navigation Satellite Systems, Springer, Verlag Wien.</li> </ol> </li> </ol>														
E-resources and other digital material	https://www.isro.gov.in/sites/default/files/irnss_sps_icd_version1.1- 2017.pdf														

# **17TP1606: QUANTITATIVE APTITUDE**

Course Category:	Institutional Core	Credits:	1
Course Type:	Learning by Doing	Lecture - Tutorial -Practice:	0 - 0 - 2
Prerequisites:		Continuous Evaluation:	100
		Semester end Evaluation:	0
		Total Marks:	100

Course outcomes	Upor	Upon successful completion of the course, the student will be able to:													
	CO1 Solve various Basic Mathematics problems by following differen methods													fferent	
	CO2	Follo Appl	ow st y shc	rateg ortcut	ies ir meth	n mir 10ds t	nimiz o sol	ing t ve pr	ime oblen	consı ns	umpti	on ii	n pro	blem s	olving
	CO3 Confidently solve any mathematical problems and utilize thes mathematical skills both in their professional as well as personal life.														these
	CO4	Anal inclu	Analyze, summarize and present information in quantitative forms including table, graphs and formulas												
Contribution of Course		РО 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
Outcomes towards	CO1	2													
of Program Outcomes	CO2		2												
(1 – Low, 2 - Medium,	CO3	2													
3– High)	CO4				2										
Course Content	UNI Ni Ni Ni Ra UNI Ai Pr Ai Ti	2       2         JNIT I:       Numerical ability I:         Number system, HCF & LCM, Average, Simplification, Problems on numbers         Numerical ability II:         Ratio & Proportion, Partnership, Percentages, Profit & Loss         JNIT II:         Arithmetical abilityI         Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.         Arithmetical ability II:         Time & Distance, Problems on boats & Steams, Problems on Trains													

	<ul> <li>UNIT III:</li> <li>Arithmetical ability III:</li> <li>Allegation, Simple interest and compound interest, Races &amp; Games of skills, Calendar and Clock,</li> <li>Logical ability:</li> <li>Permutations and Combination and Probability.</li> </ul>
	<ul> <li>UNIT IV:</li> <li>Mensuration:</li> <li>Geometry, Areas, Volumes,</li> <li>Data interpretation:</li> <li>Tabulation, Bar graphs, Pie charts, line graphs</li> </ul>
Text books and Reference books	1. R. S. Aggarwal "Quantitative Aptitude", Revised ed., S Chand publication, 2017, ISBN:8121924987

#### 17EC3651: DIGITAL SIGNAL PROCESSING LAB

<b>Course Category:</b>	Program core	Credits:	1.5
<b>Course Type:</b>	Practical Lab	Lecture - Tutorial -Practice:	0-0-3
Prerequisites:	Signal and Systems &	<b>Continuous Evaluation:</b>	30
	Digital Signal Processing	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upo	n succ	essful	l comj	oletion	n of th	ne coi	urse, t	he stu	dent v	will b	e abl	le to	:	
	CO1	To Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of Analog and digital filter types like IIR- Butterworth, Chebyshev, Bilinear, Impulse invariant, FIR window- design.													
	CO2	To d DIF TMS	o develop DSP algorithms like convolution, correlation, DFT, DIT FFT, IF FFT in software using a computer language such as C with MS320C6713 floating point Processor.												
Contribution of Course Outcomes		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
towards achievement o	CO1			3	1	2				2				2	2
Program Outcomes (1 - Low, 2 - Medium, 3 - High)     CO2     3     3     2     2													2	2	
Course Content	<ol> <li>Bi M</li> <li>Bi</li> <li>Bi</li> <li>Di</li> <li< th=""><th>utterw ethod utterw esign o esign IT FF IF FF ecima pplem verlap xperin</th><th>rorth a of FIR a. Rec b. Han of FIF a. Bar b. Bla c. Kai T Alg tion at entation add a nent b</th><th>nd Ch nd Ch filter tanguning ming filter ttlet v ckmai ser w orithm orithm nd Int on of ased c</th><th>nebysh nebysh s usin ilar wi windo g windov rs usir vindov nn win indow n. n erpola FIR fi erlap on spe</th><th>nev III g win indow dow ng win w ndow tion lter o save r ctrum</th><th>R filt R filt dowi ndow</th><th>er des ng Te ing Te tinuo d nation</th><th>ign us ign us echniq echnic us inco n.</th><th>ing Ir ing B ue jue</th><th>npuls ilinea g data</th><th>se Inv arTra</th><th>varia nnsfc</th><th>unce ormati</th><th>on</th></li<></ol>	utterw ethod utterw esign o esign IT FF IF FF ecima pplem verlap xperin	rorth a of FIR a. Rec b. Han of FIF a. Bar b. Bla c. Kai T Alg tion at entation add a nent b	nd Ch nd Ch filter tanguning ming filter ttlet v ckmai ser w orithm orithm nd Int on of ased c	nebysh nebysh s usin ilar wi windo g windov rs usir vindov nn win indow n. n erpola FIR fi erlap on spe	nev III g win indow dow ng win w ndow tion lter o save r ctrum	R filt R filt dowi ndow	er des ng Te ing Te tinuo d nation	ign us ign us echniq echnic us inco n.	ing Ir ing B ue jue	npuls ilinea g data	se Inv arTra	varia nnsfc	unce ormati	on

	<ul> <li>10.Experiments based on simulink and signal processing block set</li> <li>Code Composer Studio</li> <li>11. ASK, FSK, PSK waveform generation</li> <li>12. Linear and Circular convolution.</li> <li>13. Correlation</li> <li>14. DFT &amp; IDFT.</li> </ul>
Text books and Reference books	<ol> <li>Alan Oppenheim, "Discrete time signal processing", Prentice Hall, 2009, 1120pp.</li> <li>Proakis and Manolakis, "Digital signal processing", 4<sup>th</sup>edition, Prentice Hall, 2006. 1004pp.</li> </ol>
E-resources and other digital material	<ol> <li>http://vlab.co.in/ba_labs_all.php?id=1</li> <li>http://web.stanford.edu/class/ee264/</li> <li>http://dsp.rice.edu/software</li> </ol>

### **17EC3652: MICROCONTROLLERS LAB**

<b>Course Category:</b>	Programme Core	Credits:	1.5
<b>Course Type:</b>	Practical	Lecture - Tutorial -Practice:	0-0-3
Prerequisites:	17EC3602: Microcontrollers	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Deve	elop a	ssemb	oly la	ngua	ge pro	gram	s on 8	051 a	nd AR	M.			
	CO2	Inter	face t	he pei	riphe	rals to	o 805	1 and	ARM	•					
Contribution of Course Outcomes towards		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	PS O2
achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO1			3	3	2				2				2	
	CO2			3	3	2				2				2	
Course ContentList of lab Exercises: Experiments Based on 8051: <ol><li>Basic programs on Microcontrollers.</li><li>Programs on Serial Communication.</li><li>Programs on Interrupt Mechanism.</li><li>Programs on Timer/Counter concepts.</li><li>Programs on LCD Display interfacing.</li><li>Programs on Traffic Light Control.</li><li>Experiments Based on ARM:</li><li>Basic programs on ARM</li><li>Interfacing ADC and DAC.</li><li>Interfacing LED and PWM.</li><li>Interfacing real time clock and serial port.</li></ol>															
<b>NB:</b> A minimurecorded by the	m of candid	10(Te ate to	n) ex attain	perim eligit	ents oility	(5 fi for E	rom e Extern	each s al Pra	section ctical	n) hav Exam	ve to ninatio	be po n	erfori	ned	and
E-resources and other digital material	1. htt 2. wv	p://ww ww.en	vw.da genui	tashec cs.cor	etarcl n– A	hive.( RM (	com/8 Cortex	051-d c-M3	atash Assen	eet.htr nbly la	nl - (8 anguaş	051 d ge.	latasł	neet)	

### **17EC5653: ENGINEERING PROJECT FOR COMMUNITY SERVICES**

<b>Course Category:</b>	Project	Credits:	2
Course Type:	Practical	Lecture - Tutorial -Practice:	0-1-2
Prerequisites:		Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon s	ucce	ccessful completion of the course, the student will be able to:												
	CO1	Ide obj	ntify ective	socie es.	tal pro	oblem	from	the v	illage	s or to	owns	with v	wel-de	efined	
	CO2	Bu	ild a 1	model	for t	ne pro	blem	chose	en usi	ng mo	odern	tools	and te	echnolog	у.
	CO3	Or	rganize the technical report effectively												
Contribution of Course		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	PSO 2
Outcomes towards achievement of Program Outcomes	CO 1						3	3						2	2
	CO 2	2	2	2	2	3								2	2
(1 – Low, 2 - Medium, 3 – High)	CO 3								3	2	3	1	1	2	2
	Guidel • •	ines Stu Tov Stu feas Wo Stu bui	:. dents wns) dents sible ork w dents lding	s need s shou solut ill be s need	l to io ild su ion. carri l to ta	lentif irvey ed ou ike uj	Ty the the li it dur p a re	prob terati ing st al life	lem g ure fo ummo e prol	going or the er vao blem	to sc prob cation leadi	ociety lem i n afte ng to	r (Vill denti r IV s inno	ages / fied for semester vative n	a : nodel

### **17EC3701A: ANTENNAS AND WAVE PROPAGATION**

<b>Course Category:</b>	Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-2
Prerequisites:	17EC3503:Transmission	<b>Continuous Evaluation:</b>	30
	Lines and Waveguides	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon	Upon successful completion of the course, the student will be able to:													
	CO1	Ana elen	lyze nents	the C	urren	t dist	ributi	ions &	& pov	ver ra	adiati	on of	diffe	erent rad	liating
	CO2	Und patt	Understand the antenna fundamentals and obtain radiation pattern of various types of antenna arrays. Design resonant, non-resonant, HF, VHF, and UHF antennas.												
	CO3	Des													
	CO4	Und	derstand the characteristics of different wave propagation mechanisms.												
Contributi on of		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
Course Outcomes towards achieveme nt of Program Outcomes (1 – Low, 2-Medium, 3– High)	CO1	3		2											1
	CO2	2													1
	CO3	2	2												1
	CO4	2	1												1
Course Content	UNI paran Effic	<b>F I:R</b> neters iency	adia 5, Ra , Dire	<b>tion</b> adiati ectivi	And on p ty and	Ante atteri d Gai	nna 1 ns, 1 in, Ai	F <b>und</b> Beam	amer Are a ape	<b>itals</b> : a, rtures	Intro Radi s, Eff	ducti ation	on, E Inte e Hei	Basic Arensity, ght and	ntenna Beam Area,
	Radio	o com	nmun P	icatio	n link ed D	k, Fie	lds fo	orm os Field	scilla	ting c	lipole	, Ant	enna	Fields	zones,
	Powe	er rad	iated	by cu	irrent	elem	ent,.(	10)	5 uu		anen	141112	5 Cul		
	UNIT Radia resist wave Ante sourc	Power radiated by current element,.(10) UNIT II: Wire Antennas And Antenna Arrays: Fields of a short dipole, Radiation resistance of short electric dipole, Thin linear antenna, Radiation resistance of $\lambda/2$ antenna, Fields of thin linear antenna with uniform travelling wave, Loop antenna general case, Radiation resistance of loop antenna. Antenna Arrays: Array of two isotropic point sources, non isotropic point sources and principle of multiplication of patterns. Linear array of p point													

	sources (Broad side array, End-fire array), Binomial Array(12)
	<b>UNIT III: VHF and UHF Antennas</b> : V and Rhombic Antennas, Folded Dipole, Dipole array with parasitic elements, Yagi Uda array, Horn antennas,Helical antenna, Practical design considerations, Principle of operation, Reflector antennas, parabolic reflector, corner reflector, Feed methods for parabolic reflectors.(10)
	<b>UNIT – IV:</b> Radio Wave Propagation: Ground Wave Propagation, SpaceWave Propagation: Field Strength Relation, Effect of Earth, Super Refraction, Tropospheric Propagation. Sky Wave Propagation: Structural details of the Ionosphere, Wave propagation Mechanism, Refraction and Reflection of Sky waves by Ionosphere, Ray Path, Critical frequency, MUF,LUF,OF, virtual Height and Skip distance, Relation between MUF and the Skip Distance, Multi-Hop propagation. (12)
Text books and Reference books	<ol> <li>Text Books         <ol> <li>I. Edward C Jordan and Keith G Balmin. "Electromagnetic Waves and Radiating Systems", 2nd edition, 2003, PHI,.(Unit- I &amp; IV)</li> <li>Constantine A Balanis, "Antenna Theory: Analysis and Design", Harper and Row Publishers, 2002. (Units – II &amp; III)</li> </ol> </li> <li>Reference Books:         <ol> <li>J. D. Kraus and Ronald J Marhefka Ahmad S khan "Antennas and Wave Propagation", Tata McGraw Hill, 4th edition, 2010.</li> <li>John D Ryder "Networkd, lines and Fields", PHI, 2nd edition, 2010.</li> </ol> </li> </ol>
E- resources and other digital material	<ol> <li>http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-20Guwahati/em/in</li> <li>http://www.cdeep.iitb.ac.in/nptel/Electrical%20&amp;%20Comm% 20Engg/Transmission%20Lines%20and%20EM%20Waves/TOC.htm</li> <li><u>http://courses.cit.cornell.edu/ece303/Lectures/Lectures.htm</u></li> <li>http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT- %20Guwahati/em/index.htm</li> <li>http://nptel.iitm.ac.in/video.php?subjectId=117101056</li> </ol>

Course	Program Core	Credits:	4
Category:			
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-2
Prerequisites:	17EC3403: Electromagnetic	<b>Continuous Evaluation:</b>	30
	Theory and Transmission	Semester end Evaluation:	70
	Lines	Total Marks:	100

### **17EC3701: GUIDED WAVES AND ANTENNAS**

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Ana	alyze	the c	harac	eterist	tics o	f guio	ded w	vaves	in R	ectan	gular	Waveg	guides
	CO2	Ana ante	Analyze the electric and magnetic field emission from various basic antennas and mathematical formulation of the analysis. Understand the antenna fundamentals of parameters												
	CO3	Unc													
	CO4	Unc for	derstand the basic propagation models and propagation mechanisms radio waves.												
Contribution of Course		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
Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO 1	3		2										3	1
	CO 2	2												3	1
	CO 3	2	2											3	1
	CO 4	2	2											2	1
Course Content	UNIT Guid Trans Elect Recta Wave and C Hrs) UNIT Radi appro	<b>F-I</b> ed W sverse roma, angul es, Im Chara <b>F-II</b> ation pach,	Vaves e Mag gnetic lar V nposs cteris : Po Pote	s: Wa gnetic c Wa Vave ibility tic In otenti	aves c Wa ves. guide y of T npeda ial f	betw ves, ( es: T FEM ance. functi	een I Chara ransv Wave	Parall acteris verse es in neuris sinus	el Pl stics Mag Hollo stic oidal	anes, of TE netic ow W appr	Tran E and Waw aveg	TM TM ves, T uides Ma ons, A	se El Wave Frans s, Wa axwe	ectric V es, Tran verse E ve Impe ll's eq nating c	Vaves, sverse lectric edance (15 uation
	eleme Assur wave	ent, H med dipo	Power curre le, T	r rad nt di ravel	iated stribu ling	by o ution, wave	currer Rad ante	nt ele iation nnas	emen n fro and	t, Ap m qu the e	oplica arter ffect	tion wav of th	to sh e Mo le poi	nort ant phopole int of fe	ennas, / half eed on

	standing wave antennas. (10Hrs)
	<ul> <li>UNIT-III</li> <li>Antenna Fundamentals: Introduction, Radiation pattern, Isotropic, Directional, Omni-directional patterns, Principle patterns, Radiation pattern lobes, field regions, Radian and Steradian, Radiation power density, Radiation intensity, Directivity, Directional patterns, Power gain, Antenna efficiency Half power Beam width, beam efficiency, band width, Antenna polarization, Polarization loss factor and efficiency, input impedance, radiation efficiency, Effective aperture(area) of antenna, Relation between maximum effective aperture and directivity, Friss transmission equation.</li> <li>Array Antennas:</li> <li>Two element array, Linear arrays: N-Element linear array: Uniform amplitude and spacing, broad side array, Ordinary end fire array, Multiplication of patterns, Binomial array.</li> <li>(15 Hrs)</li> <li>UNIT-IV</li> <li>VHF and UHF Antennas: (Construction details, Principle of operation and Applications) V and Rhombic Antennas, Folded Dipole, Dipole, Yagi-Uda array, Horn antennas, Helical antenna, parabolic reflector.</li> <li>Radio Wave Propagation: Ground Wave Propagation, SpaceWave Propagation: Field Strength Relation, Super Refraction, Tropospheric Propagation. Sky Wave Propagation: Structural details of the Ionosphere, Wave propagation Mechanism, Refraction and Reflection of Sky waves by Ionosphere</li> </ul>
Text books and Reference books	<ul> <li>Text Books <ol> <li>Edward C Jordan and Keith G Balmin. "Electromagnetic Waves and Radiating Systems", 2nd edition, PHI, 2003. (Unit- I,II&amp; IV)</li> <li>Constantine A Balanis, "Antenna Theory: Analysis andDesign", Harper and Row Publishers, 2002. (Units – III&amp;IV)</li> </ol> </li> <li>Reference Books: <ol> <li>J. D. Kraus and Ronald J Marhefka Ahmad S khan "Antennasand Wave Propagation", Tata McGraw Hill, 4th edition, 2010.</li> </ol></li></ul>
E-resources and other digital material	<ol> <li>John D Ryder "Networkd, lines and Fields", PHI, 2nd edition, 2010.</li> <li>http://nptel. iitm.ac.in/courses/Webcourse-contents/IIT- 20Guwahati/em/index.htm</li> <li>cdeep.iitb.ac.in/nptel/Electrical%20&amp;%20Comm% 20Engg/Transmission%20Lines%20and%20EM%20Waves/TOC.htm</li> <li>http://courses.cit.cornell.edu/ece303/Lectures/Lectures.htm</li> </ol>

### **17EC4702/A: DSP PROCESSORS & ARCHITECTURES**

Course Category:	Program Elective 3	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	Signals and systems, Digital Signal Processing	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Exp	olain	the b	asic c	onsti	ituen	ts of a	a digi	tal si	gnal	proce	essor		
	CO2	Une	Understand architecture of fixed-point processor TMS320C54X												
	CO3	Dev	Develop DSP algorithms with assembly language.												
	CO4	Des	Design high-end application with interfacing DSP Processors.												
Contribution of Course		РО 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
Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO1	3	2											2	
	CO2		2	2										3	
	CO3		2	2										3	
	CO4		2	2										2	
Course Content	UNIT Comp Signal Source Comp Archi DSP Addree Progra UNIT Progr Proces Addree TMS3 and	-I butat s an es o utation tectu Composing ssing am E -II ssing ssing ssing 20C Progr	ional d Co f Ern onal 1 ures f putat g Ca xecut nable Dev g M 54XY	<b>Acc</b> beffic for in Error for <b>P</b> ional pabilition, f ices, odes & Pro- ning,	curac eients n DS s, D/A rogra Buil ities, Speed gital Data of ocesso On-	y in in 1 P In A Co amma ding Ada d Issu Sign Ada TMS ors, 1 Chip	DSI DSP npler nvers able Blo dress ies, F nal lressi S320 Progi Pe	P Im Syste nenta sion E DSP cks, Ger ceatur Proce ng M C54X cam ( ripher	plem ems, tions Errors Devi Bus nerati es fo essor Iodes X I Contr rals,	enta Dyn , A/ s. ces: Arch ion r Ext s: C s of 2 Proce rol, 7 Inte	tions amic D C Basic itectu Unit, ernal Comm FMS3 ssors FMS3 rrupt	: Nu Ran onver : Arcl ure a: Pro Inter a20C 5, M 320C 5, of	amber age a rsion hitect nd N gram facin facin	r Forma nd Pre Errors tural Fe Iemory mabilit g. (13F igital S ( 13F igital S ( 13F igital S ( 13F igital S ( 13F) igital S ( 13F)	ats for cision, , DSP atures, , Data y and Irs) Signal- s, Data ace of actions C54XX

	Processors, Pipeline Operation of TMS320C54XX Processors.(12Hrs)
	UNIT-III Implementations of Basic DSP Algorithms: The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, PID Controller, Adaptive Filters, 2-D Signal Processing. Implementation of FFT Algorithms: An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and Scaling, Bit-Reversed Index Generation, An 8-Point FFT Implementation on the TMS320C54XX, Computation of the Signal Spectrum. (14Hrs)
	UNIT-IV Interfacing Memory and I/O Peripherals 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. (14Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Avatar Singh and S.Srinivasan, "DSP Processors and Architectures", Thomson Publications, 2004. (Units-I, II, III &amp; IV)</li> <li>Reference Books:</li> <li>1. B. Venkataramani and M. Bhaskar, "Digital Signal Processors, Architecture, Programming and Applications", TMH, 2002.</li> <li>2. Jonatham Stein, "Digital Signal Processing", John Wiley, 2005.</li> </ul>
E-resources and other digital material	<ol> <li>www.ti.com/lit/ug/spru131g/spru131g.pdf</li> <li>http://en.wikipedia.org/wiki/Digital_signal_processor</li> <li>http://www.scribd.com/doc/8968585/Architecture-of-DSP-Processors</li> </ol>

<b>Course Category:</b>	Programm	e Elective 3	Credits:	3
<b>Course Type:</b>	Theory		Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	Analog	Communication,	<b>Continuous Evaluation:</b>	30
	Digital Co	mmunication	Semester end Evaluation:	70
			Total Marks:	100

### **17EC4702/B: OPTICAL COMMUNICATIONS**

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Get com	acq nmun	uaint icatic	ed von sys	with tem.	diffe	erent	buil	ding	bloc	eks	of o	ptical	fiber
	CO2	Mea	asure	dispe	ersion	and	atten	uatio	n in C	OFC s	system	n.			
	CO3	Mea	asure	the c	harac	terist	ics of	f sour	rces a	nd Pl	noto c	letect	ors.		
	CO4	Des	esign an analog and digital link of OFC system												
Contribution of Course		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
Outcomes towards	CO1	1	2											2	2
achievement	CO2	2	1											2	2
Outcomes	CO3	2	2	2										2	2
(1 – Low, 2 - Medium, 3 – High)	CO4	1	2	2										2	2
Course Content	UNI Intro Optic Opti Mod Opti Tech UNI Trar Mate Non- Disp Disp Fibe Conr UNI Opti	T-I cal Fi cal Fi cal Fi e The cal I nique T-II nsmise rial A cLinea ersion r Op nector T-III cal	tion: bers, Fiber cory f Fiber es, Va es, Va sion Absor ar Sca n: In n, Dis tic Cors.	Hist and J Wa for Op s: In apour Chan ption atterin tram spersi ompo	torica Appli vegu otical trodu Phas racte a Loss ng Lo odal ion in onent	1 De cation ides: Prop ction ie Dej ristic ses in osses, Disp Sing s: Fil	svelog ns of Ray agatio , Pre positi s of Silic Fibe bersio de Mo ber A	omen Optic 7 Th on, C parat on Te on Te con G r Ben n, In ode F lignn	t, Ge cal Fi eory ylind ion c echni cal Fi d Los iterm ibers nent &	enera ber C Trar rical of Op ques. <b>ibers</b> Fiber ss. odel , Pola & Joi	l Sy comm smis Fiber otical (12 H : Intr s, Lir Disp arization t Loo	stem, nunica sion, s, Sir Fibe Irs) oduc near S eersio ion. ss, Fi (1: &	Adiation. Elecongle M rs, L tion, C tion, O ber S 3 Hrs Effici	vantag ctromag Aode F iquid Attenu ring L verall plices, ) ency,	es of gnetic ibers. Phase ation, osses, Fiber Fiber LED

	<ul> <li>Structures, LED Characteristics.</li> <li>Optical Sources-LASER: Basic Concepts, Optical Emission from Semiconductors, Semiconductor Injection Laser, Laser Structures, Single Frequency Injection Lasers.</li> <li>Detectors: Introduction, Optical Detection Principles, Absorption, Quantum's Efficiency, Responsitivity, Semiconductor Photo Diode with Internal Gain, Semiconductor Photo Diode without Internal Gain. (15 Hrs)</li> <li>UNIT-IV</li> <li>Optical Fiber Systems: Optical Transmitter Circuits, Optical Receiver Circuits, Digital Systems, Digital System Planning Considerations, Analog Systems, Advanced Multiplexing Strategies.</li> <li>Optical Fiber Measurements: Introduction, Attenuation Measurement, Dispersion Measurement, Refractive Index, Optical Time Domain Reflectometry (OTDR).</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. John M Senior, "Optical Fiber Communications: Principles and Practice", 2<sup>nd</sup> edition, 2002, PHI, (Units - I, II, III &amp; IV)</li> <li>Reference books:</li> <li>1. Gerd Keiser, "Optical Fiber Communication", 3<sup>rd</sup> edition, McGraw Hill, 2003.</li> <li>2. Kolimbiris, "Fiber Optics Communication", 1<sup>st</sup> edition, McGraw Hill, Prentice Hall, 2003.</li> <li>3. Djafar K Mynbaev and Lowell L. Scheiner, "Fiber Optic Communication Technology", Pearson Education, 2006.</li> </ul>
E-resources and other digital material	<ol> <li>http://nptel.iitm.ac.in/courses/117101002/</li> <li>http://www.photonics.cusat.edu/links_optical_communications.html</li> <li>http://www.cdeep.iitb.ac.in/nptel/Electrical &amp;CommEngg /Optical Communication</li> <li>http://groups.csail.mit.edu/Miller.On-Chip-Optical-Communications.ppt</li> </ol>

### **17EC4702/C: PRINCIPLES OF RADAR ENGINEERING**

<b>Course Category:</b>	Program Elective 3	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3502: Digital Communications	<b>Continuous Evaluation:</b>	30
_	17EC4603/3:MicrowaveEngineering	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upor	Upon successful completion of the course, the student will be able to:													
	CO1	Unc	lersta	nd the	princ	iples	and	appli	catio	ns of	RAD	DAR			
	CO2	Der rada	Demonstrate the Doppler Effect and the concepts of continuous wave radars.												
	CO3	Analyze the tracking radar systems and mono pulse radar.													
	CO4	Und perf	Understand radar signal detection in presence of noise and its performance											d its	
Contribution of Course		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
Outcomes towards	CO1	2		1										3	1
achievement of Program	CO2	2		1										3	1
Outcomes (1 – Low,	CO3	2												3	1
2 - Medium, 3 – High)	CO4	2												3	1
Course Content	UNIT Equa Rada to-No False Rada Frequ UNIT Stagg Proce UNIT Pulse Scan	UNIT I INTRODUCTION TO RADAR: Basic Radar, The simple form of the Radar Equation, Radar Block Diagram and operation, Applications of Radar, The Radar Equation, Detection of Signals in Noise, Receiver Noise and the Signal- to-Noise Ratio, Probability Density Functions- Probabilities of Detection and False Alarm-Integration of Radar Pulses, Radar Cross Section of Targets- Radar cross Section Fluctuations- Transmitter Power, Pulse Repetition Frequency-System losses. (12 Hrs) UNIT-II MTI Radar: Introduction to Doppler and MTI Radar- Delay Line Cancellers, Staggered Pulse Repetition Frequencies, Doppler Filter Banks, Digital MTI Processing, Moving Target Detector, Limitations to MTI Performance. (10Hrs) UNIT- III													
	Track	king: '	Track	ing in	Ran	ge, C	Other	Trac	king	Rada	ar To	pics,	Con	npariso	on of

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	Trackers, Automatic Tracking with Surveillance Radars (ADT), Radar Antennas. (10 Hrs)									
	UNIT- IV Detection of Signals in Noise: Introduction, Matched Filter Receiver, Detection Criteria, Detectors, Automatic Detector, Integrators, Constant-False- Alarm RateReceivers, The Radar operator, Signal Management, The Radar Receiver: Receiver noise Figure, Super heterodyneReceiver, Radar Displays. Applications: Electronic Support Measure (ESM), Electronic Counter Measure (ECM), Electronic Counter-Counter Measure (ECCM), Stealth Technology. (13 Hrs)									
Text books and Reference	<ul> <li>Text Books:</li> <li>1. Merrill I Skolnik, Introduction to Radar Systems, 3<sup>rd</sup> edition, TMH, 2003</li> <li>2. Principles of Modern radar system, M. H. Carpentier, Artech House,1998</li> </ul>									
books	<ul> <li>Reference Books:</li> <li>1. Radar Technology, Brookner, Eli, Artech House</li> <li>2. Peyton Z Peebles Jr. (2004), "Radar Principles", John Wiley Inc.,</li> <li>3. BahmanZohuri, 'Radar Energy Warfare and the Challenges of Stealth Technology", Springer.</li> </ul>									
E-resources and other digital material	<ol> <li>https://ocw.mit.edu/resources/res-ll-003-build-a-small-radar-system- capable-of-sensing-range-doppler-and-synthetic-aperture-radar-imaging- january-iap-2011/lecture-notes/</li> <li>http://www.radartutorial.eu/07.waves/wa04.en.html</li> </ol>									

## 17EC4702/D: ADHOC AND SENSOR NETWORKS

<b>Course Category:</b>	Programme Elective 3	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	-	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	Upor	succe	essful	comp	oletion	of th	e cou	irse, t	he st	udent	will	be ab	le to:		
outcomes	CO1	Exer	nplify	the u	nique	issue	s in a	ıd-ho	c/sen	sor n	etwor	·ks.			
CO2 Confer the challenges in designing MAC protocols in adhoc networks.											in w	ireles	S		
	CO3	Fam imp	Familiarize with current technology trends for the implementation of different types of adhoc routing protocols.												
	CO4	Unde netw	Understand the architecture and design principles of adhoc wireless networks.										eless		
Contribution of Course		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
Outcomes towards	CO1	1	1	2										2	
achievement of Program Outcomes	CO2	2	2											3	
	CO3	2		3										2	
(1 – Low, 2 - Medium, 3 – High)	CO4		2	2										2	
Course Content	UNI Ad h Mobi hoc Chall UNI Issue Class Real- Rout: UNI Issue Class CGS Zone	UNIT-I Ad hoc Wireless Networks – What is an Ad Hoc Network? Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Ad noc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Ad hoc Mobile Networks – Ad hoc wireless Internet. (10 Hrs) UNIT -II Susses in Designing a MAC Protocol for Ad Hoc Wireless Networks – Classifications of MAC Protocol. MACAW – FAMA – BTMA – DPRMA – Real-Time MAC protocol – Multichannel protocols – Power aware MAC Routing Protocols for AD HOC Networks. (12 Hrs) UNIT- III Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols -Table-driven protocols – DSDV – WRP – Classifications of Routing Protocols -Table-driven protocols – DSDV – WRP –													

	a Multicast Routing Protocol – Operation of Multicast Routing Protocols – A Architecture Reference Model for Multicast Routing Protocols. (12Hr UNIT-IV: Sensor Networks – Architecture: Single node architecture Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios, types of sources and sinks, single h versus multi-hop networks, multiple sinks and sources, design principle Development of wireless sensor networks. (12Hrs)								
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. C. Siva Ram Murthy and B. S. Manoj, "Ad Hoc Wireless Networks Architectures and Protocols", Pearson, 2008.</li> <li>2. C. K. Toh, "Ad Hoc Mobile Wireless Networks: Protocols and Systems", Prentice Hall, 2001.</li> <li>Reference Books:</li> <li>1. Carlos De MoraisCordeiro, Dharma PrakashAgrawal "Ad Hoc &amp; Sensor Networks: Theory and Applications", World Scientific Publishing Company, 2006.</li> <li>2. Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication – 2002.</li> <li>3. Holger Karl and Andreas Willig "Protocols and Architectures for Wireless Sensor Networks", Wiley, 2005</li> </ul>								
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/106/105/106105160/</li> <li>https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/10610516 0/lec1.pdf</li> </ol>								

17EC4703/A:	ADVANCED	MICROCONTROL	LERS
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<b>Course Category:</b>	Program Elective 4	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3602: Microcontrollers	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upor	Upon successful completion of the course, the student will be able to:													
	CO1	Unc	lersta	nd R	aspbe	erry p	oi and	Rasp	obian	OS					
	CO2	Dev	Develop basic programs on Raspberry pi using python. Build basic applications using Raspberry Pi platform												
	CO3	Bui													
Contribution of Course		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
Outcomes towards achievement	CO1		1											2	
of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO2			2										2	
	CO3				2									2	
Course Content	UNI Setuj selecc a Mi VGA Passy Netw Addr Pi. UNI Oper Term or Fo File, File o File Maki Instat	<b>F-I</b> p an ting a croSI word, vorki ess, s (10 <b>F-II</b> vorki ess, s (10 <b>F-II</b> vorki ess, s (10 <b>F-II</b> vorki vorki ess, s (10 <b>F-II</b> vorki vorki vorki ess, s (10 <b>F-II</b> vorki vorki vorki ess, s (10 <b>F-II</b> vorki vorki vorki vorki ess, s (10 <b>F-II</b> vorki vorki vorki vorki vorki vorki vorki ess, s (10 <b>F-II</b> vorki vork vork vork vork vork vork vork vork	d M a pow D Ca: onitor Setti ng: setting DHrs) g Sys Sessi Rena ting a rector nissio Scree vith a nand	anag ver su rd wi ; us ing th Intro- g a Si tem: on, N aming a File ry, Pe ons, ( en Ca pt-ge Line	emer upply th N ing ie Pi t ductive tatic Introvi aviga g a Fi With erform Chan pture et, Ins , Fet	nt: Ir , Selo OOB a Co to Bo on, co IP Ac oducti ating le or nout b ning ging , Inst ctallir ching	introduce ecting S, Co ompo ot Stro onneo ldress ion, N the F Fold Using Task File alling g Py Sou	Action g an ( connect site raight cting s, Set Aovir filesy er, Ec g an F s with Pern g Soft thon f rce (	n, sel Opera- ting Vide t into to a ting t ting t stem liting Editor h Sup missi tware Packa	lecting the S o M a Wi Wire the N les A Usin ; a Fil c, Cre oer us ons, e with ages with	g a Syster onito ndow d Ne etwo round g a T le, Vi ating ser Pr Chan apt- with Git,	mode em D n, co r/TV ving S twork rk Na d Graj ermin ewin ermin ewin a Di fiviles nging get, R Pip, F Rum	el of istrib nnect , Ch System c, Fin ume o phica nal, C g the recto ges, U File temo Fetchin	Rasber ution, v ting a I anging m. ding Y of a Ras of a Ras Copying Conten ry, Dele Understa e Owne ving So ing File a Progr	ry pi, vriting )VI or Your our IP pberry rting a a File ts of a eting a anding ership, ftware s from ram or

	<ul> <li>Script Automatically on Start up. (10Hrs)</li> <li>UNIT-III</li> <li>Python Basics: Introduction, Deciding Between Python 2 and Python 3, Editing Python Programs with IDLE, Using the Python Console, Running Python Programs from the Terminal, Variables, Displaying Output, Reading User Input, Arithmetic, Creating Strings, Concatenating (Joining) Strings, Converting Numbers to Strings, Converting Strings to Numbers, Finding the Length of a String, Finding the Position of One String Inside Another, Extracting Part of a String, Replacing One String of Characters with Another Inside a String, Converting a String to Upper- or Lowercase, Running Commands Conditionally, Comparing Values, Logical Operators, Repeating Instructions an Exact Number of Times, Repeating Instructions Until Some Condition Changes, Breaking Out of a Loop, Defining a Function in Python. (10Hrs)</li> <li>UNIT-IV</li> <li>Hardware Basics: Introduction, Finding Your Way Around the GPIO Connector, Keeping Your Raspberry Pi Safe When Using the GPIO Connector, installing RPI, GPIO, Setting Up 12C, Using 12C Tools, Setting Up SPI, Installing PySerial for Access to the Serial Port from Python.</li> <li>Controlling Hardware: Introduction, Connecting an LED, Leaving the GPIO Pins in a Safe State, Controlling the Brightness of an LED, Make a Buzzing Sound, Motors- Introduction, Controlling Servo Motors, Controlling Servo Motors, Controlling the Direction of a DC Motor, Using a Unipolar Stepper</li> </ul>
	a Push Switch. (10Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Simon Monk, "Raspberry Pi Cookbook", 2<sup>nd</sup> edition, Published by O' Reilly Media, Inc., 2016.</li> <li>Reference Books: <ol> <li>McManus, Mike cook "Raspberry Pi for Dummies", 3<sup>rd</sup> edition, Jhon Wiley &amp; sons, 2017</li> <li>Kirsten Kearney and Will Freeman, "Creative Projects with Raspberry Pi", Octopus Publishing Group, 2017</li> </ol> </li> </ul>
E-resources and other digital material	<ol> <li>https://www.raspberrypi.org/training/online/</li> <li>https://swayam.gov.in/nd1_noc20_cs22/preview</li> </ol>

### 17EC4703/B: MOBILE AND CELLULAR COMMUNICATION

<b>Course Category:</b>	Programme Elective 4	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3404: Analog	<b>Continuous Evaluation:</b>	30
	Communications,17EC3502:	Semester end Evaluation:	70
	Digital Communications	Total Marks:	100

Course	Upo	n succ	essful	comp	letior	n of tl	he co	urse,	the st	tuden	t will	l be a	ble to	):			
outcomes	CO1	Desi	gn a ce	llular	syste	em us	ing fi	reque	ncy r	euse	conce	ept.					
	CO2	Unde	erstand	basic	e prop	agati	on m	echai	nisms								
	CO3	Understand the GSM architecture with different channels.															
	CO4	Be a	e aware of next generation cellular technologies.														
<b>Contribution</b>		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		
Outcomes	CO1	1	2												2		
achievement	CO2	3	2												3		
Outcomes	CO3	2	2	3											2		
(1 – Low, 2 - Medium, 3 – High)	CO4	1	2	2											2		
Course Content	UNI Intr Radii Com Cell Strat and (12) UNI Mot Waw Field Refl Dessi Sma Typo Chai Equa (16)	T -I oduct to Compariso ular tegies, Grade Hrs) T-II oile R re Prop d, Th ection gn Us II-Sca es of nnels. alizat Hrs)	ion to mmunic on of C Concej , Hando e of Serv adio P pagation le Thro- sing Pat (Two- sing Pat le Fac Small ion a	Wirk cation omm pt: I off S vice, ropa; n, Fre ee E Ray) h Los ling -Scal nd near	eless as, Ex on W ntrod trateg Impro gation ee Sp Basic Moc ss Moc and e Fa Diven Equa	Con amplifices ireles uctio jies, 1 oving n: La ace P Prop lel, E odels. Mul ding, rsity:	arge pagat tipat , Sta	f Wir mmu reque ference erage <b>Scale</b> gation ction <b>h:</b> Si tistic undan	on S eless nicat: ency ce an e & C e Pat n Moo Mech , Sca mall- al M nenta ity To	ysten Com ion S Reus d Sy apaci h Lo del, F nanisi tterin Scale Iodels ls o echni	ns: E muni ysten se, C stem ty in ss: Ir celati ns, T g, Pr Mu s for f E ques,	Evolu catio ns. Capa Capa Cellu ntrodu ng Po Refle actica ltipat Mu qualiz	tion n Sys el A acity, llar S action wer ction al Li h Pr lltipa Zation XE R	of Mastems, ssign: Trun system n to R to Elec , Gr nk-Bu opaga th Fa n, L ecceive	obile , and ment iking is. Cadio ectric ound idget ition, iding inear er.		

	<ul> <li>UNIT-III</li> <li>Wireless Networking: Common Channel Signaling: Signaling System No.7, Signaling traffic in SS7, SS7 services, performance of SS7, Example of SS7-Global cellular network inter operatability.</li> <li>Global System for Mobile (GSM): GSM Services and Features, GSM System Architecture, GSM Radio Subsystem, GSM Channel Types, GSM Traffic Channels, GSM Control Channels, Examples of GSM Call, Frame Structure for GSM, Signal Processing in GSM. (15Hrs)</li> <li>UNIT IV: Next Generation Cellular Technology 4G: Introduction, 4G evolution, Advantages of 4G over 3G, Applications of 4G, Limitations of 4G, New Technologies in Cellular Data Networks. (15Hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Theodore Rappaport, "Wireless Communications – Principles and Practices", 2<sup>nd</sup> edition, Prentice Hall of India, New Delhi, 2008. (Units - I, II &amp; III)</li> <li>2. G SasibhusanRao, "Mobile Cellular Communications, Pearson Publications, 2013 (Unit – IV)</li> <li>Reference books:</li> </ul>
	<ol> <li>W. C. Y. Lee, "Mobile Cellular Communications", 2<sup>nd</sup> edition, McGraw Hill, 1995.</li> <li>KamiloFeher, "Wireless Digital Communications", PHI, 2003.</li> </ol>
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/106/106/106106167/</li> <li>https://nptel.ac.in/courses/117104099/</li> <li>https://swayam.gov.in/nd1_noc19_ee48/preview</li> </ol>

### 17EC4703/C: REMOTE SENSING AND GIS

<b>Course Category:</b>	Program Elective 4	Credits:	3
<b>Course Type:</b>	Theory	<b>Lecture - Tutorial -Practice:</b>	3-0-0
Prerequisites:	nil	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	CO1 Learn basic concepts of Remote Sensing.													
	CO2 Understand the concepts of Remote Sensing Platforms and Sensor by Indian government& GIS Fundamentals.											ensors	used		
	CO3	Lea	rn bas	sics of	imag	e proc	essin	g and	its rel	evan	ce to	the	remo	ote sen	sing.
	CO4	Unc	lerstai	lerstand the different Applications of Remote sensing in daily life.											
Contribution of Course		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	PSO 2
Outcomes towards	CO1	1	2											2	
achievement	CO2	3	2											3	
of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO3	2	2											2	
	CO4	1	2											2	
Course Content	UNI Con Defi Ener Ana Lim: (12F UNI Rem Para Sate Fund Syst Theo	<b>T-I</b> cept nition gy, 1 gy b lysis, itatio Irs) <b>T-II</b> note mete llites lame em, 7 pretic	of R n of 1 Interacy y Sensi Appl ns of 1 Sensi rs, Se , Carte ntals The F cal Mc	emot Remo sor, T icatio Remo ng P ensor osat S of GI our M odels o	e Ser te Se with ransm ns of te Ser latfor Parar eries, S: Int Is, G of GIS	rms a neters Resource Resource Resource S.(12H	Intro , Data sphere of Reco ote So Ideal Ideal and S , Ima urce S tion, 1 finitic Irs)	oduction a, Reme e, Interestion ensing Remo Senson AT So Roots ons an	on, D mote gractic and l g, Adv ote Ser s: In Sense eries, of G ad Ter	vistan Senson wi Proce vanta nsing trodu or S <u>y</u> Char IS, C	ce of ing th T ssing ges of Syst action ysten dray Overvology	of Ro Proce arge g, Into of R tem. n, S ns, I raan- view y, GI	emot ess, t, Re terpr emot atell Earth 1. of I S At	e Sen Source ecordin etation te Sen ite Syn reso nform rchitec	using, ce of ng of n and using, vstem urces ation cture,

UNIT-	Ш

	<b>Digital Image Processing:</b> Introduction, Basic Character of Digital Image, Preprocessing, Image Registration, Image Enhancement Techniques, Spatial Filtering Techniques, Image Transforms, Image Classification, Performance Analysis of IRS-bands for land use/land cover classification system using Maximum Likelihood Classifier, Image Classification and GIS.(12Hrs)
	<ul> <li>UNIT – IV</li> <li>Urban and Municipal Applications: Introduction, The Role of Satellite Imagery and Other Data Sets, The Indicator Function of Urban Land Uses, Appropriate Methodologies, An Analysis System.</li> <li>Forest Resources Management: Introduction, Geomatics in Forestry, Forest Cover Mapping and Change Detection, Dynamics of Forest Ecosystem and Forest Canopy, Forest Damage Assessment.</li> <li>Natural Disaster Management Landslides: Introduction, Major types of Landslides, Common Features of Landslides, Causes of Landslides and Related Phenomena, Landslide Analysis.(12Hrs)</li> </ul>
Text books and Reference books	<ol> <li>Text Books:         <ol> <li>Basudeb Bhatta, "Remote Sensing and GIS", 2<sup>nd</sup>Edition, Oxford Higher Education, 2008</li> <li>M Anji Reddy, "Textbook of Remote Sensing and Geographical Information Systems", 4<sup>th</sup>Edition, BS Publications, 2017.</li> </ol> </li> <li>Reference Books:         <ol> <li>Thomas M Lillesand Ralph W Kiefer Jonathan W Chipman "Remote</li> </ol> </li> </ol>
E-resources and other digital material	<ol> <li>I. Inomas W Emesand, Kalph W. Klefel, Johannan W. Chiphian, Kenote Sensing and Image Interpretation", 5<sup>th</sup>Edition, Wiley, 2009.</li> <li>https://nptel.ac.in/courses/105108077/</li> <li>https://nptel.ac.in/courses/121107009/</li> </ol>

<b>Course Category:</b>	Program Elec	ctive 4		Credits:	3
<b>Course Type:</b>	Theory			Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3503:	VLSI	Design,	<b>Continuous Evaluation:</b>	40
	17EC3601:	Digital	Signal	Semester end Evaluation:	60
	Processing			<b>Total Marks:</b>	100

### 17EC4703/D: VLSI SIGNAL PROCESSING

Course outcomes	Upon	succ	essfu	l com	pleti	on of	the c	cours	e, the	stud	ent w	vill be	e able	to:	
	CO1	App and	Apply the concepts of pipelining, parallel processing, Retiming, Folding and unfolding to optimize digital signal processing architectures.												
	CO2	Analyze data flow in systolic architectures.													
	CO3	Min algo	linimize the computational complexity using fast convolution gorithms.												
	CO4	Ana	lyze	pipeli	ining	and j	parall	lel pr	ocess	ing c	of IIR	filte	rs.		
Contribution of Course		PO 1	O         PO         PO </th <th>PSO2</th>											PSO2	
Outcomes towards	CO1	1	1											2	
of Program Outcomes	CO2	2												2	
(1 – Low, 2 – Medium, 3 –	CO3		2											2	
High)	CO4		2											2	
Course Content	UNIT Intro algor: FIR I Low I UNIT Retir Inequi for U Retin Techi (12 H UNIT	<b>F-I</b> ducti ithms Digita Powe <b>F-II</b> ning nalitie Jnfolo ning. nique Irs) <b>F-III</b>	ion t . Pip al filto r.(10 - Int s – R ding Foldi s – R	o DS elinin ers, P Hrs) roduc etimi – Pr ing - egiste	SP - ng ar Paralle ction ng T opert Intro er min	Typi nd Pa el Pro echni ties o ducti nimiz	efinit ques of U on -I cation	DSP el Pr ing, ions . Unf nfolc Foldin in fc	algo ocess Pipel and foldin ling ng Tr olded	rithm ing - ining Prop ng - I – cr ansfo arch	erties introd itical orm - itectu	epres oduct Paral S – S luctic Patl Reg ures.	entat tion, llel P Solvir on – A h, U ister	ions of Pipelin rocessi ng Syst An Algo nfoldin minimi	f DSP ing of ng for em of orithm g and zation
	Systo	olic A	Archi	itectu	ire l	Desig	;n -	Intr	oduc	tion	– S	ystol	ic A	Array I	Design

	<ul> <li>Methodology – FIR Systolic Arrays – Selection of Scheduling Vector.</li> <li>Fast Convolution - Introduction – Cook-Toom Algorithm – Winogard algorithm – Iterated Convolution – Cyclic Convolution. (12 Hrs)</li> <li>UNIT – IV</li> <li>Pipelined and Parallel Recursive and Adaptive Filters – Introduction – Pipeline Interleaving in Digital Filters, Pipelining in 1st-Order IIR Digital Filters, Pipelining in Higher-Order IIR Digital Filters, Parallel processing for IIR Filters. (10 Hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Keshab K. Parthi, "VLSI Digital Signal Processing- System Design and Implementation", Wiley Inter Science, 1998.</li> <li>Reference Books:</li> <li>1. Jose E. France, YannisTsividis, "Design of Analog – Digital VLSI Circuits for Telecommunications and Signal Processing", Prentice Hall, 1994.</li> <li>2. Medisetti V. K., "VLSI Digital Signal Processing", IEEE Press USA, 1995.</li> </ul>
E-resources and other digital material	<ol> <li>http://viplab.cs.nctu.edu.tw/</li> <li>http://people.ece.umn.edu/users/parhi/SLIDES/</li> </ol>

<b>Course Category:</b>	Programme Elective 5	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3 - 0 - 0
Prerequisites:	17EC3703: Microcontroller	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

### **17EC4704/A: EMBEDDED DEVICE DRIVERS**

Course outcomes	Upon	succ	ccessful completion of the course, the student will be able to:												
	CO1	Understands the Device Drivers need and loadable modules													
	CO2	Lea	Learn the debugging techniques and Advanced char driver operations												
	CO3	Unc	Understand fundamentals of hardware interface with kernel												
Contribution of Course		PO 1	PO         PO<												
Outcomes towards	CO1	1	1											2	
of Program Outcomes	CO2	2												2	
(1 – Low, 2 - Medium, 3 – High)	CO3		2											2	
Course Content	UNIT An In the I Numb Char Impo: Mem UNIT Debu Printi Faults Conc Mana Traps UNIT	F-I ntrod Kerne bering Dri rtant ory U F-II gging ing, D ing, D ing, D ing, M ta gemes a, Alta T-II b, Del	luction el, C g. Data Jsage <b>g Te</b> Debugg bugg <b>ncy a</b> ent, S ernation	on to lasse - Tl Strue, reac chnic gging ers ar and Sema ives t and	Devi s of he D ctures l and ques by Q nd Re Race phore o Loo Defe	ce D Dev esign s, Ch write - De ueryi lated Con es ar cking <b>rred</b>	river vices a of ar De bugg ing, I Tool ditio nd M	s - T and scull evice ying ing S Debug s. <b>ns</b> - futexe	he Ro Mo , Ma Regi with Suppo gging Pitfa es, C	ole of dules ijor a istrati the N ort in by V .lls in Comp uring	f the s, Se and I on, c lew E a the Vatch a scu letion	Devic Curity Mino open a Devic Kern ning, Il, Co ns, S	ce Dr y Iss r Nu and re es. nel, I Debu oncur pinlo pses,	iver, Sp ues, V mbers, elease, s (12 Debuggi gging S rency a cks, Lo (10 H	olitting fersion Some scull's Hrs) ng by bystem and Its ocking rs) ng the

	Current Time, Delaying Execution, Kernel Timers, Tasklets, Work queues <b>Allocating Memory</b> - The Real Story of kmalloc, Lookaside Caches, get_free_page and Friends, vmalloc and Friends, Per-CPU Variables, Obtaining Large Buffers <b>Communicating with Hardware</b> - I/O Ports and I/O Memory, Using I/O Ports, An I/O Port Example, Using I/O Memory. (8 Hrs)
	UNIT – IV
	Handler, Implementing a Handler, Top and Bottom Halves, Interrupt Sharing, Interrupt-Driven I/O
	Data Types in the Kernel - Use of Standard C Types, Assigning an Explicit
	Size to Data Items, Interface-Specific Types, Other Portability Issues, Linked
	Lists. (8 Hfs)
Text books and Reference	<ul> <li>Text Books:</li> <li>1. Jonathan Corbet, Alessandro Rubini, and Greg Kroah-Hartman, "Linux Device Drivers" O'Reilly Third Edition,2005.</li> </ul>
DOOKS	Reference Books:
	1. Robert Love, "Linux Kernel Development", 3rd Edition, Addison-Wesley
	Professional.
	2. SreekrishnanVenkateswaran, "Essential Linux Device Drivers", Prentice Hall.
E-resources and other digital material	1. https://www.coursera.org/lecture/iot-architecture/device-drivers-AL7YG

17EC4704/B: \$	SMART A	ANTENNAS
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<b>Course Category:</b>	Program Elective 5	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3701: Guided waves and	<b>Continuous Evaluation:</b>	30
	Antennas, 17EC3601: Digital	Semester end Evaluation:	70
	Signal Processing, 17EC4604/2:	Total Marks:	100
	Wireless Communications		

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Unc	lersta	nd th	e bas	ics of	f sma	irt ant	tenna	•					
	CO2	<sup>D2</sup> Understand the operation of adaptive antenna array system ar algorithms												n and	
	CO3	Unc	Understand the DOA estimation												
Contribution of Course		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
Outcomes towards achievement of Program Outcomes (1 – Low,	CO1	3		1										3	1
	CO2	3	1											3	1
2 - Medium, 3 – High)	CO3	3			1									3	1
Course Content	UNI' Intro anter Fixed array matri adapi UNI' Adaj Adap Array Limi' UNI' Adaj Diffe Grad Appr	<b>T-I</b> ductiona, E ductiona, E ductiona, E ductionary ix, Sp tive c <b>T-II</b> ptive y E tationary <b>T-III</b> ptive prentian ient roach.	on: P Benefi um S upact oatial ell se <b>arra</b> lemen s due <b>Alg</b> al St algor	hasec its of mart of n filter ctoriz ay sy ys, A nt S e to m orith eepes rithm	l arra smar anter umbe ing, s zation ysten Adapt Spacin niscel ms: st de with	y ant t anto nna s r of Switc n.(15) ns: A ive A ng o laneo The scent h con	tenna, eyster elem hed b Hrs) Adapt Array consi bus ar least algo nstrai	, opti Type ns: S ients. beam ive A proi derat tray e mea prithn ints,	mal a es of s ector Plan syste Array blem ions, ffects n squ n, the Simu	anten smart izatic aar ar ems, 1 7 Co: state Arr s. Bro uare e acc ilatio	na, a ante on, B rays, multij ncept emen ray oadba error celera n stu	daptiv nnas. road Beau ple fi : Mo t, Sig Perfo nd Pr (LM ted g idies.	ve an side m for xed b otivat gnal ormar cocess IS) a gradie Net	tennas, and Er rming, beam sy ion of Enviror nce, N sing. (10 H lgorithr ent app ural Ne (10	Smart ad fire Butler stems, using ument, fulling Hrs) n, the roach, etwork Hrs)

	<b>UNIT-IV</b> <b>DOA Estimation</b> : Conventional Subspace methods.ML estimation techniques. Stimation of the number of sources using eigen decomposition. Direction finding and true ranging PL systems. Elliptic and hyperbolic PL systems. TDOA estimation techniques. MUSIC algorithms, Smart antenna receivers, MIMO systems. (15 Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. L. C. Godara, Smart Antennas, CRC Press.</li> <li>Reference Books:</li> <li>1. T. K. Sarkar, M. C. Wicks, M. Salazar Palma, and R. Bonneau, Smart Antennas, John Wiley &amp; Sons and IEEE Press, 2003.</li> <li>2. C. A. Balanis, "Antenna Theory: Analysis and Design", 3<sup>rd</sup> edition, New York: Wiley, 2005</li> <li>3. J. G. Proakis, "Digital Communications", 4th ed. New York: McGraw-Hill, 2001.</li> </ul>
E-resources and other digital material	<ol> <li>http://www.altera.com/end-markets/wireless/advanced- dsp/beamforming/wir-beamforming.html</li> <li>http://en.wikipedia.org/wiki/Smart_antenna</li> </ol>

### 17EC4704/C: ANALOG & DIGITAL IC DESIGN

<b>Course Category:</b>	Program Elective 5	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Und	lersta	nd th	e inte	egrity	, per	forma	ance	and e	energ	y met	rics o	of an in	verter
	CO2	Apply the appropriate logic families in the design of combinational and sequential circuits													al and
	CO3	Ana	Analyze the behavior of single stage amplifiers and current mirrors												S
	CO4	Ana	Analyze and quantify differential amplifier and operational amplifier												
Contribution of Course		PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	РО 12	PSO1	PSO2
Outcomes towards	CO1	1	1											2	1
achievement	CO2	2												2	2
of Program Outcomes (1 – Low,	CO3		2											2	
2 - Medium, 3 - High)	CO4		2											2	
Course Content	UNIT The of CM Desig Comp desig dynar UNIT Desig regist seque UNIT Singl gate Frequ	<b>F-I</b> CMOS gning pleme n, D mic lo <b>F-II</b> gning ters, l ential <b>F-III</b> le Sta and lency	OS In inver Cor entary ynam ogic. Sec Dyna circu age A source resp	y cm nbin y CM nic lo nic lo nic lo nic lo nic, N mpli ce fo onse,	er - S Dynan ation [OS, ogic: tial l atche Non-b ifiers llowe	Static mic b al La Ratic Basi Logic es and oistab and er sta S cur	CM0 ehavi ogic bed lo ic pr e Cin d regi le sec Cur ages- rent r	OS ir iour, Gate ogic, incip cuits sters quent rent Cas- nirro	Nverte Powe s in Pass le, S s - 1 , Pipe ial ci Mirri code rs-so	er, St er, Er <b>CM(</b> trans peed Introd elinir rcuits rors and urces	atic l hergy <b>DS -</b> istor and duction g: A s. - Con fold .(12F	oehav , and Static logic pow on, S n app nmor ed ca Irs)	riour, energ c CN , Dyn ver c Static oroac n sou	Perform gy- dela IOS de namic ( lissipati (12Hrs) latche h to op (12] rrce, con le struc	mance ny. sign – CMOS on of ) s and timize Hrs) mmon ctures-

1

	<b>UNIT-IV</b> <b>MOS Differential Amplifiers and Operational Amplifiers</b> - Single ended and differential operation, Basic differential pair, Common mode response, Frequency response- CMOS operational amplifiers - One-stage op-amps and two stage op-amps.(10Hrs)
Text books and Reference books	<ol> <li>Text Books:         <ol> <li>Jan M. Rabaey, Anantha P. Chandrakasan, BorivojeNikolic, "Digital Integrated Circuits: a Design Perspective", Pearson Education, 2<sup>nd</sup> Edition, 2011.</li> <li>BehzadRazavi, 'Design of Analog CMOS Integrated Circuits' Tata- McGrawHill, 2<sup>nd</sup> edition, 2017.</li> </ol> </li> <li>Reference Books:         <ol> <li>Kang, S. M., &amp;Leblebici, Y., "CMOSdigital integrated circuits", Tata McGraw-Hill Education, 3<sup>rd</sup> Edition, 2014.</li> <li>David A Johns &amp; Ken Martin, "Analog Integrated Circuit Design", John Wiley and Sons, 2<sup>nd</sup> edition, 2012.</li> <li>Philip Allen &amp; Douglas Holberg, "CMOS Analog Circuit Design", Oxford University Press, 3<sup>rd</sup> Edition, 2012.</li> </ol> </li> </ol>
E-resources and other digital material	<ol> <li>http://www.nptelvideos.in/2012/11/digital-integrated-circuits.html</li> <li>https://www.classcentral.com/course/nptel-cmos-digital-vlsi-design-12964</li> <li>CMOS Analog VLSI Design by Prof. A.N. Chandorkar,Department of Electronics &amp; Communication Engineering,IITBombay.For more details on NPTEL visit http://nptel.ac.in</li> </ol>

<b>Course Category:</b>	Program Elective 5	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3401:Probability	<b>Continuous Evaluation:</b>	30
	theory, 17EC4604/B: Image	Semester end Evaluation:	70
	and Video Processing	Total Marks:	100
	5		

### 17EC4704/D: DATA COMPRESSION

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Unc	lersta	nd im	porta	nt of d	ata co	mpres	sion.						
	CO2	Develop reasonably sophisticated data compression methods.													
	CO3	An	Analyze standards and coding techniques appropriate for the task												
Contribution of Course		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
Outcomes towards	CO1	3												3	
achievement of Program	CO2	3				3								3	
Outcomes (1 – Low, 2 - Medium, 3 – High)	CO3	3				3								3	
Course Content	UN Los Intr app seq LZ UN Los Intr unit ove qua UN Tra Dis	IT I ssless oduc licati uence W co IT II ssy C oduc form r sca ntiza IT-I ansfo crete	<b>Con</b> tion ions e. Co ding <b>Comp</b> tion quan lar q tion, <b>II</b> <b>Prm</b> Wal	mpre to lo of H ompa: , Facs oressi to sc ntizat uanti trelli Sh Ha	ssion ssless uffma rison simile on calar ion, a zation is cod	and v and v daptiv n, tree ed qu or Co ard Ti	pressi ling, iffman oding. ector ve qua e struc antiza ompr ransfo	on teo introd n and quan antiza ctured ation. ession rm, a	chniqu luction arithr tizatic tion, a vecto <b>n:</b> KI nd Wa	ues, H n to a netic on tec advant or qua	Iuffma arithm codin hniqu tages antizat	an coo etic c g. Ru es, ur of vec ion, s n, DC	ding a coding n leng niform ctor qu structu	llgoriti , codi th cod (13) a and antiza red ve (12H FT, I (12H	hms, ng a ding, Hrs) non- ation ector rs) DST, Irs)

	UNIT-IV Compression Standards Image Compression: JPEG, JPEG-LS, JBIG, JPEG2000. Audio Compression: MP3, MDCT. Video compression: MPEG-1, MPEG-2- H.262, MPEG-4. (14Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Introduction to Data Compression, 3<sup>rd</sup>Edition, Khalid Sayood, MorganKauffman.</li> <li>Reference Books:</li> <li>1. Salomon, D., MoŠa, G. Handbook of Data Compression, Springer, 2010.</li> </ul>
E-resources and other digital material	<ol> <li>http://rahilshaikh.weebly.com/uploads/1/1/6/3/11635894/data_compression.pdf</li> <li>https://www.elsevier.com/books/introduction-to-data-compression/sayood/978-0-12-620862-7</li> <li>http://ceng2.ktu.edu.tr/~cakir/files/sistemlab/Handbook%20of%20Data%20Compression,%205th%20Edition.pdf.</li> </ol>

### **17EC4751: RTOS/NETWORKS SIMULATION LAB**

Course Category:	Programme Core	Credits:	1.5
Course Type:	Theory	Lecture - Tutorial -Practice:	0 - 0 - 3
Prerequisites:		<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Design and execute the different RTOS concepts for embedded system design													em
	CO2	Dev	Developing the RTOS application on Micro controller board Conduct simulation experiments using NetSim												
	CO3	Co													
Contribution of Course		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
Outcomes towards	CO1			1	1	2				2				2	
achievement of Program Outcomes	CO2			2		2				2				2	
Medium, 3 – High)	CO3				2	2				2				2	
Course Content	Expe 1 2 3 4 5 Expe 6 7 8 9 1 <sup>4</sup> 1	rimer . Tas . Bu . Tas . Syr . Mu erime . Un . Sin . Stu 0. An 1. Stu AP	nts us sk Cre tton a sk Pri- nchron itual o nts u dersta dersta dersta idy ho alyze idy ho alyze	ing A eation nd LH ority 1 nizing exclu sing 1 und w and th ow chat the p ow thr wirele	<b>RM</b> , Imple ED Ta Imple g task sion b <b>NetSi</b> orking study e wor annel erforr oughj ess no	with l lements sk an menta and n betwe <b>m 10</b> g of A the sp king of select nance but of des is	RTOS itation d Inte ation nultip en tw .1(v). .RP, a pannin of cor tion e: of 80 WLA varie	S: n and f rrupt le even to tash ond IP ng tree mection ffects (2.11g (N ne d.	Deleti codin ents us cs usi ' forw e prot on est packed g as th twork	ion g sing s ng bir arding ocol. cablish et coll te nun c chan	emap nary s g with nment lisions nber c ges as	hore semap in a I t in T( s in W of nod s dista	CP/IP CP/IP LAN les arc ance b	and acr e increa	oss ased. n the
## **17EC4752: ADVANCED COMMUNICATIONS LAB**

<b>Course Category:</b>	Core	Credits:	1.5
<b>Course Type:</b>	Lab	Lecture - Tutorial -	0-0-3
		Practice:	
Prerequisites:	17EC3404: Analog	<b>Continuous Evaluation:</b>	30
	Communications	Semester end Evaluation:	70
	17EC4603/C: Microwave	<b>Total Marks:</b>	100
	Engineering, 17EC3702/2: Optical		
	and Satellite Communications		

Course outcomes	Upon	n successful completion of the Lab course, the student will be able to:													
	CO1	Me Lin	Measure the characteristics of optical sources, detectors and Losses in Optical Link.												
	CO2	Mea	Aeasure the characteristics of various microwave devices												
	CO3	Con	Convert subsystems of conventional radio into software modules												
Contribution of Course		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
Outcomes towards	CO1			1	3	2				2				1	1
achievement of Program	CO2			1	3	2				2				2	1
Outcomes (1 – Low, 2 - Medium,	CO3			3	3	2				2				3	1
3 – High)															
Course Content	1. 2. 3. 4. 5. 6. 7. 8. 9. 10.	OPT Char Conr Set-u RS-2 Digit MIC Char Scatt High Gain Radia Verif	ICAI acteri nector p Dig 32 Se al Lin ROV acteri ering and l &Din ation	L EX stics and gital T erial C nk VAVI stics paran Low rectiv patter	PER of Op Bend Time Comm E EX of Mi meter VSW ity of rn & T expre	IME otical ing lo Divis nunic PER icrow s of I R me The g beam	NTS source loss me ion N ation IMEI ave o Direct asure given width $\frac{1}{\lambda_0^2} =$	tes an easure fultip betwo <b>NTS</b> scilla ional ment Horn n of th $\frac{1}{\lambda_c^2} + \frac{1}{\lambda_c^2}$	d det emen lexin een tv tors Coup for th anten he Ho $\frac{1}{\lambda_g^2}$ .	ectors t of th g usir wo Co bler/E ne giv nna orn an	s ne opt ng op ompu /H Pl ren lo tenna	tical f tical f ters u lane T ad a.	ibers fiber sing	Fiber (	Optic ator
	11. 12.	Input Diele	: impe	edanc const	e and	l atter	iuatio remei	n me	asure the g	ment iven	tor the mater	ne giv rial.	en de	evice.	

#### **SDR EXPERIMENTS**

- 1. Analog Modulation techniques (AM, FM) implementation using Software Defined Radio platform.
- 2. Digital Modulation techniques (ASK,FSK,PSK) implementation using Software Defined Radio platform.
- 3. Orthogonal Frequency Division Multiplexing (OFDM) implementation using Software Defined Radio platform.

### 17EC5753 - MINI PROJECT

Upon successful completion of the course, the student will be able to:

CO1	Identify the problem related to the society.
CO2	Analyze the problem from state of the art for arriving at feasible solutions.
CO3	Apply the acquired knowledge to carry out project.
CO4	Prepare and organized report employing elements of technical writing & critical thinking
	timiting.

#### **CO-PO/PSO Mapping:**

	PO1	PO2	PO3	PO4	Р О5	PO6	PO7	PO 8	PO 9	PO1 0	PO1 1	PO12	PSO1	PSO2
CO1		2				3					2			
CO2	3	3	2	2										
CO3	2				3				3					
CO4			2				2	2	3	2		2	1	1

## **17EC4801/A: APPLICATION OF MEMS TECHNOLOGY**

Course Category:	Programme Elective – 6	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC3302-Analog Electronics,	<b>Continuous Evaluation:</b>	30
	17EC3402- Linear Integrated	Semester end Evaluation:	70
	Circuits and Applications	<b>Total Marks:</b>	100

Course outcomes	Upon	Upon successful completion of the course, the student will be able to:													
	CO1	Und devi	lerstan	nd the	e basi	c con	cepts	of M	EMS	tech	nolog	y and	worl	king of l	MEMS
	CO2	D2Understanding the concepts of fabrication process of MEMS, Design and Packaging Methodology.D3Analyze the various fabrication techniques in the manufacturing of MEMS Devices.													
	CO3														
	CO4	Stuc Mec	tudy and Analyze the different types of RF switches, Various Switching Alechanism and their applications.												
Contribution of Course Outcomes towards achievement of Program		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
	CO1	2		2											
	CO2					2									
Outcomes (1 – Low	CO3	2		2											
2 - Medium, 3 – High)	CO4			2			2							1	
Course Content	UNIT-I         Overview of MEMS and Micro Systems: Introduction, miniaturization, Reliability, Advantages of MEMS, working principles of chemical sensors, optical, pressure and thermal sensors, micro actuation: actuation using thermal forces, actuation using piezo electric crystals, actuation using electrostatic forces; Micro accelerometers, Micro fluidics, MEMS switches, Phase shifters, Varactors, Tunable oscillators. (13 Hrs)         UNIT-II         Basics of MEMS technology: Molecular theory of matter and intermolecular														

	miniaturization, Engineering mechanics: static bending of thin plates, mechanical vibrations, thermo mechanics, fluid flow in nano scale. Micro system Design: Introduction, design considerations, process design, mechanical design, micro system packaging, essential packaging technologies, 3D packaging, assembly, selection of materials,System level packaging, single and multichip packaging. (13 Hrs)
	<b>UNIT-III</b> <b>Fabrication methods:</b> Lithography: Introduction, wafers, masks, spinning resist and soft baking, exposure and post exposure treatment, resolution, mathematical expression of resist profiles, imagereversal, interface effects, radiation and resist profiles, ion implantation, diffusion, oxidation, RIE, Chemical Vapor Deposition (CVD), Physical vapor Deposition (PVD), deposition by epitaxy, comparison of bulk and surface micromachining, comparison of wet and dry etching, LIGA process. (12 Hrs)
	<ul> <li>UNIT-IV</li> <li>Applications of MEMS-Switching: Introduction- Switch parameters- Basics of switching - Mechanical switches - Electronic switches for RF and microwave applications - Mechanical RF switches - PIN diode RF switches - RF.</li> <li>MEMS switches: Integration and biasing issues for RF switches - Actuation mechanisms for MEMS devices- Electrostatic switching - Approaches for low-actuation - voltage switches - Mercury contact switches - Magnetic switching - Electromagnetic switching - Thermal switching.(12 Hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1.Tai-Ran Hsu, "MEMS and Microsystems: Design and Manufacture", Tata McGraw Hill, 2002.</li> <li>2. Gabriel M. Rebeiz, "RF MEMS Theory, Design and Technology", Wiley India Pvt Ltd.</li> </ul>
	<ul> <li>Reference Books:</li> <li>1. Stephen D. Senturia, "Microsystem Design", Springer International Edition. (2010).</li> <li>2. Mohamed Gad-el-Hak, "The MEMS Handbook", CRC Press, 2002.</li> <li>3. Chang Liu, "Foundations of MEMS", 2<sup>nd</sup>Edition, Pearson Publication.</li> </ul>
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/117105082/4</li> <li>https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6- 777j-design-and-fabrication-of-microelectromechanical-devices-spring- 2007/lecture-notes/</li> <li>https://www.edx.org/course/micro-nanofabrication-mems-epflx-memsx-0</li> </ol>

17EC4801/B:	WIRELESS	<b>NETWORKS</b>
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<b>Course Category:</b>	Programme Elective 6		Credits:	3
<b>Course Type:</b>	Theory		Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC4703/2:Mobile	&	<b>Continuous Evaluation:</b>	30
	Cellular Communication		Semester end Evaluation:	70
			Total Marks:	100

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Und	erstan	d the a	rchite	cture	of dif	ferent	wirel	ess ne	etworl	ks.			
	CO2	Unc	lersta	nd th	ne rol	e of 1	netw	ork l	ayer	in w	irele	ss ne	etwo	rks.	
	CO3	Und	ersta	nd the	e role	of tra	nspo	rt lay	er in	wire	less n	ietwo	rks.		
	CO4	Und	ersta	nd the	e netw	vork a	archit	ectur	e of v	virele	ess w	ide a	rea n	etwor	ks.
Contribution of Course		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
Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO1	1	1	2										2	
	CO2	3	2											3	
	CO3	2	2	3										2	
	CO4		2	2										2	
Course Content	UNI WIF Intro- spect layer Hipe: mana Spec UNI MO Intro- encap initia distan UNI MOI TCP contr	T-I RELF ductic rum - rLAN ger F trum a T-II BILF ductic osulat tion p nce ve F-III BILE enha ol, fa	CSS I $Drotoc la 2 - I$ $C la 2 - I$ $C ne la 2 - I$ $C ne$	LAN LAN 802.1 lyer, Blueto ol, so tion f TWC Iobild IPV6 ol – Dyna NSPC ents ransn	tech 1: Sy 802.1 both: courity or WI ORK e IP: 1 -Netwe mobil mic set ORT 1 for white the set or white the	nolog vstem 1b, Archi y – I MAX IP pac ork e ad- ource LAY ireles	gies: arch 802.1 itectu EEE8 C. YER cket of layer hoc r hoc r routi ER s pro overy	Infra itectu 11a re, R 302.1 delive in netwo ng.(1	ared, ure, p – Hi adio 6-WI ery, A the ork: F 2Hrs ls – plica	UH per Laya MA2 Agent inter Routin ) Trad	IF n col at LAN er, Ba C: Ph disconet- ng, D itiona of r	arrov rchite : W aseba aysica overy Mob estina	vban ecture ATM and 1 al 1ay r, tun ile 1 ation	d, sp e, phy 1, BF ayer, N (14Hr (14Hr neling IP se Sequ Conge - Clas	yread vsical XAN, Link IAC, s) g and ssion hence

	TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP – TCP over 3G wireless networks. (12Hrs) UNIT-IV WIRELESS WIDE AREA NETWORK Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GMSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.(12Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Jochen Schiller, Mobile Communications", 2<sup>nd</sup> Edition, Pearson Education 2012. (Unit-I,II,III)</li> <li>2. Vijay Garg, "Wireless Communications and networking", 1<sup>st</sup> Edition, Elsevier 2007. (Unit-IV)</li> </ul>
	<ol> <li>Reference Books:         <ol> <li>Clint Smith, P.E.Daniel Collins, "Wireless Networks: Design and Integration for LTE, EVDO, HSPA, and WiMAX", 3<sup>rd</sup> Edition, McGraw- Hill Education, 2014.</li> <li>Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", 2<sup>nd</sup> Edition, Academic Press, 2008.</li> <li>Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", 1<sup>st</sup> Edition, Elsevier 2011.</li> <li>Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", 1<sup>st</sup> Edition, Pearson Education 2013.</li> </ol> </li> </ol>
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/106105160/</li> <li>http://www.nptelvideos.in/2012/12/wireless-communication.html</li> </ol>

# 17EC4801/C: CRYPTOGRAPHY AND DATA SECURITY

<b>Course Category:</b>	Programme Elective	e 6	Credits:	3
<b>Course Type:</b>	Theory		Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	17EC4604/D:	Computer	<b>Continuous Evaluation:</b>	30
	Networks		Semester end Evaluation:	70
			Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Understand the basic principles and terminology in network security.													
	CO2 Identify the possible threats to each mechanism and ways to protect aga these threats.														gainst
	CO3 Analyze various cryptographic protocols and algorithms.														
	CO4	Understand the requirements of real-time communication security.													
Contribution of Course		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
Outcomes towards	CO1	2	2												3
achievement of Program	CO2	3				2									3
Outcomes	CO3	3	2												3
(1 – Low, 2 - Medium, 3 – High)	CO4	2				2									3
Course Content	UNIT-IOverview: The OSI security architecture, Security Attacks, Security Services, Security Mechanisms, A model for Network security.Classical Encryption Techniques: Symmetric cipher model – Cryptography, Cryptanalysis.Block Ciphers and the DES: Block cipher principles, Fiestel Cipher structure, The DES, The strength of DES. (10Hrs)UNIT-IIPublic key cryptography and RSA: Principles of public key cryptosystems, The RSA Algorithm.Key Management:Diffie-Hellman Key exchange. Message Authentication andHashFunctions:Authentication Requirements, Authentication Functions, SHA, Digital Signatures. (12Hrs)UNIT-IIIIP Security: IP Security Overview, IP Security Architecture. Web Security: Web Security Considerations, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction.														

	UNIT-IV Intruders: Introduction, Intrusion Detection, Password Management. Malicious Software: Viruses and related threats, Virus countermeasures Firewalls: Firewall Design Principles.(14Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. William Stalligs, Cryptography and Network Security: Principles and Practice. 4<sup>th</sup>edition, Pearson Education.</li> <li>Reference Books:</li> <li>1. Charlie Caufman, Radia Perlman and Mike Speciner, "Network Security-Private Communication in a Public World" 2<sup>th</sup> edition, PHI.</li> <li>2. Mark Burgess, "Principles of Network and Systems Administration", JohnWiley.</li> </ul>
E-resources and other digital material	<ol> <li>1.https://nptel.ac.in/courses/106105031/</li> <li>2. https://nptel.ac.in/courses/106105162/</li> <li>3. https://faculty.nps.edu/dedennin/publications/Denning CryptographyDataSecurity.pdf</li> </ol>

### **17EC5851 - MAJOR PROJECT**

Upon successful completion of the course, the student will be able to:

CO1	Define, Schedule and demonstrate the project objectives and outcomes in an effective manner
CO2	Apply appropriate research methodology to provide a solution to the chosen problem
CO3	Develop and validate the solution using current techniques.
CO4	Prepare a comprehensive report of the project work using modern tools

#### **CO-PO/PSO Mapping:**

	PO	PSO	PSO											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	3	3									3	2	2
CO2	1	2	3	2	3									
CO3						3	2	3	2			2	2	2
CO4						2		2	3	3	3		1	1