# VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE

# Effective from 2020-21



# VR20 SCHEME OF INSTRUCTIONS B.Tech. PROGRAMME [VR20]

B.Tech. Degree Programs Applicable for the batch of students admitted from the Academic Year 2020-21

VELAGAPUDI RAMAKRISHNA SIDDHARTHA ENGINEERING COLLEGE (Autonomous, Accredited with 'A' grade by NAAC) Affiliated to Jawaharlal Nehru Technological University Kakinada Approved by AICTE & ISO 9001: 2008 Certified Kanuru, Vijayawada -520 007, Andhra Pradesh  $\Box$ : 0866 2582333 www.vrsiddhartha.ac.in

## Velagapudi Ramakrishna Siddhartha Engineering College ELECTRONICS AND COMMUNICATION ENGINEERING

### SEMESTER I

### **CONTACT HOURS: 26**

S. No.	Course Code	Subject	L	Т	Р	Credits
1.	20BS1101	Matrices and Differential Calculus	3	0	0	3
2.	20BS1102	Engineering Physics	3	0	0	3
3.	20ES1103	Programming for Problem Solving	3	0	0	3
4.	20ES1104	Basics of Electrical Engineering	3	0	0	3
5.	20HS1105	Technical English and Communication Skills	2	0	0	2
6.	20BS1151	Engineering Physics Laboratory	0	0	3	1.5
7.	20ES1152	Programming for Problem Solving Laboratory	0	0	3	1.5
8.	20HS1153	Technical English and Communication Skills Laboratory	0	0	3	1.5
9.	20ES1154	Computing and Peripherals Laboratory	0	0	2	1
10.	20MC1106	Technology and Society		0	0	-
Total			15	0	11	19.5
11.	11.   20MC1107   Induction Program					-

### SEMESTER II

S. No.	<b>Course Code</b>	Subject	L	Т	Р	Credits
1.	20BS2101	Laplace Transforms and Integral Calculus	3	0	0	3
2.	20BS2102	Engineering Chemistry	3	0	0	3
3.	20ES2103	Object Oriented Programming using Python	3	0	0	3
4.	20ES2104B	Circuit Analysis	3	0	0	3
5.	20ES2105	Engineering Graphics	1	0	4	3
6.	20BS2151	Engineering Chemistry Laboratory	0	0	3	1.5
7.	20ES2152	Object Oriented Programming using Python Laboratory	0	0	3	1.5
8.	20ES2153	Engineering Workshop	0	0	3	1.5
9.	20MC2106	Professional Ethics and Practice	1	0	0	-
		Total	14	0	13	19.5

### **CONTACT HOURS: 28**

### SEMESTER III

S.No.	<b>Course Code</b>	Subject	L	Т	Р	Credits	
1	20BS3101	Complex Analysis and Numerical Methods	3	0	0	3	
2	20EC3302	Analog Electronics	3	0	0	3	
3	20EC3303	Microcontrollers	3	0	0	3	
4	20EC3304	Digital Circuit Design	3	0	0	3	
5	20EC3305	Probability Theory & Random Processes	3	0	0	3	
6	20EC3351	Analog Electronics Lab	0	0	3	1.5	
7	20EC3352	Microcontrollers Lab	0	0	3	1.5	
8	20EC3353	Digital Circuit Design Lab	0	0	3	1.5	
9	20TP3106	Logic and Reasoning	0	0	2	1	
10	20MC3107A	Environmental Studies	2	0	0	-	
	Total Credits         17         0         11         20.5						

#### SEMESTER IV

S. No.	Course Code	Course Title	L	Т	Р	Credits	
1.	20BS4101	Signals & Systems	3	0	0	3	
2.	20ES4102	Control Systems	3	0	0	3	
3.	20EC4303	Pulse and Switching Circuits	3	0	0	3	
4.	20EC4304	Analog & Digital Communications	3	0	0	3	
5.	20HS4105	Universal Human Values	3	0	0	3	
6.	20EC4351	Signals & Systems Lab	0	0	3	1.5	
7.	20EC4352	Pulse & Switching Circuits Lab	0	0	3	1.5	
8.	20EC4353	Analog & Digital Communications Lab	0	0	3	1.5	
9	20EC4106	English for Professionals	0	0	2	1	
10	20EC4607	Skill Oriented Course 1	1	0	2	2	
11	20MC4108B	Indian Constitution	2	0	0	-	
	·	Total	18	0	13	22.5	
Summer Internship six weeks (Mandatory) during summer vacation (EPICS)							
Honors	s/Minor Courses (t	he hours distribution can be 3-0-2 0r 3-1-0 also)	4	0	0	4	

### **SEMESTER V**

<u>S.No</u>	Course Code	Subject	L	Т	Р	Credits
1	20EC5301	VLSI Design	3	0	0	3
2	20EC5302	Digital Signal Processing	3	0	0	3
3	20HS5103	Engineering Economics and Management	2	0	0	2
	2012/05/10/	A. Information Theory & Coding				
1		B. Microwave Engineering	2	0	0	2
4	20EC3404	C. Electronics Measurements & Instrumentation	3	0	0	3
		D. Computer Networks				
		A. Satellite communications				
5	20EC5205	B. Digital System Design Using Verilog	3	0	0	3
		C. Computer Organization				
6	20EC5351	VLSI Design Lab	0	0	3	1.5
7	20EC5352	Digital Signal Processing Lab	0	0	3	1.5
8	20HS5153	Advanced Communication Skills Lab	0	0	2	1
9	20TP5106	Personality Development	0	0	2	1
10	20EC5354	EPICS/Internship	0	0	3	1.5
11	20EC5607	<ul> <li>A. Networking Essentials</li> <li>B. Programming on ARM Cortex-M3</li> <li>C. Graphical System Design</li> <li>D. Software Design Tools</li> </ul>		0	2	2
12	20MC5108A	Biology for Engineers	2	0	0	-
		Total	16	0	17	22.5
Hono	rs/Minor Cours	es (hours distribution can be 3-0-2 0r 3-1-0 also)	4	0	0	4

### SEMESTER VI

S.No	<b>Course Code</b>	Subject	L	Т	Р	Credits
1	20EC6301	Transmission Lines	3	0	0	3
2	20EC6302	Linear Integrated Circuits	3	0	0	3
3	20EC6303	Designing with PLDs	2	0	0	2
4	20EC6404	A. Mobile & Cellular Communications	3	0	0	3
		B. Embedded Systems & RTOS				
		C. Nano Electronics				
		D. Image & Video Processing				
5	20EC6205	A. Advanced Microcontrollers	2	0	2	3
		B. Neural Networks & Fuzzy Logic				
		C. High-Speed Communication Networks				
6	20EC6351	PLDs Lab	0	0	3	1.5
7	20EC6352	Linear Integrated Circuits Lab	0	0	3	1.5
8	20EC6353	Advanced Communications Lab	0	0	3	1.5
9	20TP6106	Quantitative Aptitude	0	0	2	1
10.	20EC6554	Mini Project-1	0	0	2	1
11	20MC6107B	Innovation, IPR and Entrepreneur ship	2	0	0	0
Industrial/Research Internship 2 Months (Mandatory) during summer vacation						
		Total	15	0	15	20.5
Hon	Honors /Minor Courses (the hours distribution can be 3-0-2 0r 3-1-0 also)					4

#### **SEMESTER VII**

#### **CONTACT HOURS:29**

S.No	Course Code	Subject	L	Т	Р	Credits
1	20EC7301	Antennas & Wave Propagation	3	0	0	3
		A. Introduction to Machine Learning	3	0	0	3
2	20EC7402	B. Optical Communications				
		C. Wireless Networks				
		D. Signal Processing Architectures				
	20EC7403A. DSP Processors & Architectures					3
3		B. Adhoc & Sensor Networks				
		C. Semiconductor Device Modeling				
		D. RADAR Principles				
	20EC7404	A. Data Compression	3	0	0	3
4		B. Satellite Communications				
		C. RF Circuit Design				
		D. System Design With Embedded Linux				
	20EC7205	A. Remote Sensing & GIS	2	0	2	3
5		B. 5G New Radio Architectures				
		C. MEMS and NEMS				
	20EC7206	A. Computer Vision & Applications	2	0	2	3
6		B. Global Navigational Satellite Systems				
		C. SDR				
7	20EC7107	PEGA	1	0	2	2
8	20EC7551	Mini Project - II	0	0	3	1.5
9	20EC7552	Industrial/Research Internship 2 Months (Mandatory)	0	0	3	1.5
		after 3 <sup>rd</sup> year (to be evaluated during VII Semester				
		17	0	12	23	
Honor	s /Minor Course	s (the hours distribution can be 3-0-2 0r 3-1-0 also)	4	0	0	4

\*There is a provision for the Universities/Institutions to implement AICTE mandatory course

"Universal Human Values 2: Understanding Harmony" under Humanities and Social Science Elective in Seventh Semester for 3 Credits

Note: Open Elective Courses may opt as self-learning course. Students register and complete the opted course in approved MOOCS platform on or before last instruction day of VII Semester. They have to submit the certificate before the last instruction day of VII semester

#### SEMESTER VIII

S.No	Course Code	Course	Subject	L	Т	Р	Credits	
1	20EC8551	Major Project**	Project work	0	0	24	12	
	Internship (6 Months)							

## Velagapudi Ramakrishna Siddhartha Engineering College ELECTRONICS AND COMMUNICATION ENGINEERING

#### **SEMESTER I**

S. No.	Course Code	Course	Subject	L	Т	Р	Credits
1.	20BS1101	Basic Science Course	Matrices and Differential Calculus		0	0	3
2.	20BS1102	Basic Science Course	Engineering Physics	3	0	0	3
3.	20ES1103	Engineering Science Course	Programming for Problem Solving	3	0	0	3
4.	20ES1104	Engineering Science Course	Basics of Electrical Engineering	3	0	0	3
5.	20HS1105	Humanities and Social Science	Technical English and Communication Skills	2	0	0	2
6.	20BS1151	Basic Science Course	Engineering Physics Laboratory	0	0	3	1.5
7.	20ES1152	Engineering Science Course	Programming for Problem Solving Laboratory	0	0	3	1.5
8.	20HS1153	Humanities and Social Science	Technical English and Communication Skills Laboratory	0	0	3	1.5
9.	20ES1154	Engineering Science Course	Computing and Peripherals Laboratory	0	0	2	1
10.	20MC1106	Mandatory Course	Technology and Society	1	0	0	-
Total				15	0	11	19.5
11.	20MC1107	Mandatory Course	Induction Program				-

### **20BS1101 – MATRICES AND DIFFERENTIAL CALCULUS**

<b>Course Category:</b>	Basic Science	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 0- 0
Prerequisites:	Fundamentals of Matrices,	<b>Continuous Evaluation:</b>	30
	Fundamentals of Calculus,	Semester end Evaluation:	70
	Integration, Differentiation-1.0	Total Marks:	100

Course	Upon si	uccessf	ful con	pletio	n of th	e cours	se, the	studen	t will ł	be able	to:		
outcomes	CO1	Deter	mine Ei	gen val	ues, Eig	gen vec	tors of	a matri	X				
	CO2	Estim	ate May	kima an	d Minii	na of N	Iultivar	riable fu	unctions	5			
	CO3	Solve	olve the Linear differential equations with constant coefficients.										
	CO4	Solve	ve the Linear differential equations with variable coefficients-12										
Contribution		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO
of Course Outcomes			2	3	4	5	6	1	8	9	10	11	12
towards	CO1	3	2			1							
achievement of Program	CO2	3	2			1							
Outcomes	CO3	3	2			1							
(1 – Low, 2 - Medium, 3 – High	CO4	3	2			1							
Content	Matrice values a by Caylic canonica UNIT- Different theorem Maclaur Applica Function Maxima multiplica UNIT- Different exact eq Applica Linear I the component	s: Cons nd Eige ey- Har al form, II ntial C: , Cauch in's ser tion: C ns of 7 and m ers III ntial Eq uations. tions: C Different plement re to sol	sistency n vector nilton t Nature alculus ny's ma ies and urvature <b>Fwo or</b> ninima <b>Juation</b> Orthogo ntial Ea tary fun- ve the o	<ul> <li>of line ors, Propheorem of a quitient</li> <li>Fundation val Taylor'</li> <li>Radiu</li> <li>More of fundation</li> <li>s of Finant</li> <li>quation</li> </ul>	ear syste perties of a Redu adratic amental ue theo is series is of cu <b>Varia</b> ctions of <b>rst Ord</b> ectories <b>ns of H</b> i Inverse	em of e of Eige ction to form, C theore orem a rvature <b>bles:</b> T of two ler: Ex , Newto operato	equation n value o diago Comple: ems - 1 nd Tay Faylor's variabl act diff on's law <b>Drder:</b> or, Rule	ns, Line es, Find nal forn x matrie Rolle's lor's ti s theore les, Lay ferentia w of coo Definit	ear tran ing invo m, Red ces theorem heorem em for grange' 1 equati oling. ions, O inding	sformaterse and uction m, Lag , Expan functions functions formations formations perator	ions, V d power of quad grange's nsions on of tr od of quations D, Rul ar integ	fectors, rs of a r lratic fo mean of fund wo var undeter s reduct es for f gral, Wa	Eigen natrix orm to value ctions- iables, mined ible to inding orking

	UNIT- IV							
	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, Linear dependence of solutions, Simultaneous linear equations							
	with constant coefficients.							
	Application: L-C-R Circuits.							
Text books	Text Book:							
and Reference	1. B.S.Grewal, Higher Engineering Mathematics, 44 <sup>th</sup> Ed., Khanna Publishers, 2019.							
books	Reference Books:							
	1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10 <sup>th</sup> Ed., John Wiley & Sons, 2015							
	2. B.V.Ramana, "Higher Engineering Mathematics", 1 <sup>st</sup> Ed., Tata MC Graw Hill, 2007							
	3. N.P.Bali, Dr. Manish Goyal, "A Text Book of Engineering Mathematics, 9 <sup>th</sup> Ed., Laxmi							
	Publications, 2014							
<b>E-resources</b>	1. https://www.nptelvideos.com/mathematics/							
and other	2. https://nptel.ac.in/courses/122/104/122104017/							
digital	3. https://nptel.ac.in/courses/111/105/111105035/							
material								

### **20BS1102 – ENGINEERING PHYSICS**

<b>Course Category:</b>	Basic Science	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 0- 0
Prerequisites:	10+2 level Physics	<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	Empl static	oy phy electri	vsical la ic field	aws of s	electro	ostatics	and co	ompute	e probl	ems re	lated to	)
	CO2	Illust: static	Illustrate the laws of magneto statics and solve various problems involving static magnetic fields Describe various types of electric and magnetic materials Understand the time varying electric and magnetic fields by applying appropriate Maxwell's equations										
	CO3	Desci											
	CO4	Unde appro											
Contribution of Course Outcomes		PO 1	PO 2	PO 3	РО 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
towards achievement of Program	CO1	3	2										
Outcomes (1 – Low, 2 - Medium, 3 – High	CO2	3	2										
	CO3	3											
	CO4	3	1										
Course Content	UNIT- Electrost distributi Surface equation Density i UNIT- Magneto Ampere' equation fields - Magnetic UNIT- Types of dielectric and stree	3       1         3       1         I       statics:         Statics:       Coulomb's law and field intensity, Electric field due to continuous chartions, Electric flux density, Gauss's law, Applications of Gauss law - Line chare charge, Volume charge, Electric potential, Relation between E and V, Maxwein for static electric fields (qualitative), Potential and field of electric dipole, Energin electrostatic fields         II       costatics:         Biot-Savart's law, Ampere's circuit law - Maxwell's equation, Applications 's law - Infinite line current, Infinite sheet of current, Magnetic flux density - Maxwein for static magnetic field, Magnetic vector and scalar potentials, Force due to magnetic force on a charged particle, Current element, Force between two current element ic dipole, Magnetic energy         III       of Electric and Magnetic Materials: Properties of electric materials - Conductors and see Convertion and acaduation aurorate Deleviation in dialectrics.								charge harge, well's Energy ons of well's ignetic ments, ors and onstant ations,			

	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 and Electro Magnetic Waves
	Time Varying Fields: Faraday's law, Transformer and motional electromotive 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	Text Book:
and	1. Resnick, Halliday and Krane, "Physics", 5 <sup>th</sup> Ed., Wiley India Pyt, Ltd. New Delhi,
Reference	2016
books	2 Matthew N O Sadiku "Principles of Electromagnetics" 4 <sup>th</sup> Ed Oxford University
	Press New Delhi 2009
	Reference Books.
	1 D K Courand S I Cunta "Engineering Dhysics" <sup>9th</sup> Ed Deprint Dhennet Dei Dublications
	I. K.K.Oaurand, S.L.Oupta, Engineering Physics, 8 Ed., Reprint, Dhanpat Kai Fublications
	2 W H Hout and I A Duale "Engineering Electromagnetics" 7 <sup>th</sup> Ed. Tota Ma Crow, Hill
	2. w.n.nayt and J.A.Buck, Eligineering Electromagnetics, 7 Ed., 1 ata Mc Graw Hill, New Delbi 2006
	2 Joseph A Edminister "Electromagnetics Theory and problems" 2 <sup>nd</sup> Ed Schaum's outline
	5. Joseph. A. Edminister, Electromagnetics – Theory and problems, 2 Ed., Schaum S outline
	series, MC Graw Hill, 1993
E-resources	1. http://www.mike-willis.com/Tutorial/PF2.htm
and other	
aigitai	
material	

### 20ES1103 – PROGRAMMING FOR PROBLEM SOLVING

<b>Course Category:</b>	Engineering Science	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 0- 0
Prerequisites:	10+2 level Physics	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	Upon suc	pon successful completion of the course, the student will be able to:											
outcomes	CO1	Unde	Understand the different types of problem solving approaches										
	CO2	Apply	Apply the selections, loops, arrays and string concepts in C to solve problems.										
	CO3	Apply	functi	ons and	l pointe	er conc	epts in	C to so	lve pro	blems.			
	CO4	Solve	probler	ns usin	g num,	structu	res, uni	ons and	file ha	ndling f	functior	ıs.	
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
towards achievement of Program	CO1	3	1										
Outcomes (1 – Low, 2 - Medium, 3 –	CO2		2	3									
High	CO3		2	3									
	CO4		2	3									
Content	UNIT- I Introduct computers problems, <b>Program</b> step-wise Programm <b>Algorithm</b> numbers, common <b>C</b> a given se given num To find th an array, Multiplica <b>UNIT- I</b> <b>Introduct</b> Constants, <b>Structure</b> associative <b>Selection</b> ; <b>Repetition</b>	ion to problem Problem Design refinem ing envy ns for I Decima livisor ( et of number, Generation et of number, Generation et of number, Generation tion to find tion to find et of a ely, Eva tion-von tion-vo	Computer of the players the C producting where the computer of the players the computer of the players the computer of the players the computer of the player of the computer	iter – finition, ng strat npleme onstruct nt. n Solvi ary bas of two 1 in asce the Fit power of numbe trices, 7 Langu ut, Inpu ogram: expres	Based Use of egies, S entation ion of ng: Ex- e conve- nding of of a number nding of of a num er in a To com age: B tt/Output is Logic sions, T Multi w	Proble of exan iteps inv Issues loops - changir ersion, I s, To ve order, F sequen aber rai an arra pute to ackgrou it, Prog cal data Type co ay select	m Solv ples for volved : Progr Basic mg value Reversi erify wh Find the for sed by y, Prim roots of and of rammira and nversio ction, N C Lo	ring: R or problem ams and program es of two ng the constant es quarts another at element f a quad C prog ng exant operatoon, State fore state	equirem lem sol- lem sol- d algorit nming vo varia digit of n intege e root of s, Evalue integents of lratic eo ram, Id nples. ors, Ex ements, ndard f	nent of lving, S ithms, T constru bles, Su an inte er is pr of an in iate sin( r, Reven f upper quation lentifier pressio Storage unction	problen Similari Cop-dov cts, Imj ummatio ger, To ime or a teger, H (x) as s rse orde r triang ax <sup>2</sup> +bx rs, Type ns, Pre e class. is.	m solvi ities be vn desig plement on of a find gr not, Org Factoria um of $c$ r eleme gular n +c=0. es, Vari eccedence he calc	ng by tween gn and tation, set of reatest ganize d of a series, ents of natrix, iables, e and

	program. Arrays: Array concepts in C, Inter function communication, Array applications, Two dimensional arrays, Multi dimensional arrays
	<ul> <li>UNIT- III</li> <li>Strings: String concepts, C strings, String Input/Output functions, Arrays of strings, String manipulation functions, String – Data conversion.</li> <li>Functions: Functions in C, User defined functions; Call by value, Call value reference, Inter-Function communication, Standard functions, Scope.</li> <li>Pointers: Introduction to pointer, Pointers for inter-function communications, Pointers to pointers, Compatibility, L value and R value.</li> <li>Pointer Applications: Arrays and pointers, Pointer arithmetic and arrays, Passing an array to a function, Memory allocations Functions, Array of pointers.</li> </ul>
	<ul> <li>UNIT- IV</li> <li>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.</li> <li>Structures: Structure type declaration, Initialization, Accessing structures, Operations on structures, Complex structures, Structures and functions, Sending the whole structure, Passing structures through pointers.</li> <li>Unions: Referencing unions, Initializers, Unions and structures, Internet address, Programming applications.</li> <li>File Handling: Files, Streams, Standard library input/output functions, Formatting input/output functions and character input/output functions, Command-Line arguments.</li> </ul>
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. Harsha Priya, R.Ranjeet, "Programming and Problem Solving Through "C" Language", Firewall media 2006</li> <li>2. Behrouz.A.Forouzan, Richard.F.Gilberg, "Computer Science A Structured Programming Approach Using C", 3<sup>rd</sup> Ed., Cengage Learning</li> <li>Reference Books:</li> <li>1. Anil.B.Chaudhuri, "Flowchart and Algorithm Basics: The Art of Programming", Mercury Learning &amp; Information, 2020.</li> <li>2. R.G.Dromey, "How to Solve it by Computer", Prentice – Hall International Series in Computer Science, 1982.</li> <li>3. Yashwant Kanetkar, "Let us C", 16<sup>th</sup> Ed., BPB Publications, 2017.</li> <li>4. Kernighan and Ritchie, "The C programming language", The (AnsiCVersion), 2<sup>nd</sup> Ed., PHI.</li> </ul>
	<ul> <li>5. Paul.J.Dietel and Harvey.M.Deitel, "C : How to Program", Prentice Hall, 8<sup>th</sup> Ed., 2021.</li> <li>6. K.R.Venugopal, Sundeep.R.Prasad, "Mastering C", 2<sup>nd</sup> Ed., McGraw Hill, 2015</li> </ul>
E-resources and other digital material	<ol> <li>ComputerScienceandEngineering-Noc:problemSolvingThroughProgramminginC https://nptel.ac.in/courses/106/105/106105171/</li> <li>Computer Science and Engineering- Noc: Introduction to Programming in C https://-nptel.ac.in/courses/106/104/106104128/</li> <li>C For Everyone: Structured Programming</li> </ol>

### **20ES1104 – BASICS OF ELECTRICAL ENGINEERING**

<b>Course Category:</b>	Engineering Science	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	Upon successful completion of the course, the student will be able to:											
outcomes	CO1	Anal	yze elec	tric cire	cuit fun	damen	tals.						
	CO2	Unde	Inderstand the basic concepts of alternating quantities and magnetic circuits.										
	CO3	Anal	alyze the basic concepts of electric machines										
	CO4	Unde	derstand measuring instruments & solar photo voltaic system concepts										
Contribution		Р	PO         PO<										
of Course Outcomes		01	2	3	4	5	6	7	8	9	10	11	12
towards achievement of Program	CO1	3	3			2							
Outcomes (1 – Low, 2 - Medium, 3 –	CO2	3	3										
High	CO3	2	1			2							
	CO4	2	1										
Course Content	UNIT Introd and emphenor Netwo current Voltag Delta – UNIT Altern definiti averag represe Magne circuits Energy UNIT DC M DC vol Operat	- I uction lergy, nenon <b>rk</b> An c source e and - Star - II ating ions, H e valuentation etic ( tomot s, Mag v in lin - III achin ltage a jon of	n to Ele Basic c and rela nalysis: ce, Depe- current transform Quanti Relations ies of a n of alte Circuits ive for gnetic pe- ear mag es: Intro- DC mag	ctrical ircuit c ated law Netwo endent division nation. ities: I ship bet alternat crnating : Intro ce, Per otential netic sy oduction ue proc	Engine compon- vs, Kirc rk sources n rule, 1 Mesh a ntroduc tween f ing cu quanti oductio meabili drop, ystems n, Cons luction	eering: eents – chhoff's rces - 5 s, Pract Series a and noc ction, C requent rrent a ties n, 1 ity, Re Magnet (Deriva truction in a DO	Electri Resisto laws. Ideal in ical vo and par- lal anal Generat cy, spee nd vol Magnet eluctance tic circu- ation fo n of DC C mach	ic curre ors – In helpend ltage a allel co ysis (w ion of ed and tages, ic circ ee, Ana uit com r pure i C mach ine, Op	ent, Ele nductor dent vo nd curr nnectio ith inde A.C v number Form cuits, alogy 1 nputatio nductor ines, A	ctromo rs - Ca bltage s ent sou on of R pender voltages of pol- factor Magnet between ons, Sel r).	tive force pacitors. ource, Id urces, Sou , L and C at sources s, Wavef es, Root n and peak tic field n electric f and mu e winding C machin	e, Electric Electrom eal indep irce conv , Star – E only). orms and mean squa t factor, strength e and m itual indu s, Genera e as a gen	power agnetic bendent ersion, Delta or l basic are and Phasor n (H), agnetic ctance,

	<ul> <li>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.</li> <li>UNIT- IV</li> <li>Measuring Instruments: Introduction, Classification of instruments, Operating principles, Essential features of measuring instruments, Ammeters and voltmeters, Measurement of power.</li> <li>Solar Photo Voltaic Systems: Solar cell fundamentals, Characteristics, Classification, module, Panel and array construction, Maximizing the solar PV output and load matching, Maximum power point tracker basic algorithm and flowchart, PV system components, Solar PV systems</li> </ul>
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. T.K.Nagasarkar and M.S.Sukhja, "Basic Electric Engineering", 2<sup>nd</sup> Ed., Oxford University Press 2011</li> <li>Reference Books:</li> <li>1. B.H.Khan, "Non Conventional Energy Resources", 2<sup>nd</sup> Ed., Mc.Graw Hill Education Pvt Ltd., NewDelhi, 2013.</li> <li>2. Ashfaq Hussain, Haroon Ashfaq, "Fundamentals of Electric Engineering", 4<sup>th</sup> Ed., Dhanpat Rai &amp; Co, 2014.</li> <li>3. I.J.Nagarath and Kothari, "Theoy and Problems of Basic Electric Engineering", 2<sup>nd</sup> Ed., PHI Pvt. Ltd., 2016.</li> </ul>
E-resources and other digital material	1. https://nptel.ac.in/courses/108/108/108076/

### **20HS1105 – TECHNICAL ENGLISH AND COMMUNICATION SKILLS**

<b>Course Category:</b>	Humanities and Social Science	Credits:	2
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	2 - 0- 0
Prerequisites:	Basic understanding of the language skills viz Listening, Speaking, Reading and Writing, including Sentence construction	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course	Upon s	Upon successful completion of the course, the student will be able to:											
outcomes	CO1	Deve	lop adr	ninistra	tive and	profess	sional co	ompilati	ons wit	h felicit	y of exp	oression	l
	CO2	Dem	Demonstrate proficiency in advanced reading and context oriented writing										
	CO3	Appl authe	y the e entic us	lements e of lar	s of fun nguage	ctional in any §	English given ac	n with s cademic	ustaine c and/oi	d under profes	standin sional e	g for environ	ment
	CO4	Exec	ute task	ts in tec	hnical c	ommun	ication	with co	mpeten	ce			
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
towards achievement of Program	CO1						2				3		
Outcomes (1 – Low, 2 - Medium, 3 – High	CO2						2			2	3		
	CO3						2			2	3		
	CO4										3		
Course Content	UNIT- Profess special Paragr Effectiv guided a UNIT- Readin Analyti thinking Effectiv Issues a Contex Accepta Develop	I ional referen aph ave Wri and ser II g Com ical ar g – Thi ve Rea and cha t-Orie ance, C pment	Writing Letters ce to b nd Ess ting P ni-cont prehen d Crit nking p ding S llenges nted I Concurr and ide	g Skills Busir lock for ay Wr ractice: rolled c nsion ar tical Ro orocess a trategio of voca Dialogu rence, I ntificati	ness con iting: 1 : Appro ompilat nd Disco eading: and lang es: Skir alization e/Argun Disagree on of in	nplaint l modifi Linkers opriaten ions inc ourse D Critica guage de nming, and su ment V eing with nconsist	and tra ed bloc , <b>Descr</b> ess, Bra eluding luding l, Crea evelopn Scannir b-vocal <b>Writing</b> hout ba	msmitta k forma riptive evity, C the use of ment SI tive and nent. ng, Eye ization. c; Exter eing dis in pre-pr	l – Pur t and An larity, ( of idion <b>cills</b> d lateral span, F nding i sagreeal repared	pose, S nalytica Cogency natic exp l thinki 'ixation, invitation ole - D dialogu	tyle and al with y and co pression ng – L , Tamin on, Rec iscourse	d forma Illustr oherenc ns. anguage g regres ciprocat e/Dialog	ations e with e and ssion, gue,

	UNIT- III
	Vocabulary and Functional English
	Vocabulary for Competitive Examinations: (A list of 500 high frequency words) Synonyms,
	Antonyms, Matching homonyms, Homophones and nearer words along with root words.
	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.
	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
	<b>Technical Report Writing:</b> Informational reports and feasibility report - Types, Components,
Tort hoole	Style and formats
1 ext DOOKS	
Reference	1. Martin Cutts, "Oxford Guide to Plain English", /" Impression, Oxford University Press,
hooks	2011 2 M Ashrof Dirwi "Effective Technical Communication" Teta Ma Crow Hill New Delhi
DOOKS	2. M.Ashrai Kizvi, Effective rechinical Communication, rata Mc Graw-Hill, New Denn, 2005.
	3. John Langan, "College Writing Skills", 9 <sup>th</sup> Ed., Mc Graw Hill, 2014
	4. Eclectic Learning Materials Offered by the Department
	Reference Books:
	1. Erwin Kreyszig, Randolph Quirk, "Use of English Longman", 1 <sup>st</sup> Ed., 2004.
	2. Thomson.A.J and A.V,Martinet, "Practical English Grammar", 3 <sup>rd</sup> Ed., Oxford University
	Press, 2001.
	3. V.Sethi and P.V.Dhamija, "A Course in Phonetics and Spoken English", 2 <sup>ND</sup> Ed., PHI, 2006
<b>E-resources</b>	Learn English   British Council
and other	1. www.natcorp.ox.ac.uk/Wkshops/Materials/specialising.xml?ID=onlin
digital	2. www.uni-marburg.de/de/sprachenzentrum
material	

### **20BS1151 – ENGINEERING PHYSICS LABORATORY**

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

Course	Upon	success	successful completion of the course, the student will be able to:										
outcomes	CO1	Test of	otical co	ompone	ents usir	ng princ	iples of	interfe	rence a	nd diffra	action o	f light	
	CO2	Use s experin	spectron ments	neter,	travelli	ing mi	croscop	be and	funct	tion ge	enerator	in v	arious
	CO4	Detern measur	Determine the V-I characteristics of photocells and appreciate the accuracy in neasurements										
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
towards achievement of Program	CO1				1								
Outcomes (1 – Low, 2 - Medium, 3 –	CO2				1								
High	CO3	2			1								
	CO4				1								
Course Content	List o 1. Fig 2. LC 3. Va 4. Wa 5. So 6. AC 7. B - 8. Ha 9. Di 10. To 11. Ph 12. Op	t of Experiments: Figure of merit of a galvanometer LCR circuit – Study of resonance Variation of magnetic field along the axis of current – Carrying circular coil Wedge method – Measurement of thickness of a foil Solar cell – Determination of Fill factor AC Sonometer – Verification of vibrating laws B – H curve unit – Determination of hysteresis loss Hall effect – Hall coefficient measurement Diffraction grating – Measurement of wavelength Torsional pendulum – Measurement of rigidity modulus Photocell – Study of V-I characteristics, Determination of work function Optical fiber – Determination of numerical aperture											
Text books and Reference books	Text I 1. Ma 2. Rar Physic	<b>Books:</b> dhusudh narao S s", 5 <sup>th</sup> E	an Rao bri, Cho d., Exce	,"Engir oudary ell Bool	neering Nityan ks,2010	Physics and and	Lab M 1 Prasa	anual", 1d Daru	ist Ed., Ika, "I	, Scitech Lab Mar	Publicanual of	ations, 2 `Engin	2015 eering

E-resources	1. www.physicsclassroom.com/The-Laboratory
and other	2. http://facstaff.cbu.edu/~jvarrian/physlabs.html
digital	3. https://vlab.amrita.edu/?sub=1&brch=201∼=366&cnt=1
material	4. https://vlab.amrita.edu/?sub=1&brch=195∼=840&cnt=1
	5. https://vlab.amrita.edu/?sub=1&brch=195∼=840&cnt=1

### 20ES1152 – PROGRAMMING FOR PROBLEM SOLVING LABORATORY

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

Course	Upon su	uccessf	ful con	npletio	n of th	e cours	se, the	studen	t will ł	be able	to:		
outcomes	CO1	Imple	ment th	e use o	f progra	amming	constr	ucts in a	a struct	ural pro	gramm	ing lang	guage.
	CO2	Apply	the sel	ections	, loops,	arrays	and stri	ng con	cepts in	C to so	olve pro	blems.	
	CO3	Apply	functio	ons, poi	nter and	d Enum	concep	ots in C	to solv	e probl	ems.		
	CO4	Solve	olve problems using structures, unions and file handling functions.										
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
towards achievement	CO1	1		3									
Outcomes (1 – Low, 2 - Medium, 3 –	CO2		1	3									
High	CO3		1	3									
	CO4		1	3									
Course	List of I	Experin	nents										
Content	Week-	1: Intro	ductio	n to C ]	Progra	mming							
	a)	The str	ucture	of C pro	ogram v	with a sa	ample p	orogram	l				
	b)	Use ide	entifiers	s, data 1	types, f	ormat s	pecifie	rs, cons	tants a	nd varia	ables de	eclaratio	on and
		initializ	zation to	o write	simple .	c progr	ams		1		1 1/0		
	c)	Write s	simple (	) progr	ams usi	ng prep	rocesso	or comn	nands a	nd simj	ble I/O	stateme	nts
	Week-2	: Data	Types	and Va	riable ]	Declara	ations						
	a)	Use vo	bid, int	egral a	and floa	ating p	oint da	ata type	es in d	lifferent	t scena	rios to	write
		program	ns.	C		0 1		• •					
	b)	Use va	rious pi	rimitive	data ty	pes for	perform	ning di	fferent	mathem	natical c	peratio	ns
	c)	Program	ms to p	erform	mathen	natical	operatio	ons usin	g vario	us oper	ators in	С	
	Week-3	Select	tion Ma	aking E	Decision	ıs							
	a)	Write P	rogram	s using	the If	Else se	lection	stateme	ents				
	b)	Use ne	sted If	Else	stateme	ent to	solve p	oroblem	is that	need a	multi-le	vel sel	ection
		making	decisio	ons.									
	c)	Write p	rogram	s that u	se Swit	chCa	se and	ElseIf	f multiv	vay stat	tements	to sele	ct one
		out of s	everal o	options									

#### Week-4: Looping Constructs and Their Applications

- a) To have a clear idea on loop initialization, validation and updation
- b) Write programs using the While, For or Do...While loops
- c) To understand the logic and adopt best looping construct for different kinds of problems
- d) Design and develop programs based on iterative loops using While, Do While, For, Nested For

#### Week-5: Unconditional Control Transfer Statements

- a) Write programs using of (break and continue) unconditional control transfer statements
- b) Use the Go To statement to transfer the control from one part to another part of a program and the use of return statement to end the execution of a called function

#### Week-6: Arrays and Their Applications

- a) To utilize one dimensional and multi-dimensional arrays to solve problems that use set(s) of similar type input data
- b) To write programs that performs multiple classical operations like searching, sorting, updation or deletion on array elements.

#### Week-7: Strings, String I/O and Manipulation Functions

- a) To write programs that work on read, write and manipulate fixed length and variablelength strings and/or arrays of strings
- b) To write programs that use predefined string i/o functions
- c) To write programs that use string manipulation functions from the string library

#### Week-8: Concepts of User Defined Functions

- a) Design and develop programs depending on functions both user defined and standard library functions in c with different approaches.
- b) To write a program using more than one function with or without parameters and function return type

#### Week-9: Pointers and Their Applications

- 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 a program.
- d) To write programs using static and dynamic memory allocation.

#### Week–10: Structure, Union and Enumeration

- 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
- c) Programs to pass structure as an argument to a function
- d) To write c programs using enumeration data types, an easiest way of mapping symbolic names to integer values.

	Week–11: File Handling Operations										
	a) Programs to open and close text and binary files using file i/o commands.										
	b) Write programs to perform read and write operations using the formatting i/o and										
	character i/o functions.										
	c) Apply file positioning, status and system commands based on a problem requirements										
	Week-12: Command Line Arguments										
	a) To use command line arguments to pass inputs in a single line while executing a										
	program through the dos command prompt or linux terminal.										
	b) To use ATOI function to convert a default string value argument to an integer value										
	inside the main function in a program.										
	c) To use ATOF function to convert a default string value argument to a float value										
	inside the main function in a program										
Text books	Text Book:										
and Reference	1.Behrouz.A.Forouzanand, Richard.F.Gilberg, "Computer Science A Structured Programming										
books	Approach Using C", 3 <sup>rd</sup> Ed., Cengage Learning.										
	Reference Books:										
	1. Anil B. Chaudhuri, "Flowchart and Algorithm Basics: The Art of Programming", Mercury										
	Learning & Information, 2020.										
	2. R.G.Dromey, "How to Solve it by Computer", Prentice-Hall International Series in										
	Computer Science, 1982.										
	3. Yashwant Kanetkar, "Let Us C", 16th Ed., BPB Publications, 2017.										
	4. Kernighan and Ritchie, "The C Programming Language", The (Ansi C Version), 2nd Ed.,										
	5 Paul I Dietel and Harvey M Deitel "C: How to Program" 8th Ed. Prentice Hall 2021										
	<b>6.</b> K.R. Venugopal, Sundeep, R. Prasad, "Mastering C", 2nd Ed., Mc Graw Hill, 2015.										
E-resources	1. Computer Science and Engineering -Noc: Problem Solving Through Programming in C										
and other	https://nptel.ac.in/courses/106/105/106105171/										
digital	2. Computer Science and Engineering - Noc: Introduction to Programming in C										
material	https://-nptel.ac.in/courses/106/104/106104128/										
	3. C For Everyone: Structured Programming										
	https://www.coursera.org/learn/c-structured-programming										
	4. Advanced C Programming Course 1 III Academy – Jason Fedin. https://www.udemy.com/-										
	course/advanced-e-programming-course/										

### 20MC1106 - TECHNOLOGY AND SOCIETY

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

Course	Upon	success	accessful completion of the course, the student will be able to:										
outcomes	CO1	Under	stand t	he orig	ins of te	echnolo	ogy and	its role	in the	history	of hun	nan pro	gress.
	CO2	Know	the ind	lustrial	revoluti	on and	its impa	act on s	ociety				
	CO3	Interp	nterpret the developments in various fields of technology till twentieth century.										
	CO4	Distin scient	Distinguish the impacts of technology on the environment and achievements of great cientists.										
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
towards achievement of Program	CO1	3							1				
Outcomes (1 – Low, 2 - Medium, 3 –	CO2	3				2		1					
High	CO3	3							1				
	CO4	3				2		1					
Course Content	UNIT Introd of anci UNIT Indust Steam: impact UNIT The Fl combus Twenti biotech UNIT Techno technol	<ul> <li>I</li> <li>uction: ent civil</li> <li>II</li> <li>rial Reading</li> <li>The poording</li> <li>of indu</li> <li>III</li> <li>owerine</li> <li>stion end</li> <li>eth center</li> <li>nology</li> <li>IV</li> <li>ology,</li> <li>ogy on</li> </ul>	Origins lization evolution ower be strial re g of Me ngines, tury: T and its Science the env	s of tec: s - Mes on: The ehind the volutio odern 7 Produc The flow implicate e and fironme	hnology opotami e social ne indus n on soc <b>Fechnol</b> tion of vering of tions of tions of	y, The a ians, Eg and p strial re- ciety logy: M metals of mod n societ y: Impa ainable	agricultu gyptians political evolutio Ianufact and a lern tec y. act of develop	technol	olution, s, Rom round, revolut echnolo The bir y like t	Techno ans, Ind The te tion in ogies, Pr th of e informa	ological lians an chnical textile time mo lectrica tion teo ty, The	contrib d Chine backg industry overs, Ir l techn chnolog e impa	utions ese. round, y, The nternal ology, y and cts of

	Achievements of Famous Scientists: (World): Einestein, Newton, Faraday, GrahamBell, Edison, S.Hawking (India):CVRaman, S.Chandrasekhar, Aryabhatta, Homi.J.Bhabha, Vikram Sarabhai, APJ Abdul Kalam, S.Ramanujan, M.Visweswarayya
Text books and Reference books	<ul> <li>Text Book:</li> <li>1. Dr.R.V.G Menon, "Technology and Society", PearsonEducation,2011.</li> <li>Reference Books:</li> <li>1. Quan-Haase, A, "Technology and Society: Inequality, Power and Social Networks", Oxford University Press, 2013</li> </ul>
E-resources and other digital material	

## Velagapudi Ramakrishna Siddhartha Engineering College ELECTRONICS AND COMMUNICATION ENGINEERING

### SEMESTER II

S. No.	Course Code	Course	Subject	L	Т	Р	Credits
1.	20BS2101	Basic Science Course	Laplace Transforms and Integral Calculus		0	0	3
2.	20BS2102	Basic Science Course	Engineering Chemistry	3	0	0	3
3.	20ES2103	Engineering Science Course	Object Oriented Programming using Python		0	0	3
4.	20ES2104B	Engineering Science Course	Circuit Analysis		0	0	3
5.	20ES2105	Engineering Science Course	Engineering Graphics		0	4	3
6.	20BS2151	Basic Science Course	Engineering Chemistry Laboratory	0	0	3	1.5
7.	20ES2152	Engineering Science Course	Object Oriented Programming using Python Laboratory	0	0	3	1.5
8.	20ES2153	Engineering Science Course	Engineering Workshop	0	0	3	1.5
9.	20MC2106	Mandatory Course Professional Ethics and Practice			0	0	-
		14	0	13	19.5		

### **20BS2101 – LAPLACE TRANSFORMS AND INTEGRAL CALCULUS**

<b>Course Category:</b>	Basic Science	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 0- 0
Prerequisites:	Vectors, Integration, Curve	<b>Continuous Evaluation:</b>	30
	Tracing	Semester end Evaluation:	70
		Total Marks:	100

Course	Upon	Upon successful completion of the course, the student will be able to:											
outcomes	CO1	Solve	the line	ar diffe	rential	equation	ns using	g Lapla	ce Tran	sforms.			
	CO2	Evalua	ate area	s and v	olumes	using d	ouble, t	triple in	tegrals.				
	CO3	Evalu	Evaluate Grad, Div & Curl of scalar and vector point functions.										
	CO4	Conve	Convert line integrals to area integrals and surface integrals to volume integrals.										
Contribution		РО	PO									РО	
of Course		1	2	3	4	5	6	7	8	9	10	11	12
towards achievement	CO1	3	2			1							
of Program Outcomes	CO2	3	2			1							
(1 – Low, 2 - Medium, 3 –	CO3	3	2			1							
High	CO4	3	2			1							
Content	Laplac element Transfo Inverse Convol Applic UNIT Integra coordin Applic UNIT Vector functio diverge functio UNIT Vector theorer Irrotati	CO4       3       2       1         UNIT- I       Laplace Transforms: Introduction, Definition, Conditions for the 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 integrals, Solving differential equations by Laplace transforms.         UNIT- II         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         UNIT- III         Vector Differential Calculus: Scalar and vector point functions, Del applied to scalar point functions - Gradient, Del applied to vector point functions, Physical interpretation of divergence and curl, Del applied twice to point functions, Del applied to products of point functions         UNIT- IV         Vector Integral Calculus: Integration of vectors, Line integral, Surface integral, Green's theorem in the plane, Stokes's theorem, Volume integral, Gauss divergence theorem,											

Text books and Reference books	<ul> <li>Text Book:</li> <li>1. B.S.Grewal, Higher Engineering Mathematics, 44<sup>th</sup> Ed., Khanna Publishers, 2019.</li> <li>Reference Books:</li> <li>1. Erwin Kreyszig, "Advanced Engineering Mathematics", 10<sup>th</sup> Ed., John Wiley &amp; Sons, 2015</li> <li>2. B.V.Ramana, "Higher Engineering Mathematics", 1<sup>st</sup> Ed., Tata MC Graw Hill, 2007</li> <li>3. N.P.Bali, Dr. Manish Goyal, "A Text Book of Engineering Mathematics, 9<sup>th</sup> Ed., Laxmi Publications, 2014</li> </ul>
E-resources and other digital material	<ol> <li>https://www.nptelvideos.com/mathematics/</li> <li>https://nptel.ac.in/courses/122/104/122104017/</li> <li>https://nptel.ac.in/courses/111/105/111105035/</li> </ol>

### **20BS2102 – ENGINEERING CHEMISTRY**

<b>Course Category:</b>	Basic Science	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 0- 0
Prerequisites:	Chemistry knowledge at	<b>Continuous Evaluation:</b>	30
	Intermediate level	Semester end Evaluation:	70
		Total Marks:	100

Course	Upon	succe	successful completion of the course, the student will be able to:											
outcomes	CO1	Anal	vze vari	ous wa	ter trea	tment n	nethods	and bo	oiler tro	ubles.				
	CO2	App	ly the co	oncept	of phas les and	se equi batterie	librium es in va	n to difi rious te	ferent i chnolo	nateria gical fie	ls and th elds.	e knowle	dge of	
	CO3	Eval	aluate corrosion processes as well as protection methods.											
	CO 1	App	ply the knowledge of conventional fuels and mechanistic aspects of conducting											
	CO4	poly	mers for	r their o	effectiv	e and e	efficien	t utiliza	ation.		I		U	
Contribution of Course Outcomes		Р 01	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	
towards achievement of Program	CO1		3											
Outcomes (1 – Low, 2 - Modium 3	CO2	2												
High	CO3			3										
	CO4					2								
Course Content	UNIT Water Sedimo and its and rev Water conditi Caustic control UNIT Phase degree system Electro glass e Constr Examp	- I Teck signification signification (Teck oning c emb - II Rule of free , Two ochen de and electro uction bles, C	hnology on, Coag ficance - osmosis, <b>mology</b> method rittlemen and Ap eedom, I compor <b>nistry:</b> d princip de. Chen , Worki hemistry	- I: gulatior - Desal Advan - II: Is – Ph nt - Re Phase r hent sys Constru- le, Cor mistry of ng and y of H <sub>2</sub> -	WHO n, Filtra ination tages a Boiler cosphate asons, <b>ons:</b> De ule equi- stem – $\frac{5}{2}$ action a struction of mod- l advan $O_2$ fuel	Stance ation, I of brace nd disa- trouble e condi Mechar finition ation, I Silver – and we on and ern batt tages. I cell.	lards - Disinfec ckish w dvantag s - Sc tioning nism ar hase e Lead s orking working teries - Fuel ce	- Wate etion by rater – I ges. ales - I , Calgo nd its c ad its c ad its c ad its c ad its c c ad its c ad its c its c its c its	er treat y chlor Principl Formation control on of the a of sin Applic omel e uss elec $CL_2$ bat neral v	tment ination, le and p ion, Di litionin and bo ne term ngle co ations c lectrode, I tery an vorking	for drin , Breakpo process of sadvanta; g and so iler corro s – Phase mponent of phase r e, Silver Determina d LI <sub>X</sub> C/L principl	king pur pint chlor f electro o ges and i dium alum sion caus , compon system – ule. -Silver C ation of p ICOO <sub>2</sub> ba e of a fu	pose - ination dialysis internal minate, ses and ent and - Water Chloride h using attery – el cell,	

	UNIT- III
	<b>Corrosion Principles:</b> Introduction, Definition, Reason for corrosion, Examples – 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
	<b>Corrosion Control Methods:</b> 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.
	<ul> <li>UNIT- IV</li> <li>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.</li> <li>Fuel Technology: Fuel - Definition, Calorific value - Lower and higher calorific values and numericals on calculation of HCV and LCV relation, Analysis of coal – Proximate analysis and ultimate analysis, Flue gas analysis by orsat's apparatus, Numericals based on calculation of air required for combustion.</li> </ul>
Text books	Text Book:
and	1. Shikha Agarwal, "Engineering Chemistry–Fundamentals and Applications", 1 <sup>st</sup> Ed.,
Reference	Cambridge University Press, New Delhi, 2015.
books	Reference Books:
	1. Sunita Rattan, "A Text Book of Engineering Chemistry", 1 <sup>st</sup> Ed., S.K.Kataria & Sons, New
	Delhi, 2012.
	2. P.C.Jain, "Engineering Chemistry", 15 <sup>th</sup> Ed., Dhanpat Rai Publishing Company (P) Limited,
	NewDelhi.
	3. B.S.Bahl, G.D.Tuli and Arun Bahl, "Essentials of Physical Chemistry". S. Chand and
	Company Limited. NewDelhi.
	4. O.G.Palanna, "Engineering Chemistry". Tata Mc Graw Hill Education Pyt. Ltd., NewDelhi.
E-resources	1. http://nopr.niscair.res.in/bitstream/123456789/5475/1/JSIR% 2063% 289% 29% 20715-
and other	728.pdf
digital	2. https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(An
material	alytical_Chemistry)/Electrochemistry/Basics_of_Electrochemistry
	3. https://www.filtronics.com/blog/tertiary-treatment/stages-in-typical-municipal-water-
	treatment/

### 20ES2103 – OBJECT ORIENTED PROGRAMMING USING PYTHON

<b>Course Category:</b>	Engineering Science	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 0- 0
Prerequisites:	Programming for Problem	<b>Continuous Evaluation:</b>	30
	Solving	Semester end Evaluation:	70
	Programming for Problem	Total Marks:	100
	Solving Laboratory		

Course outcomes	Upon	n successful completion of the course, the student will be able to:													
ourcomes	CO1	Interp	oret the	e pytho	n synta	ax and	seman	tics of	contro	l flow s	stateme	ents			
	CO2	Apply	y funct	ions ar	nd mod	lules in	pytho	n to so	lve a p	roblen	1				
	CO3	Apply	Apply 3 <sup>rd</sup> party packages for developing solutions for real time problems												
	CO4	Imple	mplement the problems in terms of real world objects using OOPs concept												
Contribution of Course		PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		
Outcomes towards achievement	CO1	3	2	2						2			3		
achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High	CO2	2	2	2						2			3		
	CO3	2	2	2						2			3		
	CO4	2	2	2						2			3		
Content	UNIT Introd can I de Variab operand Condit Alterna except, Iteratio with co UNIT Functi Math fr argume Modul tour of termina Compr	- I uction: b with F bles, Ex ds, Expri- ional I ative ex Short c ons: Th ontinue, - II ons: Fu- unctions: ents, Fru- les: Pac f standa ation, S essions	History Python, pression ressions Execution ecution ircuit e e while Definit unction s, Addin utful an ekages ard libu tring pa	y - Orig Installin ons & S s, Order ion: Bo , Chain valuatio statemo e loops calls, F ng new d void small o rary, Co	gins of ng, Pyth tateme of oper- polean and con on of log ent, Infri using f Built-in function descrip ommand natching	Python, non 2 & <b>nts</b> : Va rations, express ditional gical ex inite loc or. functio ns, Def ns, Why tion ab d line a g, Math	Featur 3 insta riables, Modulu ions, I s, Nest pression ops, "Inf ns, Typ inition a function out mo argumen nematic	es of P llation o Variab us opera Logical ed cond ns. finite lo be conve and use ons?, Re odularit nts, Err	ython - on wind le name ator, Str operate ditional ops" ar ersion f s, Flow ecursion y, Thin or outp rnet acc	Why cows es & ke ing ope ors, Co s, Exce ad break function of Exe a, Scope rd party out redi cess, D	words rations. ondition ptions c, Finish s, Rand cution, e of a va y packa rection oates &	Python, , Opera al exec using tr ning iter lom nur Parame ariable. ages, A and pr times,	What tors & cution, ry and rations mbers, ters & ogram Data		

	UNIT- III
	Lists: Syntactically, Accessing element from list, Slicing a list, Lists are mutable
	sequences, Deleting items in a list and deleting list, Methods, Searching
	<b>Dictionaries:</b> Creating a dictionary, Dictionary operations, Dictionary methods, Aliasing and
	copying
	Tuples: Tuples are immutable, Comparing tuples, Tuple assignment, Dictionaries and
	tuples, Multiple assignment with dictionaries, Using tuples as keys in dictionaries
	Strings: A string is a sequence, Getting the length of a string using len, Traversal through
	a string with a loop, String slices, Strings are immutable, Looping and counting, The in
	operator, String comparison, String methods Sets: Modifying a set Removing items from set Set operations
	Sets. Modifying a set, Removing items from set, Set operations.
	UNIT. IV
	<b>Object Oriented Programming in Python:</b> Python classes. Methods. Constructors. Class
	variables & instance variables, Basic inheritance, Special methods, Data hiding
Text books	Text Books:
and Reference	1. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson India, 2017.
books	2. Charles Severance, "Python for Informatics –Exploring Information", 1 <sup>st</sup> Ed., Shroff
	Publishers, 2017.
	Reference Books:
	1. Mark Lutz, "Learning Python", 5 <sup>th</sup> Ed., Orielly, 2013.
	2 Allen Downey "Think Python How to Think Like a Computer Scientist" 2 <sup>nd</sup> Ed
	Green Tea Press 2015
	3 W Chun "Core Python Programming" 2 <sup>nd</sup> Ed. Prentice Hall 2006
	4 Konnoth A Lombort "Introduction to Puthon" 1 <sup>st</sup> Ed. Concosco Looming 2011
	4. Kenneth.A.Lambert, Introduction to Python, 1 Ed., Cengage Learning, 2011
E-resources	1. Charles Severance: University of Michigan, "Python for Everybody"- Coursera
and other	https://www.coursera.org/
digital	2. Prof. Sudarshan Iyengar, III Ropar, Prof. Yayati Gupta, IIII Dharwad, "The Joy
material	of Computing using Python–Nptel https://nptel.ac.in/courses/106/106/106106182/#

### 20ES2104B CIRCUIT ANALYSIS

Course	Programme Core	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	An	alvze	the A	C and	DC c	ircuits	bv ar	oplvin	g appr	opriat	e theo	orems		
	CO2	An	alvze	two-p	ort ne	twork	barar	neters							
	CO3	De	Design different resonant circuits for the given specification												
	CO4	Aı	nalvze the DC transient response of RL. RC and RLC circuits												1
Contributio n of Course Outcomes		PO 1	PO 2	РО 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
towards achievement	CO1	3													2
Outcomes (1 – Low, 2 –	CO2	3		1											2
Medium, 3 – High	CO3	3		2											2
	CO4	3													2
Course Content	UNID.CtheoremtheoremA.CSuperTran(12H)UNIparannetw(12H)UNISteaRL,phase	T I Cin rem, a Cir rerpos sfer ' frs) T II Pon mete orks [rs) T III dy S RC a or no	cuits They and M cuits ition Theor rs, Net rs, O rs, R	& 1 venin's laximu & N theore rem. twork pen ci elation Analy LC cin	Netwo s theo um Po letwon em, Tl : Rela rcuit i n betw sis of rcuits,	ork T rem, wer T rk Th heven ationsl mped ween AC ( paral	<b>Cheore</b> Norto Transfe <b>neore</b> in's th hip of ance p param	ems: n's the r The ns: N heoren two jo parama heter ts: Re , RC	Sup eorem orem. Iodal n, Nor port v eters, sets, sets,	erposition, Tel and I rton's ariabl Trans Parall e to s LC w	ition legen' Loop theor es, Sh missic el con inusoi ith co	theore s theo metho em, N hort ci on par nnection dal ex mplex	em, R orem, ods of faxim rcuit a amete on of actitation	ecipro Milln anal um Po admitt rs, Hy two con – s adance	ance /brid port eries and

	<b>Resonance:</b> Series resonance, Parallel resonance, concept of band width and Q factor. (12Hrs)
	UNIT IV Transient Analysis : First order differential equations, definition of 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:</li> <li>1. Jr William H Hayt &amp; Jack Kemmerly "Engineering Circuit Analysis", 6<sup>th</sup> edition, McGraw-Hill, 2000.</li> <li>Reference Books:</li> <li>1. M. E.Van Valkenburg "Network Analysis" 3<sup>rd</sup> edition, PHI, 2009.</li> <li>2. A Sudhakar and SP Shyam Mohan, "Circuits and Networks: Analysis and Synthesis", 4<sup>th</sup> edition, TMH, 2002.</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>

### **20ES2105 – ENGINEERING GRAPHICS**

<b>Course Category:</b>	Engineering Science	Credits:	3
<b>Course Type:</b>	Theory & Practice	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 Understand the scales and conics												
	CO2	Drav	w ortho	graphi	c proje	ections	of poi	nts, lii	nes and	l plane	s		
	CO3	Drav	w ortho	graphi	c proje	ections	of sol	ids and	d to un	dersta	nd basics	s of Auto	DCAD
	CO4	Und usin	erstand g Auto	the s	ection	s, dev	elopm	ent of	solid	s and	draw is	ometric	views
Contribution of Course Outcomes		P O1	PO 2	РО 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
towards achievement of Program	CO1	3		3				3					
Outcomes (1 – Low, 2 - Medium, 3 –	CO2	2		3				3					
High	CO3	2		3				3					
	CO4	1		3				3					
Course Content	UNIT Introd signific Scales Conic eccentr	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)											
	<b>UNIT–II</b> <b>Orthographic Projections:</b> Principles of orthographic projections –projections of points, Lines (Treatment is limited to first angle projection) and projections of plane regular geometric figures (Upto plane inclined to both of the reference planes)										s, Lines ometric		
<ul> <li>UNIT-III</li> <li>Projections of Solids: Projections of simple solids such as cubes, Prisms, Pyramids, Cyli and Cones with varying positions (Limited to solid inclined to one of the reference planes) Introduction to AutoCAD: Basic introduction and operational instructions of vacommands in AutoCAD. (Internal evaluation only)</li> <li>UNIT-IV</li> <li>Sections and Development of Surfaces of Right Angular Solids: Sections and sectional of right angular solids of Prism, Pyramid and Cone, Development of surfaces of right resolids of prism, Pyramid and cone.</li> </ul>											vlinders 3) various		
											l sectiona of right ctions of	l views regular simple	

	castings using AutoCAD. (Treatment is limited to simple objects only, Internal Evaluation only).
Text books	Text Books:
and	1. Basanth Agrawal & C.M.Agrawal, "Engineering Drawing", McGraw Hill Education Private
Reference books	Limited, New Delhi.
	2. N.D.Bhatt "Engineering Drawing", 53 <sup>rd</sup> Ed., Charotar Publishing House, Anand, 2019
	Reference Books:
	1. K.L.Narayana & P.Kannaiah, "Text Book on Engineering Drawing", 2 <sup>nd</sup> Ed., Scitech
	publications (India) Pvt.Ltd., Chennai, 2006.
	2. K.Venugopal, "Engineering Drawing and Graphics + AutoCAD", New Age International,
	New Delhi.
	3. D.M.Kulkarni, A.P.Rastogi, A.K.Sarkar, "Engineering Graphics with AutoCAD", PHI
	Learning Private Limited, Delhi, 2013.
<b>E-resources</b>	1. http://www.me.umn.edu/courses/me2011/handouts/drawing/blanco-
and other	tutorial.html#isodrawing.
digital	2. https://onlinecourses.nptel.ac.in/noc20_me79/preview
material	3. https://nptel.ac.in/courses/112/103/112103019/
## 20ES2152 – OBJECT ORIENTED PROGRAMMING USING PYTHON LABORATORY

<b>Course Category:</b>	Engineering Science	Credits:	1.5
<b>Course Type:</b>	Lab	Lecture - Tutorial - Practice:	0 - 0- 3
Prerequisites:	Programming for Problem	<b>Continuous Evaluation:</b>	30
	Solving, Programming for	Semester end Evaluation:	70
	Problem Solving Laboratory	Total Marks:	100

Course	Upon	succe	essful co	omplet	tion of	the co	urse, tl	ne stud	lent wi	ll be a	ble to:		
outcomes	CO1	Imp	plement python programming constructs to build small to large plications.										
	$CO^{2}$	Impl	$\frac{1}{1}$										
	$CO_2$	Eval	valuate and handle the errors during run time involved in a program										
	005	Extr	ract and import packages for developing different solutions for real time										
	CO4	prob	blems										
Contribution of Course Outcomes		P O1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
towards achievement of Program	CO1	3		2						2			3
Outcomes (1 – Low, 2 - Medium, 3 –	CO2	3	2	2						2			3
High	CO3	2	2	2						2			3
	CO4	2	2	2						2			3
Content	List of Week Runnir Write a Week Develo Week Develo Week Develo Week Develo	<ul> <li>Expe</li> <li>Expe</li> <li>Funding instance</li> <li>a program</li> <li>2: Op</li> <li>Pytl</li> <li>3 &amp; 4</li> <li>p Pytl</li> <li>5: Fundie</li> <li>6, 7 &amp;</li> <li>op Pytl</li> <li>9: Mediate instance</li> </ul>	riments indamen ructions ram to p erations non prog : Condi non prog nctions non prog as: Data non prog odules talling p	: tal Pro in inte urposet grams u itional grams u grams u a Struc grams u package	ograms ractive fully rational sing ba & Con hat mak using rea stures sing su	interpro ise inde sic ope <b>trol Flo</b> cursive itable d PIP and	eter and entation rations ow of condi and no lata stru	l a Pyth error a in Pyth tional a n-recur actures op Pyth	on scrij nd corr on ind con sive fun on proj	pt ect it trol flo nctions	w structu	res.	

	Week 10& 11:
	Application oriented case studies
	Week 12: Classes, Inheritance Illustrate class variables and instance variable
	Develop Python programs to exemplify the concepts of inheritance and overloading
Text books	Text Books:
and	1. Vamsi Kurama, "Python Programming: A Modern Approach", Pearson India, 2017.
Reference	2. Charles Severance, "Python for Informatics – Exploring Information", 1 <sup>st</sup> Ed., Shroff
DOOKS	Publishers, 2017
	R eference Books:
	1. Mark Lutz, "Learning Python", 5 <sup>th</sup> Ed., Orielly, 2013.
	2. Allen Downey "Think Python, How to Think Like a Computer Scientist", 2 <sup>nd</sup> Ed., Green Tea Press, 2015.
	3. W.Chun, "Core Python Programming", 2 <sup>nd</sup> Ed., Prentice Hall, 2006.
	4. Kenneth.A.Lambert, "Introduction to Python", 1 <sup>st</sup> Ed., Cengage Learning, 2011.
<b>E-resources</b>	1. Charles Severance: University of Michigan, "Python for Everybody", Coursera
and other	https://www.coursera.org/
digital	2. Prof .Sudarshan Iyengar, IIT Ropar, Prof. Yayati Gupta, IIIT Dharwad, "The Joy of
material	Computing Using Python" NPTEL
	https://nptel.ac.in/courses/106/106/106106182/#
	3. Charles Russell Sevarance, University of Michigan, "Python for Everybody", 2019. https://www.coursera.org/learn/python

## 20ES2153 – ENGINEERING WORKSHOP

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

Course	Upon	success	sful co	mpletio	on of th	ne cour	se, the	studer	nt will	be able	to:		
outcomes	CO1	CO1 Understand the basic joints using wood and familiarize with various fundamental aspects of house wiring.											
	CO2	Prepar weldi	Prepare basic models using sheet metal and practice joining of metals using arc welding technique.										
	CO3	Famili printir	Familiarize with various manufacturing processes such as injection moulding and 3D printing										
	CO4	Under	Understand the preparation of PCB										
	CO5	Under	stand s	imple I	OT app	lications	s using	Arduin	0				
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
towards achievement of Program	CO1			2					1			3	2
Outcomes (1 – Low, 2 - Medium, 3 –	CO2			2					1			3	2
High	CO3			2					1			3	2
	CO4						1						
	CO5							2					
Course Content	List of Part-A Carper Demon Demon Electri Fundar Practic Sheet I Prepara	f Expen- ntry: Istration Istration istration ical Win nentals e of stai Metal & ation of	riment of cros of pow cing: of elect ircase w <u>&amp; Solde</u> comple	ts: ss half la ver tools tric wiri viring au ering: ete funn	ap and 7 s. .ng and nd conn el using	Γ joints practice ecting a g sheet r	. (10 e of seri a fluore: metal ar	class) es wirin scent tu nd pract	ıg. (1cl; be. ice of s	ass) oldering	g. (2clas	sses)	

	<u>Welding:</u> Preparation of corner joint using arc welding process. (1class)
	Preparation of "T" joint using arc welding process.
	Manufacturing Processes: Preparation of a small plastic part using injection moulding process. (1class) Demonstration of manufacturing a simple model using 3D printing process.
	Electronic Circuits: To prepare PCB for the given electronic circuit To prepare the layout and printing it on copper clad board To etch and drill the holes on PCB (2classes)
	<b>To solder the components on the PCB prepared and test the circuit</b> To identify and solder the components on the PCB prepared To test the operation of the circuit.
	Basic IOT: Demonstration of Arduino board Demonstrate different components & pin configuration of Arduino To set up Arduino IDE for programming.
	<b>To measure Temperature &amp; Humidity</b> Interfacing of temperature & humidity sensor with Arduino. (2classes) Execute the program on Arduino IDE & display the measured values.
	To measure Distance Interfacing of ultrasonic sensor with Arduino Execute the program on Arduino IDE & display the measured value.
	Part-B Group Activity (4classes) Students must prepare a working model / assembly using the knowledge gained from the above trades.
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Kannaiah.P &amp; Narayana.K.C, "Manual on Workshop Practice", Scitech Publications, Chennai, 1999.</li> <li>2. Venkatachalapathy.V.S., " First year Engineering Workshop Practice", Ramalinga Publications, Madurai, 1999.</li> <li>Reference Books:</li> <li>1. C. M. W. K. K.</li></ul>
	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	1. https://dsceme.files.wordpress.com/2016/08/workshop-practice-manual-2016-17-1.pdf
and other	2. https://www.protosystech.com/rapid-prototyping.htm
digital	3. https://www.arduino.cc/en/Tutorial/Foundations
material	4. https://www.tutorialspoint.com/arduino/index.htm

## 20MC2106 – PROFESSIONAL ETHICS & PRACTICE

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

Course	Upon successful completion of the course, the student will be able to:												
outcomes	CO1	Know	Know the moral autonomy and uses of ethical theories.										
	CO2	Under	nderstand engineering as experimentation										
	CO3	Under	derstand about safety, risk and professional rights.										
	CO4	Know weapo	now the ethics regarding global issues related to environment, computers and eapons development. Understand general principles of contracting.										
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
towards achievement of Program	CO1												
Outcomes (1 – Low, 2 - Medium, 3 –	CO2												
High	CO3												
	CO4												
Course Content	UNIT Engine inquiry Consen interest UNIT Engine respons case stu UNIT Safety, benefit Collegi Conflic Propert UNIT Global Weapo witness	- I eering 1 - Moi asus and - Custo - II eering a sible ex ady - III Respo analys ality ar ets of in cy Right - IV Issues ns deve	Ethics: ral dile l Contro oms and as Soci periment onsibili is and nd loya terest - s (IPR) s: Mult lopment advisor	Senses mmas oversy – d religio al Exp nters – ties an reducin lty – R Occupa - Discr inationa at - Eng	s of 'En – Mora - Model on – Use eerimen Codes d Righ ng risk espect ational o iminational al corp ineers a ral lead	ngineer al autor ls of pro- es of eth <b>ntation</b> : of ethic <b>nts:</b> Sa: – The for auti- crime – on orations as mana- lership	ing Eth nomy - ofession nical the Engine cs – A fety an three hority - Profess s – En agers - 0 – Sam	d risk-a mile i balance d risk-a mile i Collect sional r	Variety erg's the s – Theo as expe- ed outlo assessm sland a ctive ba ights – ental e ing eng e of eth	of mo neory - ories ab erimenta ook on ent of ind che urgainin Employ thics – ineers -	ral issu Gilliga out righ ation – law –T safety rnobyl g - Con zee righ Comp Engine ecific t	es- Typ n's the t action Engine he chal and ris case st nfidenti ts-Intell uter eth eers as	ers as lenger sk-risk ality - lectual

	engineering discipline).
	General Principles of Contracts Management: Indian contract act, 1972 and amendments
	covering general principles of contracting.
Text books	Text Books:
and Reference	1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, NewYork
books	(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 study of the
	Human Dimensions of Science and Technology", Rensellae Polytechnic Institute, Troy,
	New York, 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, 175pp, 1994.
	3. Dutt, "Indian Contract Act", Eastern Law House, 1994.
E-resources	
and other	
digital	
material	

# Velagapudi Ramakrishna Siddhartha Engineering College ELECTRONICS AND COMMUNICATION ENGINEERING

#### SEMESTER III

#### **CONTACT HOURS: 28**

S.No.	Course Code	Subject	L	Т	Р	Credits
1	20BS3101	Complex Analysis and Numerical Methods	3	0	0	3
2	20EC3302	Analog Electronics	3	0	0	3
3	20EC3303	Microcontrollers	3	0	0	3
4	20EC3304	Digital Circuit Design	3	0	0	3
5	20EC3305	Probability Theory & Random Processes	3	0	0	3
6	20EC3351	Analog Electronics Lab	0	0	3	1.5
7	20EC3352	Microcontrollers Lab	0	0	3	1.5
8	20EC3353	Digital Circuit Design Lab	0	0	3	1.5
9	20TP3106	Logic and Reasoning	0	0	2	1
10	20MC3107A	Environmental Studies	2	0	0	-
	Total Credits				11	20.5

## 20BS3101: COMPLEX ANALYSIS & NUMERICAL METHODS

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

Course	Upon s	succes	sful co	omplet	ion of	the co	ourse,	the stu	ident v	will be	able	to:			
Outcomes	CO1	Deter	rmine	analyt	ic, no	n-anal	ytic fu	nctior	is and	evalu	ate co	mplex	integ	als.	
	CO2	Anal	yze Ta	aylor,	Laure	ent ser	ries ar	id eva	luate	real d	efinite	e integ	grals u	ising re	esidue
		theor	em.												
	CO3	Solve	e algel	braic,	transc	enden	tal, sy	stem	of equ	ations	s and	estima	ate fur	octions	using
		polyr	polynomial interpolation.												
	CO4	Solve initial value problems numerically.													
Contribution		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
of Course		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Outcomes	CO1	3				2		2							3
towards		5				-		2							5
achievement	CO2	3				2		2							3
of Program		5				2		2							5
Outcomes	CO3	2	2			2							n		2
(1 - Low,		3	Z			3							Z		3
2 - Medium,	CO4	3	2			3							2		3
3 – High			2			5							2		5
Course	UNIT	I													
Content	Comp	Complex Analysis:													
	Introdu functio Cauch	uction, ons, C y's inte	Con Orthogo egral th	tinuity onal s heorer	7, Ca systen n, Cat	uchy-l ns, Aj ichy's	Riema pplica integr	nn ea tion t al form	quatio o flov nula.	ns. A w pro	nalyti blems	c fur s, Con	nctions mplex	s, Harn integr	monic ation,
	UNIT	II													
	Taylor theorem around	's serie m, Ca l the ui	es, La lculati nit circ	urent's ion of cle (ii)	s serie f Resi Integ	es, Zer idues, ration	os an Evalu aroun	d Sing ation d a sm	gularit of re all ser	ies of eal de ni-cire	an an finite cle, Bi	alytic integ linear	funct rals:(i) transf	ion, Re ) Integ formatio	esidue ration on.
	UNIT	III													
	Nume	rical N	<b>Aetho</b>	ds:											
	Solutio Solutio	on of on of S	Algeb imulta	oraic a aneous	nd Tr s linea	ransce r equa	ndenta tions v	al Equ with G	ations auss -	s with Seide	New l itera	ton - tive m	Raph nethod	son me	ethod,
	Interp differe differe formul differe	olation nces, nces, ae In nce fo	n: Iı Symbo Centr terpola rmulao	ntrodu olic R ral d ation e.	ction, elation ifferer with	Fini ns, Ne nce in unequ	te D wton' nterpo ual ir	oifferent s intent lation laterval	nces-F rpolati form s - 1	Forwar on fo nulae- Lagrar	d, B rmula Gauss Ige's	ackwa e-forw 's, S and	ard a vard an tirling Newto	nd C nd bacl 's, Be on's di	entral kward essel's ivided

	UNIT IV												
	Numerical Differentiation-First and second order derivatives using Newton's forward and backward difference formulae, Numerical integration with Trapezoidal rule and Simpsons 1/3 Rule, Numerical Solutions of Differential Equations-Taylor's series method, Euler's method, Modified Euler's method and Runge - Kutta method of 4th order.												
Textbooks	Text Book:												
and Reference books	1. B.S.Grewal, "Higher Engineering Mathematics", 44 <sup>th</sup> Edition, Khanna Publishers, 2019.												
	Reference Book(s):												
	ErwinKreyzig, "Advanced Engineering Mathematics", 10 <sup>th</sup> Edition, John Wiley &												
	Sons, 2015.												
	R.K.Jain, S.R.K.Iyengar, "Advanced Engineering Mathematics", 5 <sup>th</sup> Edition, Narosa												
	Publishers, 2016.												
	N.P.Bali, Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition,												
	Lakshmi Publications (P) Limited, 2016.												
	4. H. K. Das, Er. Rajnish Verma, "Higher Engineering Mathematics", 3"Revised Edition,												
	5. S. S. Sastry, "Introductory Methods of Numerical Analysis" 5 <sup>th</sup> Edition, PHI Learning												
	2012												
E-resources	1 Prof Pranav Haridas Kerala School of Mathematics Complex Analysis												
and other	Available:https://onlinecourses.nptel.ac.in/noc21_ma39/preview												
digital	2. Prof. Ameeya Kumar Nayak, Prof. Sanjeev Kumar, IIT Roorkee, Numerical methods,												
material	Available: <u>https://onlinecourses.nptel.ac.in/noc21_ma45/preview</u>												
	3. Jeremy Orloff, Massachusetts Institute of Technology: MIT OpenCourseWare, <i>Complex</i>												
	Variables with Applications, Available: https://ocw.mit.edu.												
	4. Henrik Schmidt, Massachusetts Institute of Technology:												
	MITOpenCourseWare,Introduction to Numerical Analysis for Engineering,												
	Available: <u>nttps://ocw.mit.edu</u> .												

## 20EC3302: ANALOG ELECTRONICS

<b>Course Category:</b>	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	20PH1102-Engineering Physics,	Continuous Evaluation:	30
	20EE1104-Basics of Electrical	Semester end Evaluation:	70
	Engineering	Total Marks:	100

Course outcomes	Upon	Upon successful completion of the course, the student will be able to:													
outcomes	CO1	Deve Dioc	elop tl les an	he abi d BJT	lity to s.	under	rstand	, anal	yze an	nd desi	ign pr	actica	l circu	iits based	lon
	CO2 Able to design amplifier circuits using MOSFET and also will be able to understand the frequency response of the amplifiers.														
	CO3	Able also	Able to design multistage amplifier and power amplifier circuits using BJTs and also will be able to understand the frequency response of the amplifiers.												
	CO4	Und para	Understand the effect of positive and negative feedback on different parameters of amplifiers and able to design oscillator circuits using BJTs.												
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		2											
	CO2		2		2										
	CO3		2			2									
	CO4	2			2										
Course Content	UNIT Diode and fu biasin ampli (12 H UNIT MOS small and co freque UNIT Multi ampli (10 H	' I: e Circ dll-wa' g circ fiers; f rs) ' II: FET signa ommo ency e ' III: -Stag fiers; rs)	uits: I ve rec uits, L Small Circu I equi n-sou: quival e and Diffe	P-N ju tifiers load li signa its: N valent rce, co lent ci ent ci	nction Inpuine and lequine MOSF circu ommo rcuit.	n diod t outp alysis, valent ET stu its - ; n-gate <b>Ampli</b> plifier	e, I-V ut cha , com circu ructur gain, : e and <b>fiers:</b> cs, Po	chara rracter mon-e its. e and input comm Dire ower	I-V of and of on-dr	tics of of BJ' r, com charac utput ain an oupled fiers	f a dio T in C mon-l eteristi impeo nplifie and - Cla	de; re B, CE base a cs. M dances ers, tra RC ss A,	view of E, CC nd con OSFF s, sma ins con Coupi Clas	of half-w configur mmon co ET as a ill-signal nductanc (1 led mult s B, Cl	ave ations, ollector switch. model ze, high <b>2 Hrs</b> ) ti-stage lass C.

	<b>UNIT – IV: Feedback Amplifiers:</b> Concepts of feedback – Classification of feedback amplifiers –         General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier         characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback         configurations – Simple problems. <b>Oscillators:</b> Condition for Oscillations, RC type Oscillators-RC phase shift and Wienbridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators.         (11 Hrs) <b>Text Books:</b>										
Text books and	Text Books:										
Reference	1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education,										
books	2nd edition 2010										
	<ol> <li>Microelectronic Circuits: Theory and Applications, Adel S. Sedra and K. C. Smith, 7th edition, Oxford University Press.</li> <li>Reference Books:         <ol> <li>Electronics circuits and applications. Md H Bashid, Cengage 2014.</li> </ol> </li> </ol>										
	2. Electronic Devices and Circuits, S. Salivahanan, N. Suresh Kumar, A Vallvaraj,										
	5th Edition, MC Graw Hill Education										
	3. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.										
	4. Electronic Devices and Circuits theory–Robert L. Boylestead, Louis Nashelsky, 11th										
	Edition, 2009, Pearson.										
<b>E-resources</b>	1. https://onlinecourses.nptel.ac.in/noc20_ee45/preview										
and other	2. https://nptel.ac.in/courses/117/101/117101106/										
digital											
material											

## 20EC3303: MICROCONTROLLERS

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

Course outcomes	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	App	rehen	d the i	nterna	al arch	itectu	re of 8	8051n	nicroc	ontrol	ler			
	CO2	Impl	emen	t appli	icatio	n logic	e in as	sembl	y lang	guage	for 80	)51			
	CO3	Dev	elop C	C prog	rams	for app	olicati	ons us	sing 8	051.					
	CO4	Desi	Design a system for basic embedded applications												
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	
of Program Outcomes	CO2	2		1										2	
(1 – Low,	CO3		2	2										2	
2 - Medium, 3 – High)	CO4			2										2	
Course Content	UNIT I Inside t Family, Address I/O and and runn and d (10 Hrs UNIT I Arithm compare applicat 8051 I/O 8051 C, in 8051 (13 Hrs	: he Co Pin sing m RAM ning a irectiv ) I: etic Ii e Inst ion pr O prog I/O p C, A	omput descr iodes, 1, Insi n 805 /es, nstruc ructio ogram gramn rogran Acces	er, M ription Acce de the 1 prog Flag tions, ns, Ro ns, Loo ning, 1 mming sing o	icroco of t ssing 805 gram, bits Signo otate op and [/O b g in 8 code	ontroll he 80 Memo I, Int Progra and ed nu Instru d Jumj it mar 051 C. ROM	ers an 51, 8 ory us roduc am Co 1 PS mber ction p Instr nipula , Logi space	nd En 051 A ing V tion to ounter SW conce and I ruction tion p c open e in S	arious o 805 and F regist pts a Data a ns, Ca rogran ration 8051	ed Pr ssing s Adda 1 asse ROM s rer, nd A seriali all Inst mming s in 80 C, D	ocesso mode: ressing embly space Regis rithme zatior ruction g, Da 051 C ata se	erializ	pvervie nediat les, Bi ammin 8051, Banks peratio D, AS conve ation	ew ot th e and R t Addres ng, Asse 8051 dat and ons, Log CII, and I Time d ersion pr using 80	e 8051 degister sses for mbling a types Stack. gic and d other elay in ograms 051 C.

	<ul> <li>UNIT III: Programming 8051 Timers, Counter programming, Programming timers0 &amp; 1 in 8051C, Basics of serial communication, 8051 serial port programming in assembly, serial port programming 8051 in C, 8051 Interrupts, programming Timer interrupts, programming the serial communication interrupt, interrupt priority in the 8051. Interrupt programming in C. (12 Hrs)</li> <li>UNIT – IV: Semiconductor memory, Memory address decoding, 8031/51 Interfacing with external ROM, Parallel and ADC, DAC interfacing, Sensor interfacing and signal conditioning, LCD interfacing, keyboard interfacing. (10 Hrs)</li> </ul>									
Text books and Reference books	<ol> <li>Text Books:         <ol> <li>Muhammad Ali Mazidin, Janice GillispieMazidi and Rolin D. McKinlay, "The 8051 Microcontroller and Embedded systems using assembly and C". 2/e Pearson Education, 2007.</li> <li>Kenneth J Ayala, "The 8051 Microcontroller", 3rd edition, 2004, Cengage Learning.</li> </ol> </li> <li>Reference Books:         <ol> <li>Rajkamal "Microcontrollers, Architecture, Programming and system design", Pearson Education, 2007.</li> <li>Ajay V Deshmukh, "Microcontrollers Theory and Applications", Tata McGraw-Hill, 2005.</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-(8051 datasheet).</li> <li>www.8052.org</li> </ol>									

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## 20EC3304: DIGITAL CIRCUIT DESIGN

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

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Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Appl circu	y the its wit	map h ANI	metho D- OR	d for , NAN	simpli ID, or	fying NOR	Boole gates.	an ex	pressio	ons an	d con	struct of	ligital
	CO2 Design various combinational circuits and use Verilog HDL for the description behavioral model of circuit's functionality.												on of		
	CO3	Analyze and design various sequential circuits.													
	CO4 Assess the performance of different logic families and use Verilog HDI description of behavioral model of circuit's functionality.											HDL fo	or the		
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 of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO1	1	1												1
	CO2	2													2
	CO3	2													2
	CO4		2												1
Course Content	UNI Book stand Gate simpl UNI Com binar HDL dataf UNI Sync analy Regi	CO4       2       1         UNIT I:       Boolean Algebra: Basic theorems and properties of Boolean functions, canonical and standard forms, digital logic gates.       Gate level minimization: The map method, four variable map, product of sums simplification, don't care conditions, NAND and NOR implementation. (11 Hrs)         UNIT II:       Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, magnitude comparator, decoders, encoders and multiplexers         HDL Models for Combinational Circuits: Module declaration, Gate level modeling, dataflow modeling, and Behavioral modeling. (11 Hrs)         UNIT III:         Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip-flops, analysis of clocked sequential circuits, design procedure and synthesis using D-flip-flops.         Registers and counters: Registers, shift registers, ripple counter, synchronous counters.													

	<ul> <li>UNIT – IV:</li> <li>Synthesizable HDL Models of Sequential Circuits: Behavioral modeling of flip flops, latches, state diagrams.</li> <li>Digital Integrated Circuits: Special Characteristics, Transistor-Transistor Logic, Emitter Coupled Logic, Metal Oxide Semiconductor, Complementary MOS. (11 Hrs)</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, 2013.</li> <li>Reference Books:</li> </ul>
	<ol> <li>Brown, Stephen D. "Fundamentals of digital logic with Verilog design". Tata McGraw- Hill Education, 2007.</li> <li>Thomas L. Floyd "Digital Fundamentals", 11<sup>th</sup> Edition, Pearson Education India, 2015.</li> </ol>
E-resources and other digital material	<ol> <li>http://www.ece.ubc.ca/~saifz/eece256.html</li> <li>https://nptel.ac.in/courses/117/106/117106086/</li> </ol>

## 20EC3305: PROBABILITY THEORY AND RANDOM PROCESSES

<b>Course Category:</b>	Basic Science	Credits:	3
Course Type:	Practical	Lecture - Tutorial-Practice:	3-0-0
Prerequisites:	20EC3305: Signals and	<b>Continuous Evaluation:</b>	30
	Systems	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:															
0	CO1	Deve comp	elop th pute th	ie prol ne stat	oabilit istical	y distr param	ibutio ieters.	n and	densit	y func	tions	of ran	dom va	ariables a	nd	
	CO2	Deve rande	Develop the Joint probability distribution and Joint Probability density functions of random variables and compute the statistical parameters.													
	CO3	Char powe	Characterize systems driven by a stationary random process using autocorrelation and power spectral density functions.													
	CO4	Anal	yze ar	nd mo	del rar	ndom 1	noise j	proces	ses in	typica	l com	munic	ation s	systems		
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low,		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	3													1	
	CO2	3													1	
	CO3	3													1	
2 - Medium, 3 – High)	CO4	3	3												1	
Course Content	UNI Prof and Ran func and Ope Mor (12H UNI Mul Prop Inde Thee Ope Vari (12H	( <b>T-I</b> babili Condi dom ction, Densi eration nents, Hrs) ( <b>T-II</b> (tiple pende orem ( eration ables, Hrs)	ty: Pr itional Varia Q Fur ty Exa ns on Trans Rand , Joint ence, (Proof ns on , Joi	obabil Proba ables: action, ample: <b>One</b> sforma forma <b>lom</b> t Dens Distri not e: <b>Mult</b> nt C	Varia button Varia button button vpecte iple F haract	troduc , Indep Rando r Func ditiona dom of a R bles: d its P and d its P and cd). Rando teristic	ed thr pender om Va tion, ' al Dist <b>Varia</b> andon Vecto Propert Densi <b>m Va</b> E Fui	ough S nt Eve riable The G tribution <b>able:</b> n Varian or Ran ies, C ity of <b>riable</b> nction	Sets an nts, Conc aussia on and Expec able. ndom onditio Sum es: Exp s, Jo	nd Rel ombin cept, I un Rar l Der ctation Varia onal D of R pected ointly	lative ed Ex Distrib dom sity F , Mo bles, Distrib andor Valu Gau	Frequ perimo ution Varial unctic ments Joint ution a n Van e of a ssian	ency, Sents, B Functions, Otons, Functions, Function Distrand Destriables	Joint Prol ernoulli t ion and l ther Distr tions that ensity, Sta , Central ction of F lom Va	bability rials Density ibution at give and its atistical l Limit Random riables.	

	<ul> <li>UNIT-III</li> <li>Random Process: Random Process Concept, Stationary and Independence, Correlation Functions, Gaussian Random Process, Poisson Random Process.</li> <li>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. (12 Hrs)</li> <li>UNIT – IV</li> </ul>
	Noise: Shot Noise, Thermal Noise, Noise Calculations: Single Noise Source, Multiple Sources: Superposition of Power Spectra, Noise Calculations in Passive Circuits, Equivalent. Noise Bandwidth, Noise Figure of an Amplifier, Power Density and Available Power Density, Effective Noise Temperature, Noise Figure in Terms of Available Gain, Cascaded Stages. (9 Hrs)
Text books and Reference books	<ul> <li>Text Book:</li> <li>Peyton Z. Peebles, "Probability, Random Variables &amp; Random Signal Principles", 4th Edition, TMH, 2002. (Units - I, II, III)</li> <li>B.P. Lathi, "Signals, Systems &amp; Communications", B.S. Publications, 4th Edition, 2009. (Unit - IV).</li> <li>Reference Books: <ol> <li>Athanasios Papoulis, S.Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", 4rd Edition, TMHI, 2002. (UNITS –I,II,III)</li> <li>R.P. Singh and S.D. Sapre, "Communication Systems: Analog &amp; Digital", 3rd Edition,</li> </ol> </li> </ul>
E-resources and other digital material	<ul> <li>TMH, 2012. (Units –I,II,IV)</li> <li>1. http://nptel.ac.in/courses/117105085/</li> <li>2. https://www.stat.berkeley.edu/~aldous/134/gravner.pdf</li> </ul>

## 20EC3351: ANALOG ELECTRONICS LAB

Course Category:	Core	Credits:	1.5
Course Type:	LAB	Lecture - Tutorial -Practice:	0-0-3
Prerequisites:	Semiconductor Physics, Analog	Continuous Evaluation:	30
	Devices.	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upo	Upon successful completion of the course, the student will be able to:													
	CO1	Design and test practical electronic circuits using Diodes, BJTs, MOSFETs.													
	CO2	Able be at	Able to design amplifier circuits using BJT and MOSFET also will be able to understand the frequency response of the amplifiers.												
	CO3	Desi osci	Design and analyze various transistor power amplifier circuits, feedback circuits and oscillators.												
Contributio		РО	РО	РО	РО	РО	РО	РО	РО	PO	РО	РО	РО	PSO	PSO
n of Course		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Outcomes	CO1			2	3										2
towards	<b>a a</b>														
achievement	CO <sub>2</sub>			2	3										2
Outcomes															2
(1 - Low,	$CO^{2}$			n	2										
2 - Medium,	COS			Z	3										
3 – High)															
Lab Content		1. U	Inderst	and the	PN Ju	inction	and Z	lener d	iode cl	naracte	ristics				
		(8	a) Circ	uit Sin	nulatio	n Tuto	rials fo	or P-N	diodes	s (LTsp	oice) &	Exper	riment	al	
		(ł	o) Circ	uit Sin	nulatio	n Tuto	rials fo	or Zene	er diod	es (LT	spice)	& Exp	erime	ntal	
		2. U	nderst	and the	BJT a	und MO	DSFET	chara	cteristi	ics	_				
		(8	a) Circ	uit Sin	nulatio	n Tuto n Tuto	rials fo	or BJT	(LTsp	nce) &	Exper	1menta	ll manutat	1	
		3 D	)) CIIC Design :	and Im	nlemer	n ruio station	of Die	or MO. ode Re	SFEI ( ctifier	(L1 spi Circuit	ce) & I	Experi	menta	l	
		4. D	esign a	and An	alysis	of BJT	CE Fi	ixed, S	elf-bia	is Circi	uits.				
		5. D	esign a	and Fre	equenc	y Anal	ysis of	BJT (	CE Am	plifier					
		6. D	esign a	and An	alysis	of MO	SFET	CS Se	lf Bias	Circui	its.				
		7. D	esign a	and Fre	equenc	y Anal	ysis of	MOS	FET C	S Amp	olifier.				
		8. D	esign a	and ana	alysis c	of trans	sistor C	Class-A	a powe	r ampl	ifier.				
		9. A	nalysis	s of Fe	edback	circui	ts with	MOS	FETs.	:4.0					
		10. D	esign a	and An	alysis	of Wig	lage re	guiato	r circu illator	1ts					
		11. L 12 Г	esign (	and An	alysis alveie	of RC	nhase	shift I		illatore	:				
		14. D	congin (		ury 515		phase	sinit, I		mators					

	*Course based project To implement the course project, following are the example circuits to be executed: Water Level Alarm Circuit, Street Light Circuit, Low Cost Fire Alarm Circuit etc
Text books and Reference books	<ol> <li>Jacob Millman and Christos C Halkias, "Integrated Electronics: Analog and Digital Circuits and Systems", TMH, 2003.</li> <li>Jacob Millman and Herbert Taub, "Pulse, Digital and Switching Waveforms, 3rd Edition, TMH, 2003.</li> <li>Rajesh Singh, Anita Gehlot, and Bhupendra Singh, "Arduino-Based Embedded Systems: Interfacing, Simulation, and LabVIEW GUI ", Taylor and Francis, CRC press, 2018.</li> <li>Arduino and Raspberry Pi lab manuals</li> </ol>
E-resources and other digital material	<ol> <li>https://dspace.mit.edu/bitstream/handle/1721.1/45581/6-101Fall- 2002/OcwWeb/Electrical-Engineering-and-Computer-Science/6-101Introductory- Analog-Electronics-LaboratoryFall2002/Labs/index.htm</li> <li>https://newhorizonindia.edu/nhengineering/analog-electronics-circuits-lab/</li> </ol>

**NB**: Eligibility for External Practical Examination:

1. A minimum of 10(Ten) experiments to be performed and recorded by the candidate.

2. Execute and submit a course-based project

## 20EC3352: MICROCONTROLLERS LAB

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

Course outcomes	Upon	on successful completion of the course, the student will be able to:													
	CO1	Dev	Develop assembly and C language programs on 8051.												
	CO2	Inter	terface the peripherals to 8051 and program using assembly and C Language.												
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	CO1				3	3								3	
of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO2				3	3								3	
Course Content	List of 1. 2. 3. 4. 5. 6. 7. 8. 9. 10 11 12 Cours 1. 2. 3.	experience Basi Prog Prog Prog Prog Prog Prog Prog Prog	riment ic prog grams	to be grams on Se on Ti on Co on In on LC on Al on D on Ke on ste on ste on ste on ste on ste on ste on ste on Se on Co on Se on Co on Co on Se on Co on Se on Co on Co on Se on Co on Con	e imple on M erial C mer o unter terrup CD Di DC int AC int eyboar epper c bus velopr evelopr	ement icroco ommu perati- opera t Mec splay terfaci terfaci rd inter interfaci interfaci interfaci nent a	ed on ontroll unicat on. tion. hanisr interf ing ing. erfacing acing acing	8051 ler Ins ions. n. acing. g. cacing al ther Blueto follow	using truction moment poth C wer ro	both on set eter. Contro bot.	assem blled 1	ıbly aı Home	nd C la	anguage.	System

<b>E-resources</b>	1. www.8052.org
and other	2. www.datasheetarchive.com/8051-datasheet.html
digital	
material	

**NB:** Eligibility for external practical examination

- 1. A minimum of 10(Ten) experiments to be performed and recorded by the candidate.
- 2. Execute and submit a course-based project

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

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Desig	n simp	le log	ic circ	uits a	nd ver	ify the	eir fur	nction	ality.				
	CO2	Devel	op ski	ll to d	lesign	simpl	e digi	tal cir	cuits	using	Veril	og HI	DL.		
Contribution		PO	РО	РО	РО	PO	РО	PO	PO	PO	РО	PO	PO	PSO	PSO
of Course		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Outcomes															
towards	CO1	2	2												2
achievement	001	-	2												2
of Program															
Outcomes (1 –															
Low, 2-															
Medium, 3-	CO2	2	2												2
High)															
Course	1. Ver	1. Verification of the following logic gates using discrete components													
Content		a. NAND Gate													
		b. NOR Gate													
	2. Des	2 Design and implement the following													
		a. H	alf add	ler usi	ng NA	AND/I	NÖR	Gates							
		b. Fu	ıll add	er usi	ng De	coder	IC								
	3. Des	sign an	d impl	emen	t subtr	actor	using	multij	plexer	·IC					
	4. Des	sign an	d impl	ement	t 2-bit	count	er usi	ng JK	flipfl	op IC					
	5. Imp	blemen	t ring of	counte	er usin	Ig JK I	of X	p IC	oto II	ing V	Jorilo	αHD	I in	anto 1	ovol
	data	aflow <i>e</i>	ind bel	ny m havioi	ral m	odelin	σ	OK g	ale u	sing	venio	g IID	LIII	gate 1	evel,
	7. Des	sign an	d verif	y the	operat	tion of	f an 82	x3 End	coder	using	Veril	og HI	DL		
	8. Des	sign an	d verif	y the	operat	tion of	falx8	8 dem	ultiple	exer u	sing V	Verilo	g HD	L	
	9. Des	sign an	d impl	emen	t the f	ollowi	ng co	de cor	iverte	rs usi	ng Ve	rilog	HDL		
		i. 	BCD	to exe	cess-3	code	and v	ice ve	rsa						
	10 Do	11.	Binai d vori	y to g	ray ar	id vice	e-vers	a inflor	11010	1 Vari	log U	וח			
	10. De	sign an	d verif	Ty the	operat	tion of	f a uni	versal	shift	regist	er usi	ng Ve	erilog	HDL	
	12. Des	sign a 3	3-bit o	dd nui	nber c	counte	r usin	g Ver	ilog H	IDL					
	13. Cou	irse Ba	sed Pr	ojects	5			<i>–</i>	0						
		a. D	evelop	a sys	tem to	o coun	t no o	f stud	ents e	nterin	g the	lab an	d disj	play th	e
			ount or	n sever	n segn	nent u	sing d	ligital	ICs	1		., .	<i>.</i>	11.	
		D. SI	mulate erilog	e a sii HDL	nple i	mcroj	proces	sor ci	rcuit	and v	erity	its fu	nctior	iality i	ısıng

Text books	Reference Books:
and Reference	1. Palnitkar, Samir. "Verilog HDL: A guide to digital design and synthesis". Prentice
books	Hall, 2003.
	2. M. Morris Mano, Michael D. Ciletti, "Digital Design", 4 <sup>th</sup> edition, Prentice Hall, 2013.
	3. Brown, Stephen D. "Fundamentals of digital logic with Verilog design". Tata
	McGraw-Hill Education, 2007.
	4. Thomas L. Floyd "Digital Fundamentals", 11 <sup>th</sup> Edition, Pearson Education India, 2015.
<b>E-resources</b>	1. https://de-iitr.vlabs.ac.in/exp/half-full-subtractor/index.html
and other	2. http://vlabs.iitkgp.ernet.in/dec/#
digital	3. http://cse15-iiith.vlabs.ac.in
material	4. http://classweb.ece.umd.edu/enee359a/verilog_tutorial.pdf

Eligibility for External Practical Examination:

- 1. A minimum of 10(Ten) experiments to be performed and recorded by the candidate.
- 2. Execute and submit a course-based project

## 17HS3106: LOGIC & REASONING

<b>Course Category:</b>	Humanities & Social Sciences	Credits:	1
<b>Course Type:</b>	Learning by Doing	Lecture -Tutorial-Practice:	1 - 0 - 1
Prerequisites:	-	<b>Continuous Evaluation:</b>	100
		Semester end Evaluation:	0
		<b>Total Marks:</b>	100

## COURSE OUTCOMES

Upon s	successful completion of 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
<b>CO4</b>	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 for companies and in other competitive exams

# 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								
CO2		2												
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
- 5. Direction sense test

#### **UNIT II:**

- 1. Logical Venn diagrams
- 2. Number test, Ranking test
- 3. Mathematical operations
- 4. Arithmetical Reasoning
- 5. Syllogism

#### UNIT III:

- 1. Binary Logic
- 2. Inserting missing character
- 3. Data sufficiency
- 4. Analogy
- 5. Classification

#### **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 BOOKS

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

#### e-Reference:

[1]. Indiabix.com, treeknox.com, examveda

## 20MC3107A: ENVIRONMENTAL STUDIES

Course Category:	Manda	atory (	Course	9				Credits: -								
Course Type:	Theor	v						Lecture-Tutorial-Practice: 2-0-0								
Prerequisites:	Consc	iousne	ess of	Envir	onmer	nt		Continuous Evaluation: 100								
								S	lemes	ter end	l Eval	uatior	n: 0			
								Total 100								
							Μ	arks:								
	1															
Course Outcomes	Upon	successful completion of the course, the student will be able to:														
	CO1	Iden meas	tify va sures	rious	factor	s caus	sing de	egrada	ation o	of natu	ral re	source	e and o	control		
	CO2	Iden	tify va	arious	ecosy	stem a	and ne	ed for	biod	iversit	у					
	CO3	Real mana	ize an ageme	d expl ent	lore th	ie proł	olems	relate	d to e	nviron	imenta	al poll	ution	and its		
	CO4	App with	ly the envir	inforr onmei	nation nt	and t	echno	logy t	o anal	yze so	ocial i	ssues,	use a	cts asso	ciated	
Contribution of		PO	РО	PO	PO	PO	РО	РО	PO	PO	PO	PO	PO	PSO	PSO	
Course		1	2	3	4	5	6	7	8	9	10	11	12	1	2	
Outcomes	CO1	1							1					1		
towards	CO2		1	1							1			1		
Program	CO3				1	1							1	1		
Outcomes	CO4													1		
(1-Low, 2-							1	1	1							
Medium, 3-							-	-	-							
High)																
Course Content	UNIT	I		_	_											
	The M	lultidi	sciplin	nary N	lature	of En	vironi	nental	Stud	ies De	efinitio	on, sco	ope ar	id impo	rtance	
	Need t	for pul	olic av	varene	ess.											
	Natur	al Res	sourc	es:				_	_	_					_	
	Renev	vable	and N	on-re	enewa	ble R	esour	ces: N	latura	l resou	irces a	and as	sociat	ed prob	olems.	
	(a)For	rest i	esour	ces:	Use	and o	over-e	xploit	ation,	defo	restat	ion.	Timbe	er extra	action,	
	mining	g, dam	is and	their	effects	s on to	orests	and tr	ibal p	eople.			_		~ .	
	(b)Wa	ater r	esour	ces:	Use a	nd ov	ver-uti	lizatio	on of	surfa	ce an	d gro	und v	vater, f	loods,	
	droug	ht, con	flicts	over v	vater,	dams	-benet	its an	d prot	olems.			2			
	(c)Mii	neral	resou	rces:	Use	and e	xploit	ation,	envi	ronme	ntal e	effects	of e	xtractin	ig and	
	using	minera	al resc	urces		0										
	(d)Fo	od re	esoure	es:	World	too	d pro	blems	s, cha	anges .	caus	ed by	y agi	riculture	e and	
	overg	azing,	effec	ts of	mode	rn agr	icultu	re, fei	rtilize	r-pesti	cide j	proble	ms, v	vater lo	gging,	
	salınıt	у.			~											
	(e)En	ergy	resou	rces:	Grow	ing e	nergy	need	s, rer	newab	le and	d non	-renev	wable e	energy	
	source	s, use	of alt	ernate	energ	gy sou	rces.									
	(f)Lar	nd res	ource	s: La	nd as	a reso	ource,	land	degra	dation	, man	indu	ced la	indslide	s, soil	
	erosio	n and	deser	tificat	10n. F	cole o	t an i	ndivio	tual i	n cons	servat	ion of	natu	ral reso	ources.	
	Equita	ble us	e of re	esourc	es for	susta	inable	lifest	yles.							

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

**Solid waste management:** Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Disaster 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
	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.
Self-Study	Water resources, Threats to biodiversity, Solid waste management, Role of Information
	Technology in environment and human health.
Text books and	Text Book(s):
<b>Reference books</b>	1. ErachBharucha. 2004, Environmental Studies for undergraduate courses, University
	Grants Commission, New Delhi, BharatiVidyapeeth Institute of Environment
	Education and Research.
	Reference Books:
	1. AnjaneyuluY. Introduction to Environmental sciences, B S Publications PVT Ltd,
	Hyderabad 2 Aniiraddy M Environmontal science & Technology RS Publications DVT I to
	2. Anjireddy.wi Environmental science & reenhology, DS rubheations rvi Edd, Hyderabad
	3 Banny Joseph 2005 Environmental Studies The Tata McGraw Hill publishing
	company limited New Delhi
	4 Principles of Environmental Science & Engg P VenuGonala Rao 2006 Prentice-Hall
	of India Pyt 1 td New Delhi
	5 Ecological and Environmental Studies – Santosh Kumar Garg RajeswariGarg (or)
	RajaniGarg 2006 Khanna Publishers New Delhi
	6 Essentials of Environmental Studies Kurian Joseph & R Nagendran Pearson
	Education publishers, 2005.
	7. A.K Dee – Environmental Chemistry, New Age India Publications.
	8. BharuchaErach-Biodiversity of India, Mapin Publishing Pyt.Ltd
E-resources and	1. Erach Bharucha. 2004, Environmental Studies for undergraduate courses, University
other digital	Grants Commission, New Delhi, Bharati Vidyapeeth Institute of Environment
material	Education and Research. https://www.ugc.ac.in/oldpdf/modelcurriculum/env.pdf
	2. NPTEL Courses - Environmental Studies By Dr.Tushar Banerjee   Devi
	Aniiya viswavidyalaya, Indore.

# Velagapudi Ramakrishna Siddhartha Engineering College ELECTRONICS AND COMMUNICATION ENGINEERING

#### SEMESTER IV

#### **CONTACT HOURS: 31**

S. No.	Course Code	Course Title	L	Т	Р	Credits				
1.	20BS4101	Signals & Systems	3	0	0	3				
2.	20ES4102	Control Systems	3	0	0	3				
3.	20EC4303	Pulse and Switching Circuits	3	0	0	3				
4.	20EC4304	Analog & Digital Communications	3	0	0	3				
5.	20HS4105	Universal Human Values	3	0	0	3				
6.	20EC4351	Signals & Systems Lab	0	0	3	1.5				
7.	20EC4352	Pulse & Switching Circuits Lab	0	0	3	1.5				
8.	20EC4353	Analog & Digital Communications Lab	0	0	3	1.5				
9	20EC4106	English for Professionals	0	0	2	1				
10	20EC4607	Skill Oriented Course 1	1	0	2	2				
11	20MC4108B	Indian Constitution	2	0	0	-				
		Total	18	0	13	22.5				
	Summer Internship six weeks (Mandatory) during summer vacation (EPICS)									
Honors	Honors/Minor Courses (the hours distribution can be 3-0-2 0r 3-1-0 also) 4 0 0 4									

## 20BS4101: SIGNALS & SYSTEMS

Course Type:TheoryLecture - Tutorial - Practice:3 - 0 - 0Prerequisites:20BS2101:Linear Algebra and Differential EquationsContinuous Evaluation:30Semester end Evaluation:70Total Marks:100	Course Category:	Programme Core	Credits:	3
Prerequisites:20BS2101:Linear Algebra and Differential EquationsContinuous Evaluation:30Semester end Evaluation:70Total Marks:100	<b>Course Type:</b>	Theory	Lecture - Tutorial - Practice:	3 - 0 - 0
Differential EquationsSemester end Evaluation:70Total Marks:100	Prerequisites:	20BS2101:Linear Algebra and	<b>Continuous Evaluation:</b>	30
Total Marks: 100		Differential Equations	Semester end Evaluation:	70
			Total Marks:	100

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Course outcomes	Upon	n successful completion of the course, the student will be able to:														
	CO1	Class	sify the	e signa	ls and	syster	ns base	ed on t	heir p	roperti	es.					
	CO2	Analyze the spectral characteristics of signals using Fourier series and Fourier transforms.														
	CO3	Anal conv	Analyze the frequency response of linear systems and apply the concepts of convolution and correlation operations on different signals.													
	CO4 Apply the Transform techniques to analyze the discrete time signals & system											stems.				
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	CO1	3												3		
of Program Outcomes	CO2	3												3		
(1 – Low, 2 - Medium,	CO3	3	1											3		
5– nigil)	CO4	3												3		
Course Content	UNIT Introd Contin Expor Introd Contin Syster Propes (12Hr UNIT Fourie Fourie Fourie Repre transfe Relati	CO4       3       3         UNIT I:       Introduction to Signals:         Continuous-Time and Discrete-Time signals, Transformation of the Independent variable, Exponential and Sinusoidal signals, unit Impulse and Unit Step functions.         Introduction to Systems:         Continuous-time and Discrete-time systems, Basic system properties. Discrete time LTI Systems: The Convolution sum, Continuous Time LTI Systems: Convolution integral, Properties of Linear Time Invariant systems.         (12Hrs)         UNIT II:         Fourier series:         Fourier series, Properties of Continuous time Fourier Series.         Fourier fransform:         Representation of periodic signals: The Continuous time Fourier transform, The Fourier transform for periodic signals, Properties of the continuous time Fourier transform.         Relationship between Fourier transform and Laplace transform (12Hrs)														

	<ul> <li>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.</li> <li>Correlation: Signal Comparison, Correlation, Properties of Correlation functions, Correlation functions for Non-finite Energy Signals, Properties of Energy and Power spectral density spectrums.</li> <li>(10Hrs)</li> <li>UNIT IV</li> <li>Sampling Theorem: Introduction, sampling theorem, Reconstruction of a signal from its samples using Interpolation, The effect of Under sampling: Aliasing</li> <li>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-transform.</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</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: 1,2 &amp; 4)</li> <li>2. B. P. Lathi, "Signals and Systems and Communications", BS Publications, 2008. (Unit: 3)</li> <li>Reference Books: <ol> <li>Simon Haykin and Barry Van Veen, 2nd edition, John Wiley, 2008.</li> <li>Tarun Kumar Rawat, "Signals &amp; Systems" Oxford University Press, 2010</li> </ol> </li> </ul>
E-resources and other digital material	<ol> <li>https://ocw.mit.edu/resources/res-6-007-signals-and-systems-spring-2011/video-lectures/</li> <li>http://www.nptelvideos.in/2012/12/signals-and-system.html</li> <li>http://www.thefouriertransform.com/</li> <li>https://www.youtube.com/watch?v=c_9JxwuEdqE&amp;feature=emb_title</li> </ol>

## 20ES4102: CONTROL SYSTEMS

<b>Course Category:</b>	Engineering Science	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-0
Co requisites:	20EC4101:Signal and systems	<b>Continuous Evaluation:</b>	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	Upor	1 succe	essful o	comple	etion o	f the c	ourse,	the stu	ident v	vill be	able to	):			
outcomes	CO1	Unde	erstand	the co	oncepts	s of fee	edback	contro	ol syste	ems an	d mod	el the	physio	cal syst	ems
	CO2	Dete	rmine	and an	alyze	the line	ear sys	tems u	ising ti	me do	main a	nalysi	s.		
	CO3	Determine and analyze the linear systems using frequency response plots.													
	CO4	Desig speci	gn and ficatio	d eval ns usii	uate ng bod	the co e-plots	mpens s and u	ators nderst	for li ands tl	near s	system e space	s to appro	meet baches	the de	esired
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	2										2	
achievement of Program	CO2	3	2											3	
Outcomes	CO3		2	3										2	
(1 – Low, 2 - Medium, 3– High)	CO4	3	2	2										2	
Course Content	UNI Intro Appl Feed Nonl Matl Netw Func (11 H UNI Time Step Orde Trans Stab	CO4       3       2       2         UNIT I:       Introduction: Basic Components of a Control System, Examples of Control System Applications, Open Loop Control Systems, Closed Loop Control Systems, Effect of Feedback on System Parameters, Types of Feedback Control Systems - Linear Versus Nonlinear Control Systems, Time Invariant Versus Time Varying Systems.         Mathematical Modeling of Physical Systems: Introduction, Equations of Electric Networks, Modeling of Mechanical System Elements, Impulse Response and Transfer Functions of Linear Systems, Block Diagrams, Signal Flow Graphs. (11 Hrs)         UNIT II:       Time Domain Analysis of Control Systems: Time Response of Continuous Data Systems, Typical Test Signals for the Time Response of Control Systems, 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.										vstem ct of ersus ectric nsfer aphs. tems, Unit econd les of utput ds of			

	Determining Stability Routh-Hurwitz Criterion. (11Hrs)
	<ul> <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, M<sub>r</sub>, W<sub>r</sub>, 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. (12 Hrs)</li> </ul>
	<ul> <li>UNIT – IV:</li> <li>Design of Control Systems: Introduction, Design with the Phase-Lead Controller, Design with the Phase-Lag Controller, Design with the Lead-Lag Controller.</li> <li>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. (11 Hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Benjamin C. Kuo, "Automatic Control Systems", 7<sup>th</sup> 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, 4<sup>th</sup> 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>

## 20EC4303: PULSE AND SWITCHING CIRCUITS

<b>Course Category:</b>	Programme Core	Credits:	4
Course Type:	Theory	Lecture - Tutorial -Practice:	4-0-4
Prerequisites:	20EC3302: Analog Electronics	<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	Design and analyze the response of Linear Wave Shaping circuits to different inputs.													
	CO2	Design and analyze the response of Non Linear Wave Shaping circuits under different biasing conditions.													
	CO3	Analyze, design and verify the states of Multivibrator Circuits.													
	CO4	Analyze, design and verify the outputs of time based generators and blocking oscillators.													
Contribution of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3– High)		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
	CO1	1	2	1	1								1	1	1
	CO2	1	3	2	2									1	1
	CO3	1	3	2	1									1	1
	CO4	1	2	1	2								1	1	1
Course Content	UNIT I: Linear Wave Shaping: High pass RC Circuit: High pass RC Circuit: Step voltage input, Pulse input, Square wave input, Exponential & Ramp Inputs, The High pass RC Circuit as a Differentiator. Low pass RC Circuit: The Low pass RC Circuit: Step voltage input, Pulse input, Square wave input, Exponential & Ramp Inputs, the Low Pass RC Circuit as a Integrator, Attenuators. (11Hrs) UNIT II: Non-Linear Wave Shaping: Clippers: Clipping Circuits, Diode Clippers, The transistor clipper, Clipping at Two Independent Levels. Clampers: The Clamping Operation, Clamping Circuits Taking Source and Diode Resistances into Account (The transient waveform & Study state output wave form for														

	<ul> <li>square wave input), A Clamping Circuit Theorem and Practical Clamping Circuits. (11 Hrs)</li> <li>UNIT-III</li> <li>Multivibrators:</li> <li>Bistable Multivibrator: The Stable States of a Binary, A Fixed Bias Transistor Binary, Self Bias Transistor Binary, Commutating Capacitors, An emitter coupled binary.</li> <li>Monostable and Astable Multivibrators: Gate Width of a Collector Coupled Monostable</li> </ul>
	Multivibrator, Waveforms of the Collector Coupled Monostable Multivibrators, The Astable Collector Coupled Multivibrator. (12 Hrs)
	<ul> <li>UNIT IV:</li> <li>Time Base Generators:</li> <li>Voltage Time Base Generators: General Features of a Time Base Signal, Methods of Generating a Time Base Waveform, Exponential Sweep Circuit, Miller and Boot Strap Time Base Generators-General Considerations, The Transistor Miller Time Base Generator, Bootstrap time base generators-basic principles, The Transistor Boot Strap Time Base Generator.</li> <li>Current Time Base Generators: A Simple Current Sweep, Linearity Correction through Adjustment of Driving Waveform, A Transistor Current Time Base Generator.</li> <li>(11 Hrs)</li> </ul>
Text Books and References Books	<ol> <li>Text Books:</li> <li>Jacob Millman and Herbert Taub, "Pulse, Digital and Switching Waveforms", TMH, 1999. (UNIT I, II, III &amp; IV).</li> <li>Reference Books:</li> <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>
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/ElectronicsRe sources.html.</li> </ol>
## 20EC4304: ANALOG AND DIGITAL COMMUNICATION

<b>Course Category:</b>	Programme Core	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	20EC3305: Probability Theory and	<b>Continuous Evaluation:</b>	30
	Random Processes,	Semester end Evaluation:	70
	20EC4101:Signals and System	Total Marks:	100

Course outcomes	Upor	n succ	essful	compl	etion of	of the o	course	, the s	tudent	will b	e able	to:			
	CO1	Anal	yze A	M and	d FM v	waves	in tim	e and t	freque	ncy do	omains				
	CO2	Analyze various methods of baseband digital transmission and Detection methods.													
	CO3 Understand geometric representation of signals and methods to detect sign noise													als in	
	CO4 Analyze various methods of band pass digital transmission and Detection methods												nods.		
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
towards	CO1	3	2	1											1
achievement of Program	CO2	3	2												1
Outcomes (1 – Low,	CO3	3	2												1
2 - Medium, 3 – High)	CO4	3	2	1											1
Course Content	UNI' Amp wave and H DSB Desc Angl Spec Appl (12 H UNI' Pulse Base Nyqu Codi (11 H	<b>F I</b> <b>blitude</b> s, Det Freque SC N ription <b>le Mo</b> <b>ication</b> <b>Irs</b> ) <b>F II</b> <b>e Mod</b> <b>band</b> nist's ( ng. <b>Irs</b> )	e Mod ection ancy D Modula h, Vest odulat Analys ns of A lulatio Pulse criteric	lulation of AN omain ited igial S ion: is, Na is, Na M &I on for	on: Tr M wav Desc Waves Side-B Frequerrow FM. C antiza Distor	ime, F es. Do ription s, Sin and M ency Band I ompar tion Pr <b>ion:</b> N rtion Ie	Freque uble S , Gen gle S odula Modu FM, V ison o rocess Matche ess Ba	ncy I Side Ba eratior Side I tion: F lation: Videba f AM	Domain and-Su of D Band Frequent Sing and FN and FN Code er, Pro d Bina	n Des ippres SBSC Modu ncy Do gle To 4, Tra M. Modu pertie ry Tra	criptio sed Ca waves llation omain one F nsmiss lation, s, Inte	n, Gen rrier N , Cohe : Free Descri requen sion Ba , Delta er sym sion, C	nerati Iodula erent o quenc ption ncy M andwi bol In Correl	on of ation: letecti y Do Modula dth of ulation nterfer ative 1	AM Time on of omain ation, FM, FM,

	<ul> <li>UNIT III:</li> <li>Signal Space Analysis: Introduction, Geometric Representation of Signals, Gram-Schmidt Orthogonalization Procedure, Likelihood Functions, Coherent Detection of Signals in Noise - Maximum Likelihood Decoding, Correlation Receiver. (11 Hrs)</li> <li>UNIT IV:</li> <li>Pass band Data Transmission: Introduction, Passband Transmission Model, Coherent Phase Shift Keying – BPSK, QPSK, M-ary PSK, Coherent Frequency Shift Keying - Binary FSK, Comparison and Applications of Digital Modulation Schemes. (11 Hrs)</li> </ul>
Text books and Reference books	<ul> <li>Text Books: <ol> <li>Simon Haykin. "An introduction to Analog and Digital Communication Systems", 3<sup>rd</sup>edition, 2009, John Wiley and Sons.(Units - I)</li> <li>Simon Haykin, "Communication Systems", John Wiley &amp; Sons, 4<sup>th</sup> edition, 2007.(Units - II,III &amp; IV)</li> </ol> </li> <li>Reference Books: <ol> <li>George Kennedy, Electronic Communication Systems, sixth edition, Tata McGraw Hill Edition -2017</li> <li>Bernard Sklar, "Digital Communication", 2<sup>nd</sup> edition, Pearson Education, 2013.</li> <li>Taub and Schilling, "Principles of Communication Systems", 2<sup>nd</sup> edition, TMH, 1986</li> </ol> </li> </ul>
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/117/105/117105143/</li> <li>https://nptel.ac.in/courses/117101051/</li> <li>https://web.stanford.edu/class/ee179/lectures/notes06.pdf</li> <li>http://www.ece.utah.edu/~npatwari/ece5520/lectureAll.pdf</li> </ol>

# 20HS4105: UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY

<b>Course Category:</b>	Humanities and Social Sciences	Credits:	3
Course Type:	Mandatory course	Lecture - Tutorial - Practice:	2-1-0
Prerequisites:	None. Universal Human Values 1	<b>Continuous Evaluation:</b>	50
	desirable.	Semester end Evaluation:	50
		Total Marks:	100

Course outcomes	Upon su	ccessf	ful con	npleti	on of	the co	urse, f	the stu	Idents	will b	e able	e to:			
	CO1	Unde natur	erstan e).	d and	aware	of th	emsel	ves ar	nd the	ir surr	oundi	ngs (f	amily	, societ	y and
	CO2	Hand and l	lle pro numar	oblem natur	s with re in n	n susta nind.	ainable	e solu	tions,	while	keep	ing hı	ıman	relation	nships
	CO3	Exhi unde	Exhibit critical ability and become sensitive to their commitment towards their understanding of human values, human relationship and human society.												
	CO4 Apply what they have learnt to their own self in different day-to-day setting real life.										setting	s in			
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					
achievement of Program	CO2			3											
Outcomes	CO3						2								
(1 – Low, 2 – Medium, 3 – High)	CO4		3 2												
Course	UNIT –	I:		•	-							-		-	
Content	Course i Part-1: exploration look at b Part-2: for fulf Understa scenarion harmony (Practice	introd Purpo ion: v on- as oasic H Right ïllmer anding , Met v at va e sessi	luction ose a vhat i the parameter under under under t of g Hap hod t rious ons a	n, nee nd m s it?, rocess n Aspin rstand aspin piness o fulf levels re to l	ed, bashotivat its coshor s ration ing, R rations and fill the be inc	sic gu ion f ontent elf-ex s elatio of Prosp e abo luded	idelin or th and plorat nship every erity ve hu to dis	e cou proces ion. C and F hum correc man	ntent Irse, 1 Ss, 'Na Continu Physica nan b etly – aspira natura	and p recapi atural lous l al Fac eing A cri tions: l acce	roces tulatic accep Happin sility - with itical unde ptance	s for on frootance ness a - the l their apprai rstand e in h	value om U and Pr basic : corr isal of ling a uman	educat HV-I, experion osperit require ect pr f the c nd livi being	tion: Self- iential y – A ments iority, urrent ng in as the

	innate acceptance for living with responsibility (living in relationship, harmony and co- existence) rather than as arbitrariness in choice based on liking-disliking). (12Hrs)
	<ul> <li>UNIT – II:</li> <li>Understanding Harmony in the Human Being – Harmony in Myself:</li> <li>Part-1: Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' – happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).</li> <li>Part-2: Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Health. (Practice sessions are to be included to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs. dealing with disease). (11Hrs)</li> </ul>
	<ul> <li>UNIT – III:</li> <li>Understanding Harmony in the Family and Society – Harmony in Human-Human Relationship:</li> <li>Part-1: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.</li> <li>Part-2: Understanding the harmony in the society (society being an extension of family); Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society–Undivided Society, Universal Order–from family to world family.</li> <li>(Practice sessions are to be included to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education, etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives).</li> <li>(11Hrs)</li> </ul>
	<ul> <li>UNIT – IV:</li> <li>Part-1: Understanding Harmony in Nature &amp; Existence – Whole existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of Nature – recyclability and self-regulation in nature, Understanding Existence as Co-existence of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.</li> <li>Part-2: Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of ethical human conduct, Basis for humanistic education, humanistic constitution and humanistic universal order,</li> </ul>

	Competence in professional ethics: a) ability to utilize the professional competence for augmenting universal human order, b) ability to identify the scope and characteristics of people-friendly and eco-friendly production systems, c) ability to identify and develop appropriate technologies and management patterns for above production systems, Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) at the level of individual: as socially and ecologically responsible engineers, technologists and managers, b) at the level of society: as mutually enriching institutions and organizations. (Part-1:Practice sessions are to be included to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology, etc. Part-2: Practice exercises and case studies are to be taken up in practice (tutorial) sessions eg. to discuss the conduct as an engineer or scientist, etc.) ( <b>11Hrs</b> )
Text books	Text Books:
and Reference	1. Human values and professional ethics, R. R. Gaur, R. Sangal and G. P. Bagaria, Excel
books	Books Private Limited, New Delhi (2010).
	<ol> <li>Reference books:         <ol> <li>Jeevan Vidya: EkParichaya, A. Nagaraj, Jeevan Vidya Prakashan, Amarkantak (1999).</li> <li>Human Values, A. N. Tripathi, New Age International Publishers, New Delhi (2004).</li> <li>The Story of Stuff: The impact of overconsumption on the planet, our communities, and our health and how we can make it better, Annie Leonard, Free Press, New York (2010).</li> <li>The story of my experiments with truth: Mahatma Gandhi Autobiography, Mohandas Karamchand Gandhi, B. N. Publishing (2008).</li> <li>Small is beautiful: A study of economics as if people mattered, E. F. Schumacher, Vintage Books, London (1993).</li> <li>Slow is beautiful: New Visions of Community, Cecile Andrews, New Society Publishers, Canada (2006).</li> <li>Economy of Permanence, J. C. Kumarappa, Sarva-Seva-Sangh Prakashan, Varanasi (2017).</li> <li>Bharat Mein Angreji Raj, Pandit Sunderlal, PrabhathPrakashan, Delhi (2018).</li> <li>Rediscovering India, Dharampal, Society for Integrated Development of Himilayas (2003).</li> <li>Hind Swaraj or Indian Home Rule, M. K. Gandhi, Navajivan Publishing House, Ahmedabad (1909).</li> <li>India Wins Freedom: The Complete Version, Maulana Abul Kalam Azad, Orient Blackswan (1988).</li> <li>The Life of Vivekananda and the Universal gospel, Romain Rolland, Advaitha Ashrama, India (2010).</li> </ol> </li> <li>Mahatma Gandhi: The Man who become one with the Universal Being, Romain Rolland, Srishti Publishers &amp; Distributors, New Delhi (2002).</li> </ol>

<b>E-resources</b>	1. AICTE – SIP Youtube Channel:
and other	https://www.youtube.com/channel/UCo8MpJB_aaVwB4LWLAx6AhQ
digital	2. AICTE – UHV Teaching Learning Material:
material	a. https://fdp-si.aicte-india.org/download.php#1

## 20EC4351: SIGNALS AND SYSTEMS LAB

<b>Course Category:</b>	Programme core	Credits:	1.5
Course Type:	Practical Lab	Lecture - Tutorial -Practice:	0-0-3
Prerequisites:	20EC4101:Signals and	<b>Continuous Evaluation:</b>	30
	Systems	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon	succes	sful co	omplet	tion of	the co	urse, t	he stu	dent w	vill be	able to	D:			
	CO1 Generate and perform the basic operations on continuous and discrete time signals											nals			
	CO2	Anal and l	Analyze the continuous and discrete time signals and systems using Fourier Series and Fourier Transform												
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	CO1				2	2									2
Outcomes (1 – Low, 2 – Medium, 3 – High)	CO2				2	2									2
Course Content	Perfor 1. Ger 2. Ger 3. Ope 4. Ger 5. Ana 6. Ana 7. De 8. De 9. Ve 10. W Cours 11. Im 12. De	rm the neration neration neration alysis of alysis of sign of rificati rite a p se-base npleme esign of	e follov n and j n of st on sig n of peo of Peri of Non g and s f Syste orogram ed Pro ntation f volu	wing u plottin andarc gnals ( eriodic odic si a-perio Simula em and Sampl m to fi <b>oject</b> n of a me co	g of T l signa Foldin and N ignals dic signals dic sig	imula rigono ls (Imj g, time Jon-pe using l gnals u f Tran sis by eorem correl /unvoi vith fac	tion se metric pulse, e shifti riodic Fourie sing F sfer fu using ation a ced cl le in a	oftwan and E Unit s ng, tir signal r serie ourier nction poles a and co assifie nd fad	re (Ma Expone tep, Ra ne sca ls. S. Trans and ze nvolut er base le out	ttlab/I ential f amp, S ling, a form ros ion of d on s	Seque	ew/Sc ons. inction ide sc ences	<b>ilab)</b> ns). aling ysis	).	
Text books and Reference books	1. A 2. S 3. J	Alan O Simon ohn.G Learni	ppenh Haykin .Proak ng, 20	eim, S n, Sigr is, Cor 13.	ignals nals an ntempo	and Syst d Syst orary (	ystems ems, V Comm	s, Pren Viley I unicat	tice H Publica ion Sy	all, 20 ations, stems,	09. 2007 Ceng	age			
E-resources	1. h	ttps://i	in.mat	hwork	s.com/	acade	nia/bo	oks/co	ontemp	porary	-comr	nunica	ation	system	IS-

and other	using-matlab-proakis.html
digital	2. https://web.stanford.edu/~boyd/ee102/
material	<ol> <li>https://in.mathworks.com/academia/books/signals-and-systems-using-matlab- chaparro.html</li> </ol>

NB: Eligibility for External Practical Examination:

- 1. A minimum of 10(Ten) experiments to be performed and recorded by the candidate.
- 2. Execute and submit a course-based project

### 20EC4352: PULSE AND SWITCHING CIRCUITS LAB

<b>Course Category:</b>	Programme Lab	Credits:	1.5
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	0-0-3
Prerequisites:	20EC3302:Analog	Continuous Evaluation:	30
	Electronics	Semester end Evaluation:	70
		Total Marks:	100

Course outcomes	Upon	succe	essful completion of the course, the student will be able to:												
	CO1	Desi	gn va	rious	linear	& not	n-line	ar circ	cuits a	nd an	alyze	their	respo	nse.	
	CO2	Desi	esign various switching logic circuits.												
	CO3	Desi mult	sign and generate various types of non-sinusoidal waveforms using altivibrators.												
	CO4	Desi	esign current and voltage sweep circuits based on given specifications.												
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
of Program	CO2			2	2										2
(1 - Low, 2 - Medium, 3 -	CO3			2	3										2
High)	CO4			2	2										2
Lab Content	<ol> <li>Li</li> <li>CO</li> <li>Do</li> <li>D</li></ol>	near V nstant esign ( esign ( esign ( sign ( sign ( esign ( esign ( esign ( esign ( A mini late to <b>jonal</b>	Wave (s) of Cli of Cla of Ast of Ast of Ast of Bist of Bist of Bist of Boc of tran of cur of cur of cur of cur	shapi ppers able I llector nostab able f able f able f st strap sistor rent ti rrent s of 10 n eligi	ng (R using s usin Multiv r Coup ble Mu Multiv ïxed t p volta r Milla ime ba sweep (Ten) ibility	C Lo diode g diod vibrato oled A ultivib vibrato oias tra age sw er Swo ase gen circui expen for Pr	w pas e and l le and or stable rator or ansiste veep ci nerato it riment ractica	ss & BJT BJT e Mul <sup>2</sup> or bin ircuit rcuit or ts, hav al Exa	High tivibra ary ve to t uminat	pass of ator be per- ion	circui	ts wit d and	h diff	ferent rded b	time y the
	Addit	ional	Expe	rimei	nts										

	<ul> <li>14. Design of RC Band pass circuit</li> <li>15. Wave form generator (square wave and triangular wave)</li> <li>*Course based project</li> <li>To implement the course project, following are the example circuits to be executed:</li> <li>LED Flasher Circuit, Battery Charger circuit using SCR, 555 Timer IC testing circuit etc</li> </ul>
Text books and Reference books	<ol> <li>Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuit theory", 5<sup>th</sup> Edition, Prentice-Hall of India Private Limited, New Delhi, 1995. Morris Mano M.: Digital Design, Prentice Hall of India,2001</li> <li>David A.Bell, "Laboratory Manual for Electronic Devices and Circuits", 4th Edition, Prentice-Hall of India Private Limited, New Delhi, 2004.</li> </ol>
E-resources and other digital material	<ol> <li>http://vlabs.iitkgp.ac.in/psac/#</li> <li>https://www.tutorialspoint.com/pulse_circuits/index.htm</li> </ol>

**NB**: Eligibility for External Practical Examination:

- 1. A minimum of 10(Ten) experiments to be performed and recorded by the candidate.
- 2. Execute and submit a course-based project

# 20EC4353: ANALOG AND DIGITAL COMMUNICATIONS LAB

<b>Course Category:</b>	Programme Core	Credits:	1.5
Course Type:	Practical	Lecture-Tutorial-Practice:	0-0-3
Prerequisites:	20EC4304: Analog & Digital Communications	Continuous Evaluation: Semester end Evaluation: Total Marks:	30 70 100

Course outcomes	Upon	succes	ccessful completion of the course, the student will be able to:												
	CO1	Experiand s	perimentally verify the working of AM and FM techniques using hardware a simulation												
	CO2	Exper transi	xperimentally verify the working of Digital modulation techniques and pulse ansmission using hardware and simulation												
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 of Program	CO1				1	2									2
Outcomes (1–Low,2 -Medium, 3–High)	CO2				1	2									2
Course Content	Experi 1. 2. 3. 4. 5. 6. Experi 1. 2. 3. 4. 5. 6. Course 1.	ments Gener Gener Gener Gener Gener Simul Simul Simul Simul Simul Simul Real t recept	using ation a ation a ation a ation a ation a ation a ation o ation o ation o ation o ation o ation o ation o ation o	Hard and de and de and de and De and De and De and De f Any of Freco of SF of Vari- of Mat of ASF ect: nplement	tection tectio	(using n of A n of Fin n of D n of D n of C n of C (Mat e Mod / Mod / Mod / Mod / Mod / Iter f ( and I on of c Digita	g Disc mplitu requent SB SC CM sig SK, F lab, L ulation ation a des ge For a re PSK n apturi l Mod	rete ( ide Ma icy Mo ignal gnal SK ar abview n and b nerationectang nodula	Compo odulat odulat dulated nd PSI w, Sci Demo Demo Demo ular p ation a speech n tech	ed sig ed sig ed sig l signa K sign lab , A dulati dulati dulati ulse. ulse. nd De n signa	s): mal nal d nal Any O on on t emodu	penso Ilatior its tra	ource) 1 ansmi	ssion	and

	2. Transmission and Reception of Text/Music/Voice with AM/FM –
	Implementation using LabVIEW
Reference books	1. Simon Haykin. "Introduction to Analog and Digital Communication Systems",
	3 <sup>rd</sup> edition, 2009, John Wiley and Sons
	2. George Kennedy, Electronic Communication Systems, sixth edition, Tata McGraw
	Hill Edition -2017
	3. Simon Haykin, "Communication Systems", John Wiley & Sons, 4 <sup>th</sup> edition, 2007.
<b>E-resources and</b>	1. https://www.vlab.co.in/broad-area-electronics-and-communications
other digital	2. http://www.commsp.ee.ic.ac.uk/~kkleung/Intro_Signals_Comm_2019/
material	Matlab_for_students_2018.pdf
	3. https://scilab.in/lab_migration/generate_lab/16/1

**NB:** Eligibility for External Practical Examination:

- 1. A minimum of 10(Ten) experiments to be performed and recorded by the candidate.
- 2. Execute and submit a course-based project

### 17HS4106: ENGLISH FOR PROFESSIONALS

<b>Course Category:</b>	Humanities & Social Sciences	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	Course Outcomes													
Upon successful completion of the course, the students will be able to:														
CO1	Present themselves effectively in the professional world by shedding off their inhibitions about communicating in English													
CO2	Introduce themselves as well as others appropriately.													
CO3	Use vocabulary to form sentences and narrate stories by using creative thinking skills													
CO4	4 Involve in practical activity-oriented sessions and respond positively by developing their analytical thinking skills.													
CO5	Learn	about	various	s expre	ssions t	o be us	ed in di	ifferent	situatio	ons.				
Contril (1 – Lo	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										3	3			

# CO5

### **Course Content:**

CO2

CO3

CO4

UNIT-I

- 1. Beginners, Functional, Situational Conversations
- 2. Practicing on Functional Conversations.

### UNIT-II

1. Errors in usage of Parts of Speech with a thrust on Verbs, Adjectives and Conjunctions, Idioms/Phrases.

2

3

3

3

3

3

3

3

3

3

- 2. B. Introducing Basic Grammar
- 3. C. Practicing on Functional Conversations.

### UNIT-III

- 1. Introducing Self & Others
- 2. Structures and Forming Sentences
- 3. Telephonic Etiquette, Social Etiquette and Table Manners
- 4. Practicing on Functional Conversations.

### UNIT-IV

- 1. Direct, Indirect/Reporting Speech
- 2. Public Speaking Basics
- 3. Versant Test Preparation
- 4. Practicing on Situational Conversations.

#### **Standard Reference**

- [1]. Swaroopa, Polineni, "Strengthen Your Communication Skills", I ed., Maruthi Publications, 2013. ISBN:978-81-907052-2-6
- [2] Mamta Bhatnagar & Nitin Bhatnagar, "Communicative English", I ed., Pearson India, 2010. ISBN:8131732045

## 20MC4108B - INDIAN CONSTITUTION

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

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Kno	w the	funda	nenta	l law c	of the	land							
	CO2 Understand how fundamental rights are protected														
	CO3	Perceive the structure and formation of the Indian Government System													
	CO4	Expl cons	Explain when and how an emergency can be imposed and what are the consequences.												
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								
Outcomes (1 – Low,	CO3						2								
2 - Medium, 3 - High)	CO4						2								
Course Content	UNIT Introd Constitu Constitu UNIT Funda to equa the righ UNIT legislat Parlian Preside Perspec Local S UNIT Emerg	I: uction ution a ution o II: menta dity, s nt of li III: 1 ive an menta ent of ctives Self G IV: gency 1	n to lism, of Indi al righ cheme fe and Natur id fina ry for India of the overn Provis	Cons Histo a. hts: So e of th perso re of ncial j rm of , Ame const ument	titution rical cheme e func- onal lil the I gover gover itution : Cons Natio	on of perspective of the lament berty u ndian s between runnent of nal am stitution	fund ective e fund tal rig inder cons veen th <b>t in I</b> the C endmo onal So	ia: N of co ament ht to c Article titutione Uni ndia: constit ents in cheme	Aeanin onstitu tal rig certain e 21, v on: F on and The ( utiona i India c in India reside	ng of ution hts, sc freed writs ju ederal d state Constit d pow dia.	the of Ind heme oms u urisdic struc s. tution vers au	Cons dia, S of the nder A ction. ture a powe nd Pro	titutio salient funda Article and di rs and ocedur	n Law featur amenta 19, sco stributi status re, Hist	, and res of l right ope of on of of the torical

Text books and Reference	<b>Text Book(s):</b> [1] Dr. J.N. Pandey, Constitutional Law of India published by Central law Agency
books	Allahabad, Edition 2018
	<ul> <li>Reference Books:</li> <li>[1] V.N Shukla's, Constitution of India Eastern Book Company, Lucknow.</li> <li>[2] M.P. jain, Indian Constitution Law, Wadhwa and Company, Nagpur.</li> <li>[3] D.D. basu, Constitution of India, Wadhwa and Company, Nagpur</li> </ul>
E-resources and other digital material	

# Velagapudi Ramakrishna Siddhartha Engineering College ELECTRONICS AND COMMUNICATION ENGINEERING

	SEMESTE	г ног				
<u>S.No</u>	Course Code	Subject	L	Т	Р	Credits
1	20EC5301	VLSI Design	3	0	0	3
2	20EC5302	Digital Signal Processing	3	0	0	3
3	20HS5103	Engineering Economics and Management	2	0	0	2
		A. Information Theory & Coding				
		B. Microwave Engineering		0	0	
4	20EC5404	C. Electronics Measurements & Instrumentation	3			3
		D. Computer Networks				
		A. Satellite communications				
5	20EC5205	B. Digital System Design Using Verilog	3	0	0	3
		C. Computer Organization				
6	20EC5351	VLSI Design Lab	0	0	3	1.5
7	20EC5352	Digital Signal Processing Lab	0	0	3	1.5
8	20HS5153	Advanced Communication Skills Lab	0	0	2	1
9	20TP5106	Personality Development	0	0	2	1
10	20EC5354	EPICS/Internship	0	0	3	1.5
11	20EC5607	<ul> <li>A. Networking Essentials</li> <li>B. Programming on ARM Cortex-M3</li> <li>C. Graphical System Design</li> <li>D. Software Design Tools</li> </ul>	1	0	2	2
12	20MC5108A	Biology for Engineers	2	0	0	-
		Total	16	0	17	22.5
Honor	rs/Minor Course	es (hours distribution can be 3-0-2 0r 3-1-0 also)	4	0	0	4

<u>Note:</u> Open Elective Courses may opt as self-learning course. Students register and complete the opted course in approved MOOCS platform on or before last instruction day of V Semester. They have to submit the certificate before the last instruction day of V semester

### 20EC5301: VLSI DESIGN

<b>Course Category:</b>	Program Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	20EC3302: Analog Electronics,	<b>Continuous Evaluation:</b>	30
	20EC3304:Digital Circuit Design	Semester end Evaluation:	70
		Total Marks:	100

Course	Upon successful completion of the course, the student will be able to:														
Outcomes	CO1	Anal	yze V	'LSI f	abrica	tion p	roces	ses a	nd CN	MOS	Logic	: Desi	gn.		
CO2 Identify the physical circuit parameters and analyze the effects of on overall performance of the circuit.											of para	rasitics			
	CO3	Desi	esign and test digital subsystem blocks using structured design.												
	CO4	Desi	sign and analyze single stage amplifiers using MOS 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		2											2
achievement of Program Outcomes	CO2			2	2										2
	CO3		2	3	3										2
(1 – Low, 2- Medium, 3 – High)	CO4	2		3	3										2
Course Content	UNIT Intro Basic Voltag Trans Figure and N for an of Pul UNIT MOS Layou Capac Propa	<b>NIT-I</b> troduction to MOS Technology: NMOS fabrication, CMOS fabrication. asic Electrical Properties Of MOS Circuits: Drain-to-Source Current I <sub>ds</sub> versus bltage V <sub>ds</sub> relationships, Aspects of MOS Transistor Threshold voltage V <sub>t</sub> , MOS ansistor Trans conductance $g_m$ and Output Conductance $g_{ds}$ , MOS Transistor gure of Merit, Pass Transistor, NMOS inverter, Pull-Up to Pull- Down Ratio for d NMOS Inverter driven by another NMOS Inverter, Pull-up to pull- down ratio r and NMOS Inverter Driven by one or more Pass Transistors, Alternative forms Pull-up, CMOS Inverter, Latch-up in CMOS Circuits. (15 Hrs) <b>NIT-II</b> <b>OS Circuit Design Processes:</b> MOS Layers, Stick Diagrams, Design Rules and ayout; <b>Basic Circuit Concepts</b> : Sheet Resistance $R_s$ , Standard Unit of apacitance. The Delay Unit, Inverter Delays, Driving Large Capacitive Loads and													

	Scaling of MOS Circuits: Scaling Models and Scaling Factors, Scaling Factors for Device Parameters.(15 Hrs)
	<ul> <li>UNIT-III</li> <li>Subsystem Design: Architectural Issues, Switch Logic, Gate Logic, Examples of Structured Design (Combinational Logic): A parity generator, Bus arbitration logic for n-line Bus, Multiplexers, A General Logic Function Block, A four line Gray code to Binary Code Converter.</li> <li>Test and Testability – Fault types and Models, Design for Testability, Controllability and Observability, Testing Combinational and Sequential Logic, Introduction to CAD Tools. (15 Hrs)</li> </ul>
	<b>UNIT-IV</b> <b>Basic Building Blocks of Analog IC Design: Single stage Amplifiers:</b> Basic concepts, Common-source stage, source follower, Common-gate stage, Cascode stage, choice of device models, Single ended and differential operation, Basic differential pair, differential pair with MOS Loads, Basic Current Mirrors. (15 Hrs)
Text books and Reference books	<ol> <li>Text books:</li> <li>Douglas A. Pucknell, Kamran Eshraghian "Basic VLSI Design", Prentice Hall of India, 3<sup>rd</sup> Edition, reprint 2009.</li> <li>Design of Analog CMOS Integrated Circuits by BehzadRazavi , McGraw Hill, 2003.</li> </ol>
	<ul> <li>References:</li> <li>1. Weste&amp;Eshraghian, "Principles of CMOS VLSI Design: A systems Perspective", Addison Wesley, 2<sup>nd</sup> Edition, 2008.</li> <li>2. John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley &amp; Sons, Reprint 2009.</li> <li>3. Allen, Phillip E, Holberg, Douglas R," CMOS Analog Circuit Design" Oxford University Press, USA, 2011.</li> </ul>
E- resources and other digital material	<ol> <li>https://www.cdac.in/index.aspx?id=DVLSI_modules&amp;courseid=20</li> <li>https://nptel.ac.in/courses/117106030</li> <li>The domain certification for VLSI: https://vlsiresources.com/nptel/</li> </ol>

<b>Course Category:</b>	Programme Core	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	20BS1101: Matrices and Differential	<b>Continuous Evaluation:</b>	30
	Calculus, 20BS2101: Laplace	Semester end Evaluation:	70
	transforms and Integral Calculus	<b>Total Marks:</b>	100
	20EC4301:Signals and Systems		

# 20EC5302::DIGITAL SIGNAL PROCESSING

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	App	ly DI	Г and	DIF F	FT alg	gorith	ms fo	r effic	ient c	ompu	tation	of the	DFT	
	CO2	Desi	gn an	d veri	fy the	frequ	ency	respor	ise of	Digita	al IIR	Filters	5.		
	CO3	Des	esign and verify the frequency response of Digital FIR filters												
	CO4	Und	nderstand the concept of Multi-rate Digital Signal Processing												
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 achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO1	3												2	
	CO2	3				2								2	
	CO3	3				2								2	
	CO4	1												1	
Course Content	UNIT The I DTFT The I Relat Filter Effici DFT, Algon Filter UNIT Desig Deriv Biling Frequ	Γ I Discret C, Free Discret ionshi ing m ient C Divi rithms ing ar Γ II gn of vatives ear T iency iency	ete Fo quenc ete Fo p of ethod Compu de-an de-an de-an de-an de-an fo <b>IIR F</b> s, IIR Transfo Transfo	y Dor ourier the I s base outation d-Con dication dication relation format format format	Tran main s Tran DFT = d on t on of th quer ons of on. from r Des ion, tions i	sform Sampl sform to Oth he DF <b>the</b> ne DF appro FFT SFT appro FFT	n - Its ing an (DF her T T. T. FF ach t Algor og Fil y Im cteriss uency tal dor	<b>Prop</b> nd Re Γ), Tl ransfo - <b>Fa</b> T Al o Co ithms <b>Iters:</b> pulse tics o 7 Tran main.	<b>Dertie</b> : constribution orms, <b>st Fo</b> gorith mputa – Use IIR fi Invari of co sform	s and ruction T as Prope ourier ms - tion e of the lter D iance, mmon ations	appli a of D a Li erties <b>Tra</b> Direc of the ne FFT vesign , IIR aly u s in the	by Aj filter sed Δ	ns: Ov e Tim Trans le DF m Al pputat , Rac prithm pprox Desig Analo log D	vervie le Sig forma T, Li <b>goritl</b> ion of dix-2 i in Li (12) imatic gn by g Fil omain (12 F	w of nals, tion, near <b>ms:</b> f the FFT near Hrs) on of the ters. and Irs)

	<ul> <li>UNIT III</li> <li>Design of FIR Filters: General Conditions, Design of FIR Filters - Symmetric &amp; 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. (12 Hrs)</li> <li>UNIT-IV</li> <li>Structures for IIR Systems: Direct-Form Structures, Signal Flow Graph and Transposed Structures, Cascade Form Structures and Parallel-Form Structures</li> <li>Structures for FIR Systems: Direct Form Structures, Linear Phase Structures and 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	<ol> <li>Text Books:</li> <li>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>Oppenheim, Alan V., Ronald W. Schafer, and John R. Buck. Discrete-time signa processing 2nd edition. Pearson Education</li> </ol>								
	<ol> <li>Reference Books:</li> <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>								
E-resources and other digital material	<ol> <li>https://nptel.ac.in/courses/117102060</li> <li>https://archive.nptel.ac.in/courses/108106151</li> <li>https://ocw.mit.edu/resources/res-6-008-digital-signal-processing-spring-2011/</li> <li>http://www.ece.cmu.edu/~ee791/</li> <li>http://cobweb.ecn.purdue.edu/~ipollak/ee438/FALL04/notes/ notes.html</li> </ol>								

_01200100			
<b>Course Category</b>	Humanities & Social Sciences	Credits	2
<b>Course Type:</b>	Theory	Lecture - Tutorial-Practice:	2-0-0
Prerequisites:	20BS4101: Signal and Systems	<b>Continuous Evaluation:</b>	30
	20EC5302: Digital Signal	Semester end Evaluation:	70
	Processing	Total Marks:	100

## 20HS5103: ENGINEERING ECONOMICS AND MANAGEMENT

Course	Upon successful completion of the course, the student will be able to:														
Outcomes	CO1	Und	erstar	nd var	ious f	forms	of org	ganiza	ations	and p	orincij	ples of	f man	ageme	nt.
	CO2	Und	erstar	nd the	vario	ous as	pects	of bus	siness	econ	omics				
	CO3	Perc	ceive the knowledge on Human resources and Marketing functions.												
	CO4	Eval	aluate various alternatives economically.												
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	CO2	2				3							2		2
Outcomes	CO3	2											2		2
(1 – Low, 2 Medium, 3 – High)	CO4	2				3							2		2
Course Content	UNIT Form Partne Mana of Sci UNIT Introd Analy Law of Dema Dema Dema Suppl	<b>S - I</b> ership ageme entific <b>C - II</b> duction vsis: No of Equ and A nd, I and; E ly An y Fun	Bus , Join ent: I c Mar c Mar dargin i Mar Margin i Mar Jastic lastic alysis	iness t Stoc ntrodu nagem o Eco nal Uu rginal sis: 1 nd Sc and I s: Sup	Org k Con action hent, N nomi tility : Utilit Theory hedul nelast oply S	ganiza mpany to M Moder <b>cs:</b> In and T ty. y of e and tic De Schedt	tion: y, Co- Ianag rn Prin ntrodu Ootal U Dema l Den mand ule an	Sali opera emen nciple nction Jtility and: 1 nand , Type Id Sup	tive S t, Fur s of M to E y, Law Dema Curve es of I oply (	Featur Societ Inction Manag Basic V of I nd F e, Sh Elasti Curve	res o y and s of 1 gemen Econ Dimin unctio ift in city. , Fact	f So Publi Manaş at. omic ishing on, Fa Dem ors Ir	le Pr c Sect gemer Conc g Mar actors and, afluen	oprieto tor. at, Prin (12) cepts, U ginal U Influe Elastic cing Su (12)	Utility Jtility, encing ity of upply, Hrs)

	UNIT – III											
	Human Resource Management: Meaning and difference between Personnel											
	Management and Human Resource Management, Functions of Human Resource											
	Management.											
	Marketing Management: Concept of Selling And Marketing – Differences,											
	Functions of Marketing, Product Life Cycle, Concept of Advertising, Sales											
	Promotion, Types of Distribution Channels, Marketing Research, Break-Even											
	Analysis. (12 Hrs)											
	UNIT – IV											
	<b>Financial Management:</b> Functions of Financial Management, Time value of money with cash flow diagrams. Concept of Simple and Compound Interest											
	with cash flow diagrams, Concept of Simple and Compound Interest. <b>Depreciation:</b> Causes of depreciation, Factors influencing depreciation, common											
	Depreciation: Causes of depreciation, Factors influencing depreciation, common											
	methods of Depreciation: Straight Line Method, Declining Balance Method, Sum of											
	Feanomic Alternatives: Methods of Evoluting Alternatives under Present worth											
	<b>Economic Alternatives:</b> Methods of Evaluating Alternatives under Present worth method. Future worth method. Annual Equivalent method. Problems (12 Hrs)											
	incurod, i dudie worth incurod, i finiadi Equivalent incurod i froblems. (12 filis)											
Text books	Text Books:											
and	1. M. Mahajan: Industrial Engineering and Production Management@, 2 <sup>th</sup> Edition, Dhanpat Rai Publications											
Reference	2. Martand Telsang" Industrial & Business Management", S.Chand publications											
DOOKS	Reference books											
	1. R.Paneerselvam "Production and Operations Management" PHI											
	2. Philip Kotler & Gary Armstrong "Principles of Marketing", pearson prentice											
	Hall,NewDelhi,2012 Edition.											
	4. B.B Mahapatro, "Human Resource Management", New Age International, 2011											
F- resources	1 https://www.toppr.com/guides/fundamentals-of-economics-and-management/											
and other	supply/supply-function/											
digital	2. https://keydifferences.com/difference-between-personnel-management-and-human-											
material	3. http://productlifecvclestages.com/											
	4. https://speechfoodie.com/cash-flow-diagrams/											

# 20EC5404A: INFORMATION THEORY AND CODING

<b>Course Category:</b>	Programme Elective	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
<b>Prerequisites:</b>	20EC3305- Probability Theory	<b>Continuous Evaluation:</b>	30
	& Random Processes	Semester end Evaluation:	70
	20EC4304- Analog and Digital	<b>Total Marks:</b>	100
	Communications		

Course	<b>urse</b> Upon successful completion of the course, the student will be able to:														
Outcomes	CO1	Und	erstan	d Info	rmati	on the	ory ar	nd erro	or con	trol st	rategi	es in o	chann	el cod	ing
	CO2	App	ly line	ar blo	ock co	des ar	nd cyc	lic co	des fo	r erro	r dete	ction a	and co	orrecti	on
	CO3	Ana	lyze C	onvol	ution	al cod	es and	l Max	imum	likeli	hood	decod	ing		
	CO4	Ana	lyze T	urbo (	Codes	and I	Low D	ensity	y Parit	ty Che	eck co	des			
Contribution		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
of Course		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Outcomes															
towards	CO1	2	2												2
of Program	CO2	2	2												2
Outcomes	CO3	2	2												2
(1 – Low,															
2 -Medium, 3 – High)	CO4	2	2												2
Content	UNIT Fund and e Codim Binar capac UNIT Linea Detec Capat Cyclic Encod UNIT Conv State Free d	Y I amen ntropy g, Sh y syn ity, ch Y II of II tion, I bilities c Coo ling, S Y III olutio Diagra mum listanc	tal lir y, sou annon metri annel ock C Minim s of a l des: I Syndro onal C am. likeli ce of a	nits in urce-cu i-Fanco c cha codir codir um D Block Descri Descri Descri Codes hood a Conv	n Info oding o codi unnel, ug the Jistano code, ption compu compu compu	ormat theor ng, Le binar orem, oductiv ce of <i>a</i> , Ham of cy ntation oding ding o	ion the rem, of empel- by era- inform on to a Bloc ming of clic of a and H of Co code.	lata c -Ziv c sure natior Linea k cod Codes code, Error I onvol	: Intro compa coding chann n capa ar Blo e, Err Gene Detect utiona	oduction ction g, disc el, m city th ock C or-De rator tion, I dl Cod	on, ur – pro- prete r utual neorer odes, tectin and F Decod les, C les: T	Synd g and Parity- ing.	nty, in oding y less matio ement rome Error check Tree, T terbi	nform , Huf s chan n, cha ). (15 and 1 -corre : Mati (12 H Trellis Algori (10 H	ation fman nels, annel Hrs) Error cting cices, rs) and ithm, Irs)

	UNIT IV										
	Turbo Codes: Turbo Coding, Performance of Turbo Codes, Turbo Decoding -										
	BCJR Algorithm.										
	Low Density Parity Check (LDPC) Codes: Construction of LDPC codes,										
	Minimum Distance of LDPC Codes, Probabilistic decoding of LDPC Codes.										
	(10 Hrs)										
Text books	Text Books:										
and	1 Simon Haykins, "Communication Systems", 4 <sup>th</sup> edition, John Wiley & Sons Inc.										
Reference	eference Books:										
DOOKS	1. Bernard Sklar "Digital Communications-Fundamental and Application", 2 <sup>nd</sup>										
	edition, PE.										
	2. John G. Proakis, "Digital Communications", 5 <sup>th</sup> ed., 2008, TMH.										
	3. Ranjan Bose, Information Theory, Coding and Cryptography, 2015, 1st Edition,										
	McGraw Hill Education (India) Pvt. Ltd., India.										
<b>E-resources</b>	1. https://nptel.ac.in/courses/108102117										
and other	2. http://www-math.ucdenver.edu/~wcherowi/courses/m7823/codln.html										
digital	3. https://www.ics.uci.edu/~magda/Courses/netsys270/ch10_2_v1										
material											

### 20EC5404B:MICROWAVE ENGINEERING

<b>Course Category:</b>	Program Elective 1	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	20BS1102:Engineering	<b>Continuous Evaluation:</b>	30
	Physics	Semester end Evaluation:	70
		Total Marks:	100

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Con	npreh	end t	he ba	sic pi	rincip	ole of	opera	ation	of mi	crow	ave s	ources.	
	CO2	Ana devi	lyze ces u	the pe sing	erforr scatte	nance ering j	e of d paran	iffere neters	ent mi 5.	icrow	ave c	ompo	onent	s and fer	rrite
	CO3	Des	Design and analyze the filters at microwave frequencies												
	CO4	Den	nonst	rate n	nicro	wave	benc	h seti	up foi	: mea	surin	g vari	ious p	oaramete	ers
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	PSO 1	PSO 2
	CO1		2												1
	CO2				2										1
Outcomes (1 – Low, 2 -	CO3				2										1
Medium, 3 – High)	CO4		2												1
Course Content	UNIT MICE Power and E Cylind UNIT PASS Passiv divide Phase Solid IMPA UNIT MW I by Ins Richar	-I ROW fficie fficie lrical -II IVE ce Co rs, C Shift State TT, T - III Filter ertion rds Tr	AVE Bean ncy, Mag COM ouple er, att <b>Dev</b> TRAP <b>s:</b> M n loss cansfo	SOU In Loa Helix netron IPON nents ers, D cenuar icces: ATT icrow s met ormat	JRCH ading, Trav n, π-rr VENT S: Bas Directitors, a Tuni diode vave ' hod, ion, H	ES: T , Refl veling node TS AP sic pri ional and ci nel di es. Trans (Butt Kurod	wo-c ex K g Wa oscill <b>ND S</b> coper coup ircula ode, missi terwo la's I	avity lystro ve T lation oter, 1 ties co ler, 1 tors, Vara ion li orth a dentit	Klys on: V ube A s. <b>D-ST</b> of 3-p E-plat isolat ctor of nes, S nd C ties- s	ATE ort a ne Te diode Strip heby	Velo ty Mo ifiers <b>DEV</b> and 4 ee, H S-mat s, PI lines shev) ed imp	City I odula - prin <b>TCE</b> -port -plan trix re N dic , Low Filte pedar	Modu tion, nciple paran e Tec prese odes, / pass er Tra nce.	llation, ( Power ( of ope (12 l meters, e, Magi entation, Gunn E (12 s Filter ansform (10	Output Output ration. Hrs) Power c Tee, Diodes, Hrs) design ations: Hrs)

	UNIT-IV MICROWAVE MEASUREMENTS: Power Measurement, Insertion Loss and Attenuation Measurement, Impedance Measurement, Slotted line VSWR measurement, Frequency Measurement, Network Analyzer and measurement of scattering 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.</li> <li>2. David M. Pozar: Microwave Engg John Wiley &amp; Sons - 2<sup>nd</sup>Edition (2003).</li> </ul>
	<ul> <li>Reference Books:</li> <li>1. E. Collin: Foundations for Microwave Engg IEEE Press 2<sup>nd</sup>Edition (2007).</li> <li>2. Annapurna Das and Sisir K.Das: Microwave Engineering - Tata McGraw-Hill, 2000.</li> </ul>
E-resources and other digital material	<ol> <li>http://technology.niagarac.on.ca/courses/elnc1730/microsolid.ppt</li> <li>http://www.intechopen.com/-/passive_microwave_components_ana_antenna</li> <li>http://home.sandiego.edu/~ekim/e194rfs01/</li> <li>http://www.slideshare.net/sarahkrystelle/lecture-notes-microwaves.</li> </ol>

### 20EC2504C: ELECTRONIC MEASUREMENTS & INSTRUMENTATION

<b>Course Category:</b>	Open Elective	e	Credits:	3
Course Type:	Theory		Lecture - Tutorial -Practice:	3 -0-0
Prerequisites:	20EC3302: Electronics	Analog	Continuous Evaluation: Semester end Evaluation:	30M 70M
			Total Marks:	100M

Course	Upoi	n suce	cessfi	ıl cor	nplet	ion o	f the	cours	e, the	e stud	lent v	vill b	e able	e to:	
outcomes	CO1	Em	phasi	ze th	e bas	ic ele	ctron	ics m	leasu	reme	nt cor	ncept	s & I	Design t	he
		diff	erent	analo	og an	d dig	ital e	lectro	onics	voltn	neters	5.		•	
	CO2	Des	ign t	he M	easur	emen	t of c	liffer	ent b	ridge	s.				
	CO3	Idei	ntify	and u	se di	fferer	nt ana	lyzer	s osc	illos	copes	& ge	enera	tors to 1	nake
		mea	asure	ments	s and	analy	ze m	easu	reme	nt	1	0			
	CO4	Ana	alvze the basic concepts of Transducers and Signal conditioning based												
		ona	n application												
Contribution		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSPO	PSPO
of Course		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Outcomes	CO1	2		3										3	3
towards	COI	2		5										5	5
achievement	$CO^{2}$	2												3	3
of Program	CO2	2												5	5
Outcomes	CO3	2	2											3	3
(1 - Low.)			-											5	5
2- Medium.	CO4			3	2									3	3
3- High)															
Course															
Course	UNI	UNIT- I													
Content	Basi	Basic Electronic Measurement Concepts: Introduction Performance													
	chara	acteri	stics-	Static		Dyna	amic	Mea	sure	ment,	Err	or A	nalys	sis, Sta	tistical
	Anal	ysis,		ting e	error.	DC				1					
	Indi	cating	g Ins	strum	ients	: DC	Amr	neter	, Mu	Iti-ra	nge A	Ammo	eter,	Aryton	shunt,
		Voltm	ieter,	Mult	1-ran	ge vo	ltmet	er, , (	Ohm D	mete	r - Se	eries	and S	shunt ty	vpe
	Insti	rume	nts :	tor 1	Meas	suring	g Ba	asic	Para	mete	ers-	AC	Volt	meters	Using
	Rect	ifiers,	, Mu	lti-rai	ige A	C vc	oltme	ters,	True	RMS	s volt	mete	r, Pe	ak resp	onding
	voltr	neters	5, AV	erage	resp	ondin	ig vol	tmete	ers.					(12)	Hrs)
	UNI	T-II													
	Brid	ges:	Intro	oduct	ion	to E	Bridge	e M	easur	emer	nts –	- W]	heats	tone, l	Kelvin,
	Max	well,	Hay,	Sche	ering,	, Wie	n Bri	idge,	, Res	sonan	ice B	ridge	, And	derson	bridge,
	The	Ower	n brid	ge, D	e Sa	uty br	idge	<u> </u>				C			2
	Dig	ital V	<sup>7</sup> oltm	eters	s: - In	trodu	iction	to D	VM,	Ram	p, Sta	air Ca	ase R	amp,	
	Inte	gratir	ng, C	ontin	uous	Balaı	nce, S	Succe	ssive	App	roxin	natioi	n Res	olution	and
	Sen	sitivi	ty of	Digit	al Me	eters.				••				(12)	Hrs)
				-											
	UNI	T- II	[												
	Osci	llosco	opes:	Basi	c pri	ncipl	e of	Oscil	losco	pe, I	Block	diag	ram,	Cathoo	le Ray
	Tube	e, Tin	ne-fre	equer	ncy –	phas	se an	gle n	neast	ireme	ents u	ising	CRC	), Dual	beam

	<ul> <li>CRO, Dual Trace CRO, Digital Storage Oscilloscope, Sampling Oscilloscope, CRO and its applications</li> <li>Signal Generator – AF Oscillator, Function Generator, Square and Pulse generator.</li> <li>Signal Analysis: Wave Analyzers, Harmonic Distortion Analyzers, Spectrum Analyzer, Logic Analyzer, Network analyzer (14 Hrs)</li> </ul>
	UNIT – IV Transducers as Input Elements to Instrumentation Systems: Classification of Transducers, Selecting a Transducer, Resistive Transducers, Strain gauges, Potentiometer, Inductive and Capacitive Transducers, Linear variable differential transducer, Temperature Measurements – Resistance thermometer, Thermistor, Thermocouple: Photovoltaic, Photoconductive, Photo emissive transducer, Piezoelectric Transducer, Mechanical transducers Signal conditioning: Introduction, Operational amplifier, Basic instrumentation amplifier, Applications of instrumentation amplifiers (specific bridge) (14 Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. H S Kalsi, "Electronics Instrumentation, Tata McGraw-Hill, 2004. (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>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

# 20EC5404D: COMPUTER NETWORKS

<b>Course Category:</b>	Programme Elective-1	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	None	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	Upor	Upon successful completion of the course, the student will be able to:													
CO1 Identify and explain the fundamental concepts of computer networks The Physical Layer.											orks, 1	model	s and		
	CO2 Design a data communication link considering fundamental concepts of stop & wait, go-back-n link layer concepts and framing.												op &		
	CO3	2O3 Interpret Network layer design issues, Routing algorithms and addressing.													
	CO4	Unde proto	erstand cols	l Trai	nsport	proto	ocols	and i	mport	ant a	spects	of a	applica	ation	layer
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	CO1	2	1											2	2
achievement of Program	CO2	2		1										3	2
Outcomes	CO3	2	1											3	3
2 - Medium, 3 – High)	CO4	2												3	3
Course Content	UNI Intro TCP/ The I UNI Elem Medi Proto UNI The Cont	<b>F-I</b> IP Ref Physic <b>F-II</b> Data 1 entary ium A cols, I <b>F-III</b> <b>Netw</b> rol Al	on: No ference cal Lay Link I Data ccess Etherno ork L gorithm	etwork e Mod yer: G Layer Link F Contr et, Dat ayer: ns, Int	c Harc el. uided Data Protoco ol Sul ta Link Netwo	lware, Transı Link ols. <b>b Lay</b> e x Laye ork La workir	Netw missic Layer er: Th r Swit nyer E ng, Th	ork So on Med Desig e Chan ching. Design e Netw	oftwar lia, Wi n Issu nnel A Issues vork L	e, The ireless es, Er llocati s, Rou ayer in	o OSI Trans for De fon Pro	Reference missic etection oblem. Algorit	ence N on. n and , Mult. (1 hms, v t.	Model, (10 H Correct iple A 12 Hrs Conge (12 H	, The (rs) ction, ccess () estion (rs)

	<b>UNIT-IV</b> <b>The Transport Layer</b> : The Transport Service, Elements of Transport Protocols, The Internet Transport Protocols: UDP, TCP. <b>Application Layer</b> : Domain Name System, Electronic Mail, The World WEB. (11 Hrs)
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Andrew S Tanenbaum, "Computer Networks", 5<sup>th</sup> edition, Pearson Education.</li> <li>Reference Books:</li> <li>1. Kurose, J. F., &amp; Ross, K. W. "Computer networking: A top-down approach", 7<sup>th</sup> edition, Peason Education.</li> <li>2. Behrouz A. Forouzan "Data Communications and Networking". 4<sup>th</sup> edition, TMH.</li> </ul>
E-resources and other digital material	<ol> <li>http://home.iitk.ac.in/~navi/sidbinetworkcourse/</li> <li>https://nptel.ac.in/courses/106105081</li> </ol>

## 20EC5205A: SATELLITE COMMUNICATION

<b>Course Category:</b>	Open Elective-1	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	None	Continuous Evaluation:	30
		Semester end Evaluation:	70
		Total Marks:	100

Course	Upor	1 succe	essful	compl	etion	of the	course	e, the s	studen	t will	be able	e to:			
outcomes	CO1	Reali	ze the	orbital	and fu	nction	al prino	ciples of	of satel	lite co	mmuni	cation	systen	ns.	
	CO2	Desig	gn a sa	atellite	comm	nunica	tion li	nk un	der sp	ecified	l chara	acterist	tics.		
	CO3	Unde	nderstand the multiple access techniques in satellite communication.												
	CO4	Desig	Design very small aperture terminals and familiar with earth station technology.												
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	1										2	2
achievement	CO2	2	2	1										2	2
of Program Outcomes	CO3	2	2	1										2	2
(1 – Low, 2 - Medium, 3 – High)	CO4	2	2	1										2	2
Course Content	UNI Orbi Mech Laun Perfo	UNIT I: Orbital Mechanics and Launchers: Overview of Satellite Communications, Orbital Mechanics, Look Angle Determination, Orbital Perturbations, Orbit Determination, Launches and Launch Vehicles, Orbital Effects in Communications Systems												rbital ation, atems	
	UNI	Г II:											(1	0 1115,	/
	<b>Satellites</b> : Satellite subsystems, Attitude and Orbit Control System (AOCS), Telemetry, Tracking, Command, and Monitoring, Satellite antennas, Satellite Link Design, Basic transmission theory, System noise temperature and G/T ratio, down link design, up link design, Satellite Systems Using Small Earth Stations, Design for Specified C/N.														
													(12	2 Hrs)	
	UNI	T III:													
	Mult C/N	<b>iple</b> A with 1	<b>ccess</b> interm	: Inti odulat	roduct tion, 7	ion, F Time I	reque Divisio	ncy D on Mu	vivision altiple	n Mul Acce	tiple A ss, TE	Access DMA 1	s, Cal Frame	culatio Struc	on of cture,

	Synchronization in TDMA Networks, Onboard Processing, Code Division Multiple Access, Spread Spectrum Transmission and Reception, DS-SS CDMA Capacity.								
	(12 Hrs)								
	UNIT – IV:								
	<b>VSAT Systems:</b> Overview of VSAT Systems, Network Architectures, Access Control Protocols, Basic Techniques, VSAT Earth Station Engineering, Calculation of Link Margins for a VSAT Star Network, System Design Procedure. (11 Hrs)								
Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Timothy Pratt, Charles Bostian, Jeremy Allnut, "Satellite Communications", Second edition, John Willey &amp; Sons.</li> <li>Reference Books:</li> </ul>								
	1. Dennis Roddy, "Satellite Communications", 4 <sup>th</sup> edition, TMH.								
E-resources and other digital material	<ol> <li>https://www.coursera.org/learn/satellite-communications</li> <li>https://nptel.ac.in/courses/117105131</li> </ol>								

# 20EC5205B: DIGITAL SYSTEM DESIGN USING VERILOG

<b>Course Category:</b>	Programme Elective 1	Credits:	3
<b>Course Type:</b>	Theory	Lecture - Tutorial -Practice:	3-0-0
Prerequisites:	Digital Circuit Design	<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 Develop and test Verilog models for digi											al logic blocks using structural modelling							
	CO2	<ul> <li>Design of combinational and sequential logic circuits in behavioral modelling</li> <li>Synthesize combinational logic and sequential machines using Verilog HDL</li> </ul>																	
	CO3																		
	CO4 Model the Digital Interfacing Systems using Verilog and analyze the case studies											ies							
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	CO1		2	2									2		2				
of Program	CO2		3	2	2								2		2				
(1 – Low,	CO3		3	2	3								2		2				
2 -Medium, 3 – High)	CO4		3	3	3								3		3				
Course Content	CO4       3       3       3       3       3         UNIT I       Introduction to Logic Design with Verilog: Structural Models of Combinational Logic, Logic System, Verification and Test Methodology, Propagation Delay, Truth Table Models of combinational and sequential logic with Verilog. (15 Hrs)         UNIT II       Logic Design with Behavioral Models of Combinational and Sequential Logic: Behavioral Modelling, Data Types of Behavioral Modelling, Propagation Delay and Continuous Assignments, Latches and Level Sensitive Circuits in Verilog, Behavioral Models of Multiplexers, Encoders and Decoders, Data Flow Models of a Linear Feedback Shift Registers, Modelling Digital Machines with Repetitive Algorithms. (15 Hrs)         UNIT III         UNIT III         Continuous Assignments, Latches and Decoders, Data Flow Models of a Linear Feedback Shift Registers, Modelling Digital Machines with Repetitive Algorithms. (15 Hrs)         UNIT III																		
	of Combinational Logic, Synthesis of Sequential Logic with Latches, Synthesis Sequential Logic with flipflops, Synthesis of Implicit State Machines, Registers											is of and							

	Counters. (15 Hrs)
	<ul> <li>UNIT IV</li> <li>Digital Interfacing Using Verilog: -Universal Asynchronous Receiver/Transmitter, Serial Peripheral Interface, Inter-Integrated Circuit,Video Graphics Array, Universal Serial Bus, Ethernet.</li> <li>Advanced Applicatons using Verilog:Vending Machine, Digital Clock, Moving Wave via LEDs, Translator, Air Freshener Dispenser, Obstacle-Avoiding Tank,Car Parking Sensor System, Digital Table Tennis Game (15Hrs).</li> </ul>
Text books and Reference books	<ol> <li>Text Books:</li> <li>Michael D. Ciletti, "Advanced digital design with the Verilog HDL", Eastern economy edition, 2002, PHI.</li> <li>Palnitkar, S. Verilog HDL: a guide to digital design and synthesis (Vol. 1). 2003, Prentice Hall Professional.</li> </ol>
	<ul> <li>Reference Books:</li> <li>1. John Michael Williams, Digital VLSI Design with Verilog, Springer Publication, 2<sup>nd</sup> Edition, 2014.</li> <li>2. Sameer Palnitkar, Verilog HDL: A guide to digital Design and Synthesis, 2<sup>nd</sup> Edition, Pearson, 2003.</li> </ul>
E-resources and other digital material	<ol> <li>http://www.eecg.toronto.edu/~jayar/pubs/brown/survey.pdf</li> <li>Prentice Hall Xilinx design series</li> <li>https://www.pearsoned.co.in/prc/book/michael-d-ciletti-advanced-digital-design-with-verilog-hdl-2e2/9789332584464</li> </ol>

# 20EC5205C: COMPUTER ORGANIZATION

<b>Course Category:</b>	Open Elective	Credits:	3
Course Type:	Theory	Lecture - Tutorial -Practice:	3 - 0 - 0
Prerequisites:	20EC3304:Digital Circuits	<b>Continuous Evaluation:</b>	30
	and Systems	Semester end Evaluation:	70
		Total Marks:	100

Course	Upon successful completion of the course, the student will be able to:															
CO1 Conceptualize the basics of computer organization and one methods in digital computer.											id dat	data representation				
	CO2 Analyze the design and implementation of various arithmetic algorithmetic architectures in a digital computer.													thm's		
	CO3	Understand typical control unit implementation techniques in digital computer.														
	CO4 Recognize the memory design and data transfer techniques in digital compu											ompute	er			
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	3	2											2	3	
	CO2		2	3										3	2	
	CO3		2	3										3	2	
	CO4	3	2											2	3	
Course Content	UNI Intro Basia Intro Repr repre UNI Arith Integ mult and r Float point	UNIT I         Introduction of Computer Organization and Architecture.         Basic organization of computer and block level description of the functional units.         Introduction to bus structure and connecting I/O devices to CPU and Memory. Data         Representation-Number representation: Binary Data representation, two's complement         representation       (12 Hrs)         UNIT II         Arithmetic Algorithms Architectures:         Integer Data computation: Addition, Subtraction. Multiplication: Unsigned         multiplication, Signed Multiplication-Booth's algorithm. Division of integers: Restoring         and non-restoring division.         Floating-point representation. IEEE 754 floating point number representation. Floating         point arithmetic: Addition, subtraction.														
	<ul> <li>UNIT III</li> <li>Control Unit: Pipeline basic concepts: processing, instruction pipelining, pipeline stages, Pipeline Hazards. Instruction formats- Addressing modes, Basic Instruction cycle, Micro-operations &amp; control signals, Hardwired control unit design methods, Micro programmed control, Micro instructions, Micro instructions with next address field, Nano-programming (11 Hrs)</li> <li>UNIT – IV</li> <li>Memory: Memory Hierarchy, Memory characteristics, Virtual memory management, paging and segmentation, Page replacement policies, Interleave memories, Cache memory, Cache mapping techniques,</li> <li>Data Transfer Techniques and I/O organization:</li> <li>Bus arbitration, DMA and transfer techniques, I/O Addressing: Memory mapped I/O, I/O mapped I/O, Interrupt driven I/O</li> </ul>															
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Text books and Reference books	<ul> <li>Text Books:</li> <li>1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw-Hill.</li> <li>2. John P. Hayes, "Computer Architecture and Organization", Third Edition.</li> <li>Reference Books:</li> <li>1. William Stallings, "Computer Organization and Architecture: Designing for Performance", Eighth Edition, Pearson.</li> <li>2. M. Moris Mano. (2007), "Computer System Architecture" 3rd edition, Pearson/ PHI.</li> <li>3. Ramesh Gaonkar, "Microprocessor Architecture, Programming and Applications with the 8085, Fifth Edition, Penram.</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>															

### 20EC5351: VLSI DESIGN LAB

Course Category:	Core	Credits:	1.5
Course Type:	Practical	Lecture - Tutorial -Practice:	0-0-3
Prerequisites:	20EC3352: Digital Circuit	Continuous Evaluation:	30
	Design Lab	Semester end Evaluation:	70
		Total Marks:	100

Course Outcomes	Upoi	successful completion of the course, the student will be able to:													
	CO1	Desi	gn, sy	nthesiz	ze and	analy	ze Dig	gital C	ircuits	using	y Veril	og HI	DL.		
	CO2	Desig trans	Design combinational and sequential circuits at circuit level, verify DCand transient analysis.												
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	CO1			2	3	2							2	2	
of Program Outcomes (1 – Low, 2 - Medium, 3 - High)	CO2			2	3	2							2	2	
Course Content	PART-A:         Design, Simulate, Synthesize the following experiments using Verilog HDL         1. 4-bit Ripple carry adder         2. 8 to 3 Priority Encoder         3. 8-bit parity generator and checker         4. Modulo-N up-down counter         5. Universal Shift register         6. 16-Bit ALU with 8 Arithmetic Operations, 4 Logic Operations and 2 Shift Operations         7. 4-bit Magnitude Comparator         8. Sequence detector using FSM.         PART-B:         Design circuits using the flow of the Full Custom IC design cycle at schematic level using CMOS logic(Minimum 4).         1. An Inverter         2. 2-input NAND Gate Design									using					

<ul> <li>5. A Latch Design</li> <li>6. 4-bit Gray to Binary code Converter</li> <li>7.Differential amplifier</li> <li>8.Common Source Amplifier</li> </ul>
<ul> <li>*Course based Projects: Design and simulation of</li> <li>1. Design of PLL</li> <li>2. Two-Stage CMOS Opamp Design</li> </ul>

NB: Eligibility for External Practical Examination:

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- 1. A minimum of 10(Ten) experiments have to be performed and recorded by the candidate.
- 2. Execute and submit a course-based project

<b>Course Category</b>	Programme core	Credits	1.5
<b>Course Type:</b>	Practical Lab	Lecture - Tutorial-Practice:	0-0-3
Prerequisites:	20BS4101: Signal and Systems	Continuous Evaluation:	30
	20EC5302: Digital Signal	Semester end Evaluation:	70
	Processing	Total Marks:	100

#### 20EC5352::DIGITAL SIGNAL PROCESSING LAB

Course	Upon successful completion of the course, the student will be able to:														
outcomes	CO1	Desig appli	Design and analyze various DSP Algorithms for signal and image processing applications using MATLAB Software.												
	CO2	Imple floati	Implement DSP algorithms using Code Composer Studio with TMS320C67XX 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 of Program Outcomes (1 – Low, 2 -Medium, 3 – High)	CO1	2			2							2		1	2
	CO2	2			2							2		1	2
Course Content	LIST 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. Code 11. 12. Cour 13.	OF E Comp Desig Desig metho Desig Decin Power Realiz Image Featur Signa Comp linear se-base Desig	XPER utation n of Bu n of Bu n of G d. n of dig nation a r spectr cation c e enhan re extra l proce oser S oute the convol ed Pro n of III	IMEN a of DF atterwo Butterwo Butterwo Butterwo gital FI and Int rum est of short cemen action f ssing u tudio N-poi lution to ject R digita	TS US T using orth and orth and rorth a R filter erpolat imation t time F t and so from 11 sing m nt DFT using c: al filter	ING M g DIT a l Cheby nd Cheby rs using ion of the Fourier moothi D and 2 ultirese ' of a g ircular	IATLA and DII yshev c ebyshe g windo a discre e discre transfo ng ope 2D sign olution iven se convol	AB: FFFT ligital I v digit owing to the time orm usi rations als analys quence ution of	algorith IIR filta tal IIR technic e seque e signal ing FFT sis (EM e of two s	hms ers usir filters jue ence f (D, EE) signals	ng Imp s using MD, V m a sig	ulse In g Bilind MD, D gnal con	varianc ear tra WT, S	e meth nsform WT)	nod hation
	13.	and fe	male v	oices t	ogethe	r							151515 (		mait

	14. For a given input signal and a moving average filter, analyse the filtered output signal showing spectrum of it. Compute energy content of the filtered signal and compare it with actual energy content of the input signal.
Text books	Text Book:
and Reference books	<ol> <li>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>Oppenheim, Alan V., Ronald W. Schafer, and John R. Buck. Discrete-time signal processing, 2nd edition, Pearson Education.</li> </ol>
	<ol> <li>Reference Books:</li> <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>
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>

## 20HS5153: ADVANCED COMMUNICATION SKILLS LAB

Course Categor	y:	Prog	ramm	e Core	•						edits:	1			
Course Type:		lab							]	Lectur	ctice:	0-0-2			
Prerequisites:		Cons in la Spea inclu	sideral nguag king, ding S	ole ser e skill Readin Senten	ni-adv s viz I ng and ce cor	anced Listeni I Writh Istruct	prof ng, ing, tion at	icienc <sub>y</sub>	y	Continuous Evaluation:30Semester end Evaluation:70Total Marks:100					
Course	Upo	n suc	cessfu	l com	pletio	ı of th	e cou	rse, the	e stude	ent wi	11 :				
outcomes	CO1 Apply elements of listening comprehension relevant for professional environment										ronme	nts			
CO2 Apply rational spoken communication with authentic accentuation in con complemented by the abilities of argumentation and skills of public speal										necte king	cted speech g				
	CO3 Understand the nuances of requisite Advanced Reading Skills for transnational te professional communication										techno-				
	CO4	Pro cor	Produce Higher order Written Communication required for administrative and corporate compilations												
Contribution		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO 2
of Course		1	2	3	4	5	6	1	8	9	10	11	12	1	
towards	CO1										3				
achievement	CO2						1		1	2	3	2	2		
of Program Outcomes	CO3								1	2	3	2			
(1 – Low, 2 - Medium, 3 – High)	CO4				1		1			2	3	2	1		
Course Content	UNIAdv TED ELE throu UNIA Adv	Image:													

	Illustrations and Practice including paralinguistic elements
	<ul> <li>UNIT - III</li> <li>Advanced Reading and interpretation skills</li> <li>&gt; EFFECTIVE READING- SQ3R Method, ERRQ Method and SPE Method with textual practice</li> <li>&gt; LOGICAL READING- Syllogisms -illustrations and practice</li> </ul>
	<ul> <li>UNIT – IV</li> <li>Advanced Writing ad other professional communication skills</li> <li>➢ ADVANCED COMPILATION AND DRAFTING SKILLS - Minuets, Résumé&amp; Video profile, Review and case writing</li> <li>➢ LIFE SKILLS FOR WORK PLACE COMMUNICATION including Sensitivity towards gender and diversity in communication- Multi-genre Activity</li> </ul>
Text books	<ol> <li>Lokesh Mehra, Sanjiva Dubey, S. P. Singh (Ed.) "Corporate Employability skills", 1<sup>st</sup> edition, CEGR, New Delhi, 2016</li> <li>Brent C. Oberg.C., Interpersonal Communication, 1<sup>st</sup> Impression, Jaico Publishing, Mumbai, 2005</li> <li>Eclectic materials offered by the Department of English</li> </ol>
Reference books	<ol> <li>Chauhan, Gajendra Singh, Smitha Kashiramka, "Technical Communication", Cengage, Delhi, 1<sup>st</sup> Impression ,2018</li> <li>Quintanilla Kelly M, Shan T Wahl, "Business and Professional Communication: Keys for Workplace Excellence", SAGE, New Delhi, 2<sup>nd</sup> Impression 2012</li> <li>Selinkar, Larry et al, English for Academic and Technical Purposes, I edition, Newbury House Publishers, 1981.</li> <li>John Langan, College Writing Skills, McGraw Hill, IX Edition, 2014</li> <li>Martin Cutts, Oxford Guide to Plain English, 7<sup>th</sup> Impression, OUP, 2011</li> </ol>
E-resources and other digital material	<ol> <li>ODll Language Learner's Software, Aug 2021 Orell Techno Systems , Visionet Spears Digital Language Lab software Advance Pro , Feb 2021</li> <li>www.britishcouncil.org/learning-english-gateway.</li> <li>the-oxford-guide-to-english-usage-pdf.</li> <li>www.cambridgeapps.org/</li> </ol>

### 20TP5106: PERSONALITY DEVELOPMENT

Course Categor	·y	Iı	nstitut	ional (	Core							C	redits	1	7
Course Type:		L	earnir	ıg by l	Doing				Lectu	re - Tı	ıtoria	l-Pra	ctice:	0-0-2	
Prerequisites:									Co Sem	ontinu lester	ous E end E	Zvalua Zvalua	tion:	100 0	
											T	otal M	arks:	100	
Course	Upor	on successful completion of the course, the student will be able to:													
outcomes	CO1	Understand the corporate etiquette.													
	CO2	Make presentations effectively with appropriate body language													
	CO3	Be composed with positive attitude													
	CO4	Und	nderstand the core competencies to succeed in professional and personal life												e
Contribution		PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO
of Course Outcomes towards achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)		1	2	3	4	5	6	7	8	9	10	11	12	1	2
	CO1								2		3				
	CO2									2	3				
	CO3										3				
	CO4									2	3				
Course Content	Unit 1. A: Talk Attit Com Uni 3. Man Socia Unit 5. S Ema	<ul> <li>Unit-I</li> <li>1. Analytical Thinking &amp; Listening Skills Self-Introduction, Shaping Young Minds - A Talk by Azim Premji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception. 2. Communication Skills Verbal Communication; Non Verbal Communication (Body Language)</li> <li>Unit-II</li> <li>3. Self-Management Skills Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities 4. Etiquette Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette</li> <li>Unit-III</li> <li>5. Standard Operation Methods Note Making, Note Taking, Minutes, Preparation</li> </ul>													
	6. Vo Anal Assu UNI	erbal ogies imptio	Abilit, Spo	y Syno otting entenc	onyms Error e Arg	s, Ante rs, Se ument	onyms entence s, Rea	, One e Co ding (	Word mplet Comp	l Subs ion, ( rehens	stitutes Course sion, P	s-Corr e of Practic	ection Actic e worl	of Sen on Sen k	tences tences
	UNI 7.Joł	<b>T-IV</b> o-Orie	ented S	Skills	-I Gro	oup Di	scussi	on, M	ock G	roup l	Discus	ssions			

	8.Job-Oriented Skills –II Resume Preparation, Interview Skills, Mock Interviews
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, Orient Black swan, 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	1. www. Indiabix.com 6. www.freshersworld.com

# 20EC5607/A: Networking Essentials - CISCO Networking Academy

<b>Course Category:</b>	Skill Oriented Course	Credits:	2
<b>Course Type:</b>	Lab Oriented	Lecture -Tutorial-Practice:	1-0-2
Prerequisites:	No prerequisites	<b>Continuous Evaluation:</b>	-
		Semester end Evaluation:	-
		Total Marks:	100

Course	Upon successful completion of the course, the students will be able to:														
Outcomes	CO1	Com	preh	end th	e basi	cs of n	ietwoi	ks an	d cor	nmun	icatio	on pri	nciple	es.	
	CO2	Infer	nfer networking protocols and routing between networks.												
	CO3	Unde	nderstand various addressing schemes and network services												
	CO4	Real	ealize a small CISCO network with basic switch & router configuration.												
Contribution of Course		<b>PO</b> 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	CO1	2	1			1								1	1
achievement of Program Outcomes (1 – Low, 2 - Medium, 3 – High)	CO2	1												1	2
	CO3	1		1										1	2
	CO4		1	1		2								2	2
Course Content:	UNI INT Com with UNI NET Com layer	UNIT-I         INTRODUCTION TO NETWORKS         Communications in a connected world, Online connections, Explore networks with packet tracer, Build a simple network         UNIT-II         NETWORING PROTOCOLS AND ARCHITECTURE         Communication principles, Network protocols, Network design and the access layer, Routing between networks, The internet protocol											orks		

	UNIT-III								
	DATA COMMUNICATION AND NETWORK SERVICES								
	Dynamic addressing with DHCP, IPV6 addressing and IPV4 and IPV6 address management, Transport layer services, Application layer services								
	UNIT-IV								
	<b>BASICS OF HOME NETWORK &amp; CISCO NETWORKING</b>								
	Build a Home network, Virtualization, Security considerations, Configure network and device security, Cisco switches and routers, The cisco IOS command line and Build a small cisco network.								
E-References	<ol> <li>https://skillsforall.com/course/networking-essentials?userLang=en-US</li> <li>https://www.netacad.com/sites/default/files/ss-netess.pdf</li> </ol>								

## 20EC5607B: PROGRAMMING ON ARM CORTEX-M3

<b>Course Category:</b>	Skill Oriented Course	Credits:	2
Course Type:	Lab Oriented	Lecture -Tutorial-Practice:	1-0-2
Prerequisites:	Programming in C, Digital Electronics	Continuous Evaluation: Semester end Evaluation: Total Marks:	- - 100

Course	Upor	Upon successful completion of the course, the student will be able to:													
outcomes	CO1	Atta (Kei	in the l).	basic	know	ledge	on A	RM C	Cortex	-M m	icroco	ontroll	er and	also o	n IDE
	CO2	Understand the GPIO Pins and their modes													
	CO3	Gai	Gain the knowledge on different clock sources.												
	CO4	Understand the Peripherals (Timers, PWM& UART) and their initialization													
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	2
	CO2			2										2	2
	CO3			2										2	2
	CO4			2										2	2
Course Content	UNI INT Intro UNI GPI0 LPC GPI0 regis UNI CLC LPC PLL	UNIT-II GPIO PINS & MODES LPC176x/5x General Purpose Input/ Output (GPIO), GPIO port Direction register, GPIO port output Set/clear register, GPIO port status register and GPIO interrupt registers. Programming exercises on GPIO pins. (12 Hrs) UNIT-III CLOCKING& POWER CONTROL LPC17xx Clocking and power control, Clock source selection multiplexer, PLL0 &									17xx Hrs) Ister, rrupt Hrs) 0 & ction				

	of different clock sources.	(12 Hrs)
	UNIT-IV PERIPHERALS LPC17xx Timer 0/1/2/3, LPC17xx Pulse Width Modulator Programming exercises on Timers, PWM with ISR & UART.	(PWM), UART, (11 Hrs)
Text books and Reference books/ E- resources and other digital material	<ol> <li>https://www.keil.com/dd/docs/datashts/philips/lpc17xx_um.pdf</li> <li>.https://www.nxp.com/docs/en/data-sheet/LPC1769_68_67_66_65_64_</li> <li>https://www.nxp.com/downloads/en/schematics/LPCXpresso-LPC1769</li> <li>Introduction to ARM@ Cortex-M Microcontrollers Fifth Edition by Value</li> </ol>	63.pdf -CMSIS-DAP.pdf <i>alvano</i> , Jonathan W

## 20EC5607C: GRAPHICAL SYSTEM DESIGN

<b>Course Category:</b>	Skill Oriented course	Credits:	2
Course Type:	Theory	Lecture - Tutorial -Practice:	1-0-2
Prerequisites:	-	Continuous Evaluation:	-
		Semester end Evaluation:	-
		Total Marks:	100

Course outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	CO1 Understand the basics of graphical programming.													
	CO2	Understand the Error Handling functions in standalone applications													
	CO3	Unde	Understand the data acquisition methods												
Contribution		PO P										PSO			
of Course		1	2	3	4	3	6	/	8	9	10	11	12	1	2
Outcomes	CO1						3								3
towards															
achievement of	CO2					2	3							2	3
Program															
Outcomes														2	3
(1 - Low, 2 - 1)	CO3					3	3								
Medium, 3 –															
Hign)															
Course	UNIT	- I													
Content	Graph	nical 1	Progra	ammiı	ng: In	troduc	ction	to La	ab V	TEW,	Lab	VIE	W Pr	ogram	ming
	Enviro	onment	, Crea	ting ar	nd savi	ng VI	, Con	trols a	and in	ndicat	ors, I	Data ty	pes, S	Strings	
	Condi	itional	State	monte	· Case	Struct	turo	For lo	one	While	loon	e Shi	ft Reo	rictore	Feed
	Back	Nodes	Local	varial	• Case hles an	d glob	al va	riable	s s	vv IIIIC	100p	5, 5m	n Keg	,151015,	I ccu
	Duck	10005	,Local	varia		u 510t	ui va	110010	6						
	UNIT	– II													
	Modu	ılar F	Progra	mmin	ig: In	troduc	tion,	Crea	ting	Sub	VI's	, Tin	ners,	Creati	ng a
	standa	lone ap	pplicat	ion.											
	Array	s and	Clust	ers: Ci	reating	one d	limen	isional	l arra	y, crea	ating	two d	limens	sional	array,
	Array	functi	ons, A	Auto i	indexir	ng, M	atrix	opera	ation	s with	n arra	ays, (	Creati	ng clu	sters,
	Cluste	r opera	ations,	Conve	ersion	betwe	en ar	rays a	nd cl	usters	, Erro	or han	dling.		
	UNIT	– III													
	Plotti	ng Da	ata ar	nd Stu	ructur	es: In	ıtrodı	uction,	, Tyj	pes of	f wa	ve fo	rms, `	Wave	form

	graphs, Wave form charts, Wave form data type, XY graphs, Case structures, Sequence structures, Formula nodes, Math script node.
	File I/O: Basics of file input/ output, Choosing a file format, File I/O VI's.
	UNIT – IV Data Acquisition Basics: Introduction to data acquisition, Sampling fundamentals, Signal conditioning, DAQ hardware configuration, DAQ hardware, DAQ assistant, Channels and task configuration.
Text books and Reference	<b>Text Book:</b> 1. Jovitha Jerome, "Virtual Instrumentation using LabVIEW", 1st Ed., PHI, 2013
books	<ul> <li>Reference Books:</li> <li>1. Sanjay Gupta, Joseph John, "Virtual Instrumentation using LabVIEW", 1st Ed., Tata McGraw-Hill, 2005.</li> <li>2. Gary Johnson, Richard Jennings, "LabVIEW Graphical Programming", Tata McGraw-Hill, 2006</li> </ul>
E-resources and other digital material	1. http://www.ni.com

### 20MC5108A BIOLOGY FOR ENGINEERS

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

Course Outcomes	Upon successful completion of the course, the student will be able to:														
	CO1	Unde of liv	erstand ing org	the bio ganism	ologica s	al conc	cepts	from a	an eng	gineer	ing pe	erspec	tive ar	nd classi	fication
	CO2	Demo biolo	bemonstrate the fundamentals of biomolecules like structure, function and regulation of iological processes												
	CO3 Understand the basic principles of Mendelian genetics, gene interaction transfer/inheritance of genetic factors/genes												nteraction	is and	
	CO4	Expla diver	Explain the process of cellular respiration and photosynthesis, and illustrate important liversified microorganisms and their classification												
Contribution		PO	РО	PO	PO	PO	РО	PO	РО	PO	PO	РО	PO	PSO	PSO
of Course		1	2	3	4	5	6	7	8	9	10	11	12	1	2
Outcomes towards	CO1							2							
achievement of	CO2							2							
Outcomes															
(1 – Low,	CO3							2							
2-Medium,							1								
3 – High)	CO4							2							
S – High) Course Content	CO4       2       2       2         Unit-I       Introduction and Classification of Living organisms         Introduction:       (4 hrs)         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 hrs)         Classification of living organisms based on (a) Cellularity- Unicellular or multicellular (b)         Ultrastructure- prokaryotes or eukaryotes. (c) Energy and Carbon utilization -Autotrophs, heterotrophs, lithotrophs (d) Ammonia excretion – ammonotelic, uricotelic, ureotelic (e)Habitat-aquatic, terrestrial (e) Molecular taxonomy- three major kingdoms of life.										rs) eye and major rring to 's) ilar (b) otrophs, Habitat-				

	Unit-II         Biomolecules and Enzymes         Biomolecules:       (4 hrs)         Biomolecules: Structures of sugars(Glucose and Fructose), starch and cellulose. Nucleotides and DNA/RNA. Amino acids and lipids. Proteins- structure and functions- as enzymes, transporters, receptors and structural elements.         Enzymes:       (3hrs)         Enzyme classification. Mechanism of enzyme action.         Enzyme kinetics and kinetic parameters.
	Unit-III Genetics and Gene information Transfer Genetics : (4 hrs) 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. Information Transfer: (4 hrs) 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.
	Unit-IV Metabolism and Microbiology Metabolism: (4 hrs) 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. Microbiology: (3 hrs) Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Growth kinetics. Ecological aspects of single celled organisms. Microscopy.
Text books and Reference books	<ol> <li>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>Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wileyand Sons</li> <li>Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freemanand Company</li> <li>Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher</li> <li>Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers</li> </ol>